No. _____

In the Supreme Court of the United States

Capella Photonics, Inc.,

Petitioner,

v.

Cisco Systems, Inc., *et al.*,

Respondents.

On Petition for a Writ of Certiorari to United States Court of Appeals for the Federal Circuit

PETITION FOR A WRIT OF CERTIORARI

ROBERT GREENE STERNE
Counsel of Record
JASON D. EISENBERG
WILLIAM H. MILLIKEN
Sterne, Kessler, Goldstein & Fox, P.L.L.C.
1100 New York Avenue, N.W.
Washington, D.C. 20005
(202) 371-2600
rsterne@sternekessler.com

Counsel for Petitioner

QUESTION PRESENTED

Whether the Federal Circuit's practice of routinely issuing judgments without opinions in appeals from the Patent Trial and Appeal Board violates 35 U.S.C. § 144, which provides that the Federal Circuit "shall issue . . . its mandate and opinion" in such appeals.[1]

[1] This question is substantially similar to the second question presented in *Leon Stambler v. Mastercard International, Inc.*, No. 17-1140. The Court called for a response to the *Stambler* petition, and briefing was completed as of June 20, 2018.

PARTIES TO THE PROCEEDING

Petitioner Capella Photonics, Inc. was the Patent Owner-Appellant below.

Respondents Cisco Systems, Inc.; Ciena Corporation; Coriant Operations, Inc.; Coriant (USA) Inc.; Fujitsu Network Communications, Inc.; Lumentum Holdings, Inc.; Lumentum Inc.; and Lumentum Operations, LLC were the Petitioners-Appellees below.

RULE 29.6 STATEMENT

Pursuant to Supreme Court Rule 29.6, Petitioner Capella Photonics, Inc. states that it has no parent corporation and that no publicly held company owns 10% or more of its stock.

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PETITION FOR A WRIT OF CERTIORARI

Capella Photonics, Inc. respectfully petitions for a writ of certiorari to review the judgment of the United States Court of Appeals for the Federal Circuit in this case.

OPINIONS BELOW

The Federal Circuit's non-precedential judgment without opinion is reported at 711 F. App'x 642. Pet. App. 3a–5a. The Federal Circuit's order denying rehearing en banc is unreported but is reproduced at Pet App. 1a–2a. The relevant opinions and orders of the Patent Trial and Appeal Board in the underlying agency proceedings are unreported but are reproduced at App 6a–322a.

JURISDICTION

The Federal Circuit entered judgment on February 12, 2018, and denied Capella's Petition for Rehearing on April 9, 2018. On July 5, 2018, the Chief Justice granted Capella's application to extend the time to file this petition until September 6, 2018. This Petition is thus timely filed under Sup. Ct. R. 13.1. This Court's jurisdiction is invoked under 28 U.S.C. § 1254(1).

STATUTORY PROVISIONS INVOLVED

Section 144 of the Patent Act, 35 U.S.C. § 144, provides as follows:

The United States Court of Appeals for the Federal Circuit shall review the decision from which an appeal is taken on the record before the Patent and Trademark Office. Upon its determination the court shall issue to the Director its mandate and opinion, which shall be entered of record in the Patent and Trademark Office and shall govern the further proceedings in the case.

Federal Circuit Rule 36 provides as follows:

The court may enter a judgment of affirmance without opinion, citing this rule, when it determines that any of the following conditions exist and an opinion would have no precedential value:

(a) the judgment, decision, or order of the trial court appealed from is based on findings that are not clearly erroneous;

(b) the evidence supporting the jury's verdict is sufficient;

(c) the record supports summary judgment, directed verdict, or judgment on the pleadings;

(d) the decision of an administrative agency warrants affirmance under the standard of review in the statute authorizing the petition for review; or

(e) a judgment or decision has been entered without an error of law.

INTRODUCTION

Section 144 of the Patent Act requires that, in appeals from decisions of the Patent Trial and Appeal Board, the Federal Circuit "shall issue to the Director [of the Patent Office] its mandate *and opinion*." 35 U.S.C. § 144 (emphasis added). The Federal Circuit has adopted a routine practice of disregarding this statutory command. Since the America Invents Act established the current regime of PTAB proceedings, the Federal Circuit has issued a "judgment without opinion" under Federal Circuit Rule 36 in roughly *half* of all appeals from the Board: 51% in 2013, 49% in 2014, 63% in 2015, 51% in 2016, and 44% in 2017.[1]

This cannot be allowed to continue. The plain language of § 144 requires that the Federal Circuit issue an "opinion" in appeals from the Board. An "opinion" is "a statement of the reasons on which [a]

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[1] *See* Matthew Bultman, *Has Rule 36 Peaked At The Federal Circuit?*, LAW360 (Feb. 20, 2018), https://www.law360.com/articles/1013664.

judgment rests." *Rogers v. Hill*, 289 U.S. 582, 587 (1933). In other words, an "opinion" requires that the court show its work—the court must explain, with reference to the relevant facts and legal authorities, *why* the case came out the way it did. Rule 36 judgments do not do that. Indeed, the Federal Circuit itself has conceded that such judgments are not opinions, *Rates Tech., Inc. v. Mediatrix Telecom, Inc.*, 688 F.3d 742, 750 (Fed. Cir. 2012), and black-letter law confirms that a court does not issue an "opinion" merely by rendering a judgment on the outcome of a case. *See, e.g.*, *Rogers,* 289 U.S. at 587; *United States v. Nugent*, 100 F.2d 215, 217 (6th Cir. 1938).

Congress had good reason to require the Federal Circuit to issue opinions in appeals from Board decisions. Appellate-court opinions not only provide important guidance to the immediate parties to the case; they also serve a critical role in advising the public and the bar of the legal principles governing their rights and conduct, which in turn ensures that the legitimacy of the judicial system is maintained. This law-declaring function of opinions is particularly important in the context of patent disputes. "[P]atents are 'public franchises'" that allow their inventors to "exclude others from making, using, offering for sale, or selling the invention throughout the United States.'" *Oil States Energy Services, LLC v. Greene's Energy Group, LLC*, 138 S. Ct. 1365, 1373–74 (2018) (quoting *Seymour v. Osbourne*, 78 U.S. (11 Wall.) 516, 533 (1871); 35 U.S.C. § 154(a)(1)). Patentees and the public alike are entitled to know the precise boundaries of those franchises, in accordance with the twin federal policies of "promot[ing] the progress of Science and useful Arts," U.S. Const. art. 1, § 8, cl. 8, while also ensuring "the full and free use of ideas in the public domain," *Lear, Inc. v. Adkins*, 395 U.S. 653, 674 (1969). Appellate-court opinions on patent-law issues play a vital role in defining those boundaries and consequently in maintaining public faith in the fairness and legitimacy of the patent system.

In short, the Federal Circuit's failure to abide by § 144's clear command effectively deprives patent owners of their property in derogation of the regime established by Congress—and in the process, it deprives patent applicants, patent owners, the patent bar, and the general public of essential guidance regarding the scope and extent of patent rights. The consequences of this failure are detrimental to all stakeholders involved.

Those consequences are on full display in the present appeal, which arises from Board decisions in several related *inter partes* review proceedings. Capella's appeal to the Federal Circuit and subsequent petition for rehearing raised important issues concerning patent claim construction, the legal requirements to qualify a document as prior art, and the procedural rights afforded to participants in the IPR process. Section 144 required that the Federal Circuit address these issues in a reasoned opinion, but the court failed to do so—depriving Capella specifically, and the patent bar generally, of much-needed guidance regarding the operative legal principles.

Moreover, the Federal Circuit's routine practice of issuing Rule 36 judgments in Board appeals not only disregards § 144's plain text; it also threatens to introduce infirmities of a constitutional dimension into administrative review processes established by the AIA. This Court's *Oil States* decision, in the course of rejecting an Article III challenge to *inter partes* reviews, suggested that appellate review of Board proceedings acts as a constitutionally required safeguard of patent owners' rights. *See* 138 S. Ct. at 1379 (noting that "the Patent Act provides for judicial review by the Federal Circuit" and reserving judgment on "whether inter partes review would be constitutional without any sort of intervention by a court at any stage of the proceedings") (citations and quotation marks omitted). As long as the Federal Circuit continues to issue Rule 36 judgments in appeals from the Patent Office, that court risks subverting this safeguard and, consequently, risks depriving patent owners of their property without constitutionally sufficient process.

The question presented is important, and it is recurring: Rule 36 judgments have become the norm in PTAB appeals in the Federal Circuit, notwithstanding § 144's command that the court issue "opinions" in such appeals. This Court's intervention is warranted to stop this widespread disregard of Congress's clear directive and to ensure that all stakeholders in the patent system have certainty regarding the scope of patent rights.

This Court should grant the petition for a writ of certiorari, vacate the decision below, and remand for proceedings compliant with 35 U.S.C. § 144.

STATEMENT OF THE CASE

A. The Patents-In-Suit

This case concerns the validity of two patents, Reissue Patent RE42,678 ("the '678 patent") and Reissue Patent RE42,368 ("the '368 patent"). The patents, which have materially identical specifications, describe an improved fiber-optic communication system that employs fiber collimators as input and output ports and corresponding channel micromirrors that are controllable and pivotable and thus can reflect individual wavelengths of a fiber-optic ray into selected output ports. Each of the challenged claims requires an optical apparatus comprising, among other things, multiple "ports" for a "multi-wavelength optical signal." *See, e.g.*, '678 patent 14:6–23 (claim 1); '368 patent 14:6–20 (claim 1).

The specifications of the two patents repeatedly state that fiber collimators, and *only fiber collimators*, serve as the claimed "ports." *See, e.g.*, '678 patent 4:26–27 ("The fiber collimators serving as the input and output ports");[2] *id.* 8:35–36 ("the fiber collimator grating serving as the output port"); *id.* 9:20–21 ("The fiber collimators serving as the input and output ports"); *id.* 9:62–63 ("the fiber collimators (serving as the input and output ports)"); *id.* 10:29–32 (In FIG. 3, "the one-dimensional fiber collimator array 110 of FIG. 2B is replaced by a two-dimensional array 350 of fiber collimators, providing for an input-port and a plurality of output ports."); *id.* 10:52–53 ("the fiber collimators that provide for the input and output ports"); *see also id.* 2:44 ("port/fiber"); *id.* 8:33–34 (output ports have a "fiber core"). Indeed, according to the very first sentence of the "Summary of the Invention," "[t]he present invention . . . employ[s] an array of fiber collimators serving as an input port and a plurality of output ports." *Id.* 3:54–57.

The specification's description of its figures reinforces this physical characterization of a "port" as a "fiber collimator." The specification explains that Figure 1A—printed on the face of the patents—depicts an apparatus that includes "an array of fiber collimators 110, providing an input port 110-1 and a plurality of output ports 110-2 through 110-N (N≥3)." *Id.* 6:58–60. In discussing 110-1 through 110-N, the specification uses the term "port" and its physical "fiber collimator" structure interchangeably. *See, e.g.*, *id.* 6:65 ("input port 110-1"); *id.* 7:9–10

[2] Citations are made to the specification of the '678 patent; the '368 patent specification contains identical disclosures.

("output ports 110-2 through 110-N"); *id.* 8:19–20 ("output ports 110-2 through 110-N"); *id.* 10:14 ("fiber collimators 110-1 through 110-N"); *id.* 10:21 ("fiber collimators 110-1 through 110-N").

To make matters even more clear, in the '678 patent, the *claims themselves* teach that "fiber collimators[] provid[e] an input port for a multi-wavelength optical signal and a plurality of output ports." *E.g.*, *id.* 14:8–10 (claim 1); *id.* 15:31–33 (claim 21); *id.* 17:34–37 (claim 44).[3]

The patents also explicitly distinguish prior-art structures known as "circulators" from the claimed fiber-collimator ports. The specifications note that "the optical circulators implemented in [prior-art systems] for various routing purposes introduce additional optical losses, which can accumulate to a substantial amount." *Id.* 2:54–47.

B. The Proceedings Before the Board

In a period of less than one year, Respondents filed twelve separate petitions for *Inter Partes* Review against the '678 and '368 patents, arguing that various claims of those patents were invalid because they would have been obvious in light of the prior art. As relevant here, the Board found claims

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[3] The same limitation applies to all the remaining challenged claims of the '678 patent because each of the remaining claims depends from (and thus contains all of the limitations of) claims 1, 21, or 44.

1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53, and 61–65 of the '678 patent and claims 1–6, 9–13, 15, and 16 of the '368 patent invalid as obvious under 35 U.S.C. § 103.

The Board reached this conclusion even though it is undisputed that the prior art does not disclose an optical apparatus containing the required plurality of fiber collimators as ports. Instead, the Board concluded that the *circulators* in a prior-art reference called Bouevitch—structures that the patents-in-suit explicitly distinguish from the fiber-collimator ports—satisfy the "port" limitation of the challenged claims. *See* Pet. App. 48a–49a; *id.* 115a. The Board rejected Capella's argument that the claimed "ports" were limited to fiber collimators, concluding that "the ordinary and customary meaning of 'port' encompasses circulator ports" and that the patents did not "clear[ly]" disavow "circulator ports from the scope of the term 'port.'" *Id.* 33a–36a; *id.* 102a–105a.

In four of the underlying IPRs—IPR2014-01166, IPR2014-01276, IPR2015-00816, and IPR2015-00894—the Board found the challenged claims obvious in light of a combination consisting of Bouevitch and a patent called Smith. Smith's filing date post-dated the filing date of the patents-in-suit, but Cisco had argued that Smith was entitled to claim the priority date of an earlier-filed provisional application ("the '683 provisional") because the material upon which Cisco was relying in Smith was carried through to Smith from the '683 provisional. *See* Pet. App. 41a–42a; *id.* 108a–109a. But as Cisco belatedly recognized—after the record should have been closed—that was not sufficient to qualify Smith as prior art. *See id.* 41a; *id.* 109a. Cisco was *also* required to show that the '683 provisional *provided written-description support for the claims of Smith*. *See, e.g.*, *In re Wertheim*, 646 F.2d 527, 537 (C.C.P.A. 1981).

The Board permitted Cisco to supplement the record with additional evidence, in the form of a supplemental claim chart, in an effort to make the required showing. *See* Pet. App. 41a–46a; *id.* 108a–113a; *id.* 306a–309a. But, while the Board permitted Capella to file a brief in response, it denied Capella the opportunity to submit any additional *evidence* on the priority issue. *See id.* 319a–321a. The Board then concluded, relying on Cisco's supplemental evidence—which Cappella was not allowed to fully rebut—that Cisco had made the required showing that Smith qualified as prior art. *See id.* 46a; *id.* 113a.

Capella petitioned for rehearing before the Board in both IPR2014-01116 and IPR2014-01276, but the Board denied the requests. *Id.* 6a–15a; *id.* 79a–88a.

C. The Federal Circuit Appeal

Capella timely appealed the Board's final written decisions to the Federal Circuit, which considered the appeals in a single consolidated proceeding. As relevant here, Capella argued that the Board ignored the disclosure of the patents' specifications—and, with respect to the ’678 patent, ignored the *explicit claim language*—requiring that fiber collimators, and only fiber collimators, serve as the claimed “ports.” Because the Board’s obviousness finding was based on an impermissibly broad construction of the “port” limitation, Capella explained, the Board’s decision to invalidate the challenged claims was erroneous and must be reversed.

Capella also argued that the Board violated the Administrative Procedure Act by relying upon Cisco’s supplemental evidence to find that Smith was entitled to the priority date of the ’683 provisional. The APA, Capella explained, requires that parties to an agency proceeding be “timely informed of . . . the matters of fact and law asserted” and be given the opportunity “to present [their] case or defense by oral or documentary evidence, to submit rebuttal evidence, and to conduct such cross-examination as may be required for a full and true disclosure of the facts.” 5 U.S.C. §§ 554(b)(3), 556(d). Capella argued that the Board’s reliance on Cisco’s untimely evidence, and its refusal to allow Capella to fully rebut that evidence, violated these APA provisions by effectively introducing a new theory into the proceedings—one not contained in Cisco’s petition—without allowing Capella to meaningfully respond. *See, e.g.*, *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1381 (Fed. Cir. 2016) (Board may not “adopt arguments on behalf of petitioners that could have been, but were not, raised” in the petition; “[i]nstead, the Board must base its decision on arguments that were advanced by a party, and to which the opposing party was given a chance to respond"); *Dell Inc. v. Acceleron, LLC*, 818 F.3d 1293, 1301 (Fed. Cir. 2016) (similar); *Rodale Press, Inc. v. F.T.C.*, 407 F.2d 1252, 1256 (D.C. Cir. 1968) ("an agency may not change theories in midstream without giving [a party to an agency proceeding] reasonable notice of the change").[4]

The Federal Circuit disposed of Capella's appeal pursuant to Federal Circuit Rule 36 with a single word: "AFFIRMED." Pet. App. 5a. No opinion accompanied the Federal Circuit's judgment. In fact, the cover document preceding the judgment is titled "NOTICE OF ENTRY OF JUDGMENT WITHOUT OPINION."

Capella timely petitioned for rehearing, pressing anew its argument that the Board's obviousness finding was premised on an incorrect

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[4] Cisco had argued that the supplemental evidence was needed because an intervening Federal Circuit decision, *Dynamic Drinkware, LLC v. National Graphics, Inc.*, 800 F.3d 1375 (Fed. Cir. 2015), had changed the relevant principles of priority law. As Capella explained in its appeal brief, that was incorrect. It has been settled since at least *In re Wertheim*—decided before the Federal Circuit came into existence—that a provisional application must support the claims of a later-filed application to entitle the latter to the former's priority date. *See* 646 F.2d at 537. *Dynamic Drinkware* did not change the law, and Cisco could have and should have made arguments under the proper legal framework in its petition.

construction of the term "port" and that the conclusion of invalidity could not be sustained under the correct claim construction. The Federal Circuit denied Capella's petition—again without opinion, *id.* 1a–2a—and this petition for a writ of certiorari timely followed.

REASONS FOR GRANTING THE PETITION

The Federal Circuit's summary affirmance in this case joined a long line of decisions in which that court has disregarded the statutory requirement that it issue an "opinion" in appeals from the Patent Trial and Appeal Board. 35 U.S.C. § 144. It is undisputed—and indisputable—that Rule 36 judgments are not "opinions" within the meaning of the statute.

The Federal Circuit's routine derogation of the statutory text is reason enough to warrant this Court's review. The Federal Circuit, as the arbiter of all patent appeals, must enforce the provisions of the Patent Act as written to ensure that patent owners and potential infringers alike are afforded the procedural and substantive rights granted to them by Congress. And Congress had good reason to require the Federal Circuit to issue opinions in appeals from Board decisions; written, reasoned appellate decisions play a critical role in advising patent litigants, the patent bar, and the general public of the legal principles governing the scope of patent rights. The Federal Circuit's disregard of the statute is thus not only wrong as a matter of law; it is deeply troubling as a matter of legal and judicial policy. In this case, it deprived Capella and similarly situated parties of important guidance concerning the rules of claim construction and the requirements of the Administrative Procedure Act in proceedings before the PTAB.

Also lurking in this case, however, is an issue of deep *constitutional* concern: if the Board can deprive patent owners of their property rights without meaningful appellate review by an Article III court, the careful balance struck by Congress in providing for administrative review of patent validity threatens to be upended. This Court suggested in *Oil States* that the promise of Federal Circuit review operates as an important safeguard of patent owners' rights and ensures that Board proceedings may be carried out consistent with the strictures of Article III. Without that safeguard, patent owners are potentially subject to an unconstitutional deprivation of their property every time an IPR is instituted.

To say this issue is recurring would be an understatement; the Federal Circuit issues Rule 36 judgments in roughly *half* of all PTAB appeals. Immediate intervention by this Court is warranted to stop the Federal Circuit's routine disregard of the statutory scheme established by Congress and to ensure that patent owners are afforded the statutory and constitutional protections to which they are entitled.

I. THE FEDERAL CIRCUIT'S ISSUANCE OF A JUDGMENT WITHOUT OPINION IN THIS APPEAL VIOLATED 35 U.S.C. § 144

Section 144 of the Patent Act provides that, in appeals from the Patent Office, the Federal Circuit "shall review the decision from which an appeal is taken on the record before the . . . Office" and that "[u]pon its determination the court *shall issue to the Director its mandate and opinion*, which shall . . . govern the further proceedings in the case." 35 U.S.C. § 144 (emphasis added).[5]

"This directive is both mandatory and comprehensive"; "[t]he word 'shall' generally imposes a nondiscretionary duty." *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1354 (2018). In this respect, the statute could not be more clear: it requires that, when the Federal Circuit reviews a PTAB decision, it "shall issue" an "opinion." And where, as here, a statute's words provide a clear directive, courts must apply the statute as written. *See id.* at 1357 (citing *United States v. Ron Pair Enters., Inc.*, 489 U.S. 235, 240–41 (1989) ("[A]s long as the statutory scheme is coherent and consistent, there generally is no need for a court to inquire beyond the plain language of

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[5] Appeals from the Patent Office include appeals from PTAB decisions in examinations, reexaminations, post-grant and *inter partes* reviews, and derivation proceedings, *see* 35 U.S.C. § 141, as well as PTAB decisions in Covered Business Method patent reviews ("CBMs"), *see* 37 C.F.R. § 42.300 *et seq.*

the statute.")). "[C]ourts must presume that a legislature says in a statute what it means," and "[w]hen the words of a statute are unambiguous, . . . this first canon [of statutory construction] is also the last: 'judicial inquiry is complete.'" *Connecticut Nat'l Bank v. Germain*, 503 U.S. 249, 253–54 (1992).

Rule 36 judgments do not satisfy § 144 because they are, by their very terms, "judgment[s] of affirmance *without opinion*." Fed. Cir. R. 36 (emphasis added); *see also Rates Tech.,* 688 F.3d at 750 (Rule 36 judgment contains "no opinion"). And legion authorities confirm that a court's "decision"—e.g., the determination whether to affirm, reverse, or vacate—is distinct from its "opinion." The two words, "while often used interchangeably, are not equivalents. The court's decision of a case is its judgment thereon. Its opinion is a statement of the reasons on which the judgment rests." *Rogers*, 289 U.S. at 587 (1933); *accord Comm'r v. Bedford's Estate*, 325 U.S. 283, 285 (1945); *In re Garland*, 295 B.R. 347, 352 (9th Cir. Bankr. 2003); BLACK'S LAW DICTIONARY (10th ed. 2014) (defining "opinion" as "[a] court's written statement explaining its decision in a given case, including the statement of facts, points of law, rationale, and dicta"); David M. Gunn, *"Unpublished Opinions Shall Not Be Cited As Authority": The Emerging Contours of Texas Rule of Appellate Procedure 90(l)*, 24 ST. MARY'S L.J. 115, 138 (1992) ("There is a difference between an opinion and a judgment. An opinion gives reasons; it says why. A judgment gives orders; it says what."). Rule

36 judgments thus indisputably do not satisfy § 144's requirement of an "opinion."

In *United States v. Nugent*, for example, the Sixth Circuit reversed a district-court judgment because the governing statute required the court to issue "a written opinion" and the district court's "findings of fact and conclusions of law . . . [were] too meager to be considered as an opinion of the court." 100 F.2d at 217 (citing 28 U.S.C. § 764). The same result is compelled here. The Federal Circuit's issuance of a mere "judgment"—accompanied by a notice explicitly stating that the court has entered "judgment without opinion"—violated the plain terms of § 144. *See generally* Dennis Crouch, *Wrongly Affirmed Without Opinion*, 52 WAKE FOREST L. REV. 561 (2017) (noting that § 144 requires an "opinion" and arguing that the Federal Circuit's practice of issuing Rule 36 judgments in PTAB appeals violates the statutory requirement).

The statutory requirement of an opinion is far from a meaningless formality. As an initial matter, written opinions are of tremendous immediate value to the parties to the case because they provide essential information regarding the parties' legal rights and duties vis-à-vis the contested issues in the case. Such information is especially valuable where—as is the case here, and as is commonly the case in PTAB proceedings—those issues are also implicated in a parallel proceeding in another forum (here, a patent-infringement suit in district court). Had the Federal Circuit complied with its duty to issue a reasoned "opinion" in this case, that opinion could have narrowed or resolved many of the issues facing the district court overseeing the infringement litigation—thereby saving the court and the parties substantial time and resources.

The impact of the Federal Circuit's disregard of the statute, moreover, extends far beyond the immediate parties to the case. Written appellate-court opinions play a vital role in the legal process. They not only explain to the litigants immediately affected by the court's decision why the court decided the case as it did; they also "settl[e] the law," thereby providing critical guidance "for the indefinite body of litigants, whose causes are potentially implicated in the specific cause at issue." Benjamin N. Cardozo, Jurisdiction of the Court of Appeals § 6 (2d ed. 1909). When appellate courts issue statements of reasons supporting a given outcome, they allow the judicial branch to fulfill its function as law-declarer, its "duty . . . to say what the law is." *Marbury v. Madison*, 5 U.S. (1 Cranch) 137, 177 (1803). Congress's command that the Federal Circuit issue "opinions" in Patent-Office appeals ensures that the court adheres to that duty.[6]

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[6] Respondents may argue that enforcing § 144 will place too great a burden on the Federal Circuit because it will require the court to write more opinions. As an initial matter, it is far from clear that the burden will in fact increase: according to the Federal Circuit, when a panel issues a Rule 36 judgment, it "has done 90% of the work needed for a written opinion." Crouch, *supra*, at 578 (quotation marks omitted); *see also U.S. Surgical Corp. v. Ethicon, Inc.*, 103 F.3d 1554, 1556

This principle—that appellate courts best fulfill their duty "to say what the law is" when they issue reasoned opinions that advise the public of the legal framework that governs their rights, their conduct, and their relationships—has particular salience in the patent-law context. Patent rights are public rights. *Oil States*, 138 S. Ct. at 1374. In order to "promote the Progress of Science and useful Arts," the government grants to inventors limited "public franchises" in the form of patents that allow the inventors to exclude others from making, using, or selling articles embodying their inventions for a specified period of time. *Id.* at 1374–75. It is critical to the functioning of the patent system that inventors, their competitors, the patent bar, and the general public understand the legal rules that govern the scope of those public franchises. Only then can the patent system fulfill its twin aims of incentivizing valuable innovation while also ensuring that exclusionary patent rights do not inhibit the "the full and free use of ideas in the public domain," *Lear*, 395 U.S. at 674. And only then can the relevant stakeholders be assured that they are governed by a legal framework that is rational and fair. The Federal Circuit's routine practice of denying the public the guidance it

(Fed. Cir. 1997) ("Appeals whose judgments are entered under Rule 36 receive the full consideration of the court, and are no less carefully decided than the cases in which we issue full opinions."). In any event, however, that is a complaint properly addressed to Congress, not this Court. Courts must apply the laws as Congress wrote them.

deserves vis-à-vis the scope of patent protections thus threatens to undermine the very legitimacy of the patent system itself.

The shortcomings of the Rule 36 process—and, concomittantly, the critical role of § 144's mandate that the Federal Circuit issue a written opinion—are on full display in this case. Capella's arguments on appeal focused on the *legal* issues of (a) whether the Board violated the Administrative Procedure Act by basing its obviousness determination on supplemental evidence to which Capella had no meaningful opportunity to respond; (b) whether the Board's claim construction of the "port" limitation of the challenged claims was incorrect; and (c) whether the Board's obviousness determination was erroneous because it was based on that incorrect construction. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 427 (2007) ("The ultimate judgment of obviousness is a legal determination."); *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 384 (1996) (claim construction is an issue of law for the court); *Singh v. Clinton*, 618 F.3d 1085, 1088 (9th Cir. 2010) (whether agency action complies with APA is a question of law). Capella was entitled to de novo review of these legal issues by an Article III court.

Had Capella received the comprehensive review to which it was entitled, the Board's decision could not have been affirmed. As explained above, *see supra* Statement of the Case, the Board ignored the clear requirements of the APA by "chang[ing] theories in midstream without giving [Capella] reasonable notice of the change and the opportunity to present arguments under the new theory." *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1080 (Fed. Cir. 2015) (quoting *Rodale Press*, 407 F.2d at 1256–57); *see also Magnum Oil*, 829 F.3d at 1381 ("[T]he Board must base its decision on arguments that were advanced by a party, and to which the opposing party was given a chance to respond."). The Board also ignored the patents' clear teachings that fiber collimators, and *only fiber collimators*, serve as the claimed "ports," and it found the claims obvious based on prior art that undisputedly did not disclose the requisite plurality of fiber collimators serving as ports. At the very least, the issues raised by Capella implicated important and unsettled issues of patent law upon which the patent bar sorely needs appellate-court guidance.

This case is not an outlier. "While "[o]ne might expect that Rule 36 judgments would be used in only non-controversial, open-and-shut cases applying longstanding law," that is not what happens in practice. Crouch, *supra*, at 570. This case is only one of many in which the Federal Circuit has used Rule 36—a rule that purports to be reserved for cases in which an opinion would have "no precedential value"—to adjudicate "substantive and novel [issues of] patent law." *Id.* In so doing, the court routinely deprives patent applicants, patent owners, accused infringers, and the patent bar of essential guidance on these important and unsettled issues. The result is a patent system that is less transparent, less predictable, and less legitimate—a system that, in the long run, leaves all stakeholders worse off.

The judgment below should be vacated so that the Court of Appeals may address Capella's arguments in a reasoned opinion, as § 144 requires.[7]

II. THE FEDERAL CIRCUIT'S PRACTICE OF ISSUING RULE 36 JUDGMENTS IN APPEALS FROM THE BOARD THREATENS TO DEPRIVE PATENT OWNERS OF THEIR RIGHTS WITHOUT CONSTITUTIONALLY SUFFICIENT PROCESS

A construction of § 144 that requires the Federal Circuit to issue an "opinion" in appeals from the Board—and forbids it from issuing a Rule 36 judgment *without opinion* in such cases—is not only compelled by the statute's plain language. Such a construction also avoids the serious constitutional questions that would result if the statute were read to allow the Federal Circuit to affirm the Board summarily, without any evidence of meaningful review by an Article III court.

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[7] Capella believes that it would be most appropriate and efficient for this Court to grant review only on the validity of the Federal Circuit's practice of issuing Rule 36 judgments, and for the Federal Circuit to address anew the merits of the claim-construction, obviousness, and APA issues on remand. However, given that the merits questions are issues of law, this Court can of course address them itself should it wish to do so.

Agencies routinely adjudicate disputes among private parties that could have been assigned to Article III courts in the first instance—and this Court has long held that there is no Article III barrier to their doing so, *provided that* the parties are afforded appellate review that "maintain[s] the essential attributes of the judicial power." *Crowell v. Benson*, 285 U.S. 22, 51 (1932); *see also, e.g.*, *CFTC v. Schor*, 478 U.S. 833, 852–53 (1986) (congressional scheme for agency adjudication must leave the "'essential attributes of judicial power' . . . to Article III courts"); *Northern Pipeline Constr. Co. v. Marathon Pipe Line Co.*, 458 U.S. 50, 85–86 & n.39 (1982) (plurality opinion) (holding that the adjudicatory scheme of the Bankruptcy Act of 1978 violated Article III because it placed the essential attributes of judicial power in Article I bankruptcy courts). This Court's recent *Oil States* decision held that the IPR process is a permissible delegation of adjudicative authority to a non-Article III body, but the Court took pains to emphasize that it did "not consider whether inter partes review would be constitutional 'without any sort of intervention by a court at any stage of the proceedings.'" 138 S. Ct. at 1379 (quoting *Atlas Roofing Co. v. Occupational Safety & Health Review Comm'n*, 430 U.S. 442, 455 n.13 (1977)).

The Federal Circuit's issuance of Rule 36 judgments, however, effectively means that many participants in the IPR process—and in the other administrative processes established by the AIA—will have their patent rights taken away *without* meaningful intervention by an Article III court. Congress's requirement that the Federal Circuit issue an "opinion" in such appeals operates as an important constitutional safeguard: it mandates that the court show its work in adjudicating the legal issues raised by the parties, and it thus ensures, consistent with this Court's pronouncements in *Crowell*, *Schor*, and like cases, that substantive Article III review of federal patent-law questions is available to parties litigating before the Board. The Federal Circuit's neglect of this safeguard thus raises grave questions about the constitutionality of that process as it is currently being conducted. *See Pacemaker Diagnostic Clinic of Am., Inc. v. Instromedix, Inc.*, 725 F.2d 537, 544 (9th Cir. 1984) ("If the essential, constitutional role of the judiciary is to be maintained, there must be both the appearance and the reality of control by Article III judges over the interpretation, declaration, and application of federal law.").[8]

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[8] *Cf.* Richard H. Fallon, Jr., *Of Legislative Courts, Administrative Agencies, and Article III*, 101 HARV. L. REV. 915, 978 (1988) ("No less in public than in private disputes, a requirement of judicial review of questions of law emerges from the basic concern that led the framers to fear location of judicial power in executive or legislative hands: that adjudication could become the tool for the selective or arbitrary pursuit of a political program, not authorized by law, that would deprive people of the security that a regime of law should provide."); Richard B. Saphire & Michael E. Solimine, *Shoring Up Article III: Legislative Court Doctrine in the Post* CFTC v. Schor *Era*, 68 B.U. L. REV. 85, 135–51 (1988) (suggesting that Article III

This Court should grant certiorari to reaffirm that Congress meant what it said in § 144—and consequently, to avoid the serious constitutional problems that could arise if the Federal Circuit continues to ignore the statutory language. *See Stern v. Marshall*, 564 U.S. 462, 477–78 (2011) (federal statues should be construed and applied so as to avoid "rais[ing] serious constitutional concerns"); *Crowell*, 285 U.S. at 62–63 (construing statute to provide for de novo Article III review of jurisdictional facts found by administrative agency "to remove the question [of constitutional] validity" that would otherwise exist).

III. THE QUESTION PRESENTED IS IMPORTANT AND WORTHY OF THIS COURT'S REVIEW

The importance of the question presented would be reason enough for this Court to grant certiorari. It is imperative that patent owners such as Capella be afforded the statutory and constitutional protections to which they are entitled when their patent rights are called into question in Board proceedings. Patent rights are property rights, *see Brown v. Duchesne*, 60 U.S. 183, 197 (1856), and they are critically important ones—so much so that the Framers saw fit to call for their establishment in the Constitution "[t]o promote the progress of science and useful arts." U.S. Const. art.

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review is constitutionally required to validate adjudication by an administrative agency).

I, § 8, cl. 8. To be sure, patent rights are "qualified," in that they are "subject to" the provisions of the Patent Act. *Oil States*, 138 S. Ct. at 1375–76 (citing 35 U.S.C. § 261). But that works both ways: a patentee is also "subject to" (more accurately, entitled to) the *protections* established by the Patent Act, including § 144's requirement that the Federal Circuit issue opinions in PTAB appeals. The Federal Circuit gave short shrift to those protections here.

To make matters worse, this problem is not limited to the instant case—and that is putting it mildly. Since the establishment of the modern Patent Trial and Appeal Board, the Federal Circuit has issued Rule 36 judgments in roughly 50% of PTAB appeals: 51% in 2013, 49% in 2014, 63% in 2015, 51% in 2016, and 44% in 2017. *See* Bultman, *supra*. As of January 2018, the total figure in IPR and CBM appeals since the AIA was enacted was a staggering 46%. *See* David C. Seastrunk *et al.*, AIA BLOG, Federal Circuit PTAB Appeal Statistics (Feb. 6, 2018), https://www.finnegan.com/en/insights/blogs/america-invents-act/federal-circuit-ptab-appeal-statistics-January-15-2018.html. And accordingly to counsel's calculations, the total figure for the first two quarters of 2018 was over 50% (196 out of 389).

Given these statistics, it is not surprising that a large number of petitions raising this issue have been filed in this Court.[9] But the problem is not going away: the Federal Circuit—by statutory design, the final arbiter in the vast majority of patent appeals in this country—continues, year in and year out, to issue summary affirmances in roughly half of PTAB appeals, in derogation of the statutory scheme established by Congress and the constitutional protections afforded by Article III. And in the process, the court deprives all stakeholders in the patent system of critically important guidance concerning the scope of patent rights. Capella respectfully submits that the Court should intervene now and put an end to this practice.

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[9] *See, e.g.*, Pet. for Writ of Cert., *Security People, Inc. v. Ojmar US, LLC*, No. 17-1443 (Apr. 16, 2018); Pet. for Writ of Cert., *Stambler v. Mastercard Int'l Inc.*, No. 17-1272 (Feb. 9, 2018); Pet. for Writ of Cert., *In re: Celgard, LLC*, No. 16-1526 (June 19, 2017); Pet. for Writ of Cert., *Shore v. Dir., U.S. Patent & Trademark Office*, No. 16-240 (Apr. 13, 2017); Pet. for Writ of Cert., *Oil States Energy Services, LLC v. Greene's Energy Group, LLC*, No. 16-712 (Nov. 23, 2016); Pet. for Writ of Cert., *Cloud Satchel, LLC v. Barnes & Noble, Inc.*, No. 15-1161 (Mar. 16, 2016); Pet. for Writ of Cert., *Concaten, Inc., v. AmeriTrak Fleet Solutions, LLC*, No. 16-1109 (Mar. 10, 2016); Pet. for Writ of Cert., *Hyundai Motor America, Inc. v. Clear With Computers, LLC*, No. 13-296 (Sept 3, 2013); Pet. for Writ of Cert., *Kastner v. Chet's Shoes, Inc.*, No. 11-776 (Dec. 20, 2011); Pet. for Writ of Cert., *Romala Stone, Inc. v. Home Depot U.S.A., Inc.*, No. 10-777 (Dec. 8, 2010); Pet. for Writ of Cert., *Wayne-Dalton Corp. v. Amarr Co.*, No. 09-260 (Aug. 31, 2009); Pet. for Writ of Cert., *DePalma v. Nike, Inc.*, No. 05-1360 (Apr. 24, 2006); Pet. for Writ of Cert., *City of Gettysburg v. United States*, No. 06-235 (Aug. 14, 2006); Pet. for Writ of Cert., *Hancock v. Dep't of Interior*, No. 06-93 (July 18, 2006).

CONCLUSION

For these reasons, Capella respectfully requests that the Court grant the petition for a writ of certiorari, vacate the decision below, and remand for proceedings compliant with 35 U.S.C. § 144.

Respectfully submitted,

ROBERT GREENE STERNE
Counsel of Record
JASON D. EISENBERG
WILLIAM H. MILLIKEN
Sterne, Kessler, Goldstein & Fox, P.L.L.C.
1100 New York Avenue, N.W.
Washington, D.C. 20005
(202) 371-2600
rsterne@sternekessler.com

Counsel for Petitioner

APPENDIX

APPENDIX A

NOTE: This order is nonprecedential.

United States Court of Appeals
for the Federal Circuit

CAPELLA PHOTONICS, INC.,
Appellant

v.

CISCO SYSTEMS, INC., CIENA CORPORATION, CORIANT OPERATIONS, INC., CORIANT (USA) INC., FUJITSU NETWORK COMMUNICATIONS, INC., LUMENTUM HOLDINGS, INC., LUMENTUM INC., LUMENTUM OPERATIONS, LLC,
Appellees

2016-2394, 2016-2395, 2017-1105, 2017-1106, 2017-1107, 2017-1108

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2014-01166, IPR2014-01276, IPR2015-00726, IPR2015-00727, IPR2015-00731, IPR2015-00739, IPR2015-00816, IPR2015-00894, IPR2015-01958, IPR2015-01961, IPR2015-01969, IPR2015-01971.

ON PETITION FOR PANEL REHEARING

Before DYK, O'MALLEY, and HUGHES, *Circuit Judges*.

PER CURIAM.

O R D E R

Appellant Capella Photonics, Inc. filed a petition for panel rehearing.

Upon consideration thereof,

IT IS ORDERED THAT:

The petition for panel rehearing is denied.

The mandate of the court will issue on April 16, 2018.

FOR THE COURT

April 9, 2018	/s/ Peter R. Marksteiner
Date	Peter R. Marksteiner
	Clerk of Court

APPENDIX B

NOTE: This disposition is nonprecedential.

United States Court of Appeals
for the Federal Circuit

CAPELLA PHOTONICS, INC.,
Appellant

v.

CISCO SYSTEMS, INC., CIENA CORPORATION, CORIANT OPERATIONS, INC., CORIANT (USA) INC., FUJITSU NETWORK COMMUNICATIONS, INC., LUMENTUM HOLDINGS, INC., LUMENTUM INC., LUMENTUM OPERATIONS, LLC,
Appellees

2016-2394, 2016-2395, 2017-1105, 2017-1106, 2017-1107, 2017-1108

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Nos. IPR2014-01166, IPR2014-01276, IPR2015-00726, IPR2015-00727, IPR2015-00731, IPR2015-00739, IPR2015-00816, IPR2015-00894, IPR2015-01958, IPR2015-01961, IPR2015-01969, IPR2015-01971.

JUDGMENT

ROBERT GREENE STERNE, Sterne Kessler Goldstein & Fox, PLLC, Washington, DC, argued for appellant. Also represented by TYLER DUTTON, JASON DANIEL EISENBERG, DEIRDRE M. WELLS.

SARAH J. GUSKE, Baker Botts LLP, San Francisco, CA, argued for appellee Cisco Systems, Inc. Also represented by WAYNE O. STACY, Dallas, TX.

NATHANIEL T. BROWAND, Milbank, Tweed, Hadley & McCloy, LLP, New York, NY, argued for appellee Fujitsu Network Communications, Inc. Also represented by CHRISTOPHER JAMES GASPAR; MARK C. SCARSI, Los Angeles, CA.

JOEL SAYRES, Faegre Baker Daniels LLP, Denver, CO, argued for appellees Lumentum Holdings, Inc., Lumentum Inc., Lumentum Operations, LLC. Also represented by KENNETH LIEBMAN, Minneapolis, MN.

MATTHEW J. MOORE, Latham & Watkins LLP, Washington, DC, for appellee Ciena Corporation. Also represented by CHI CHEUNG, CLEMENT J. NAPLES, New York, NY; ROBERT STEINBERG, Los Angeles, CA.

JONATHAN PIETER VAN ES, Banner & Witcoff, Ltd., Chicago, IL, for appellees Coriant Operations, Inc., Coriant (USA) Inc. Also represented by THOMAS KENT PRATT; MICHAEL STEVEN CUVIELLO, Washington, DC.

THIS CAUSE having been heard and considered, it is

ORDERED and ADJUDGED:

PER CURIAM (DYK, O'MALLEY, and HUGHES, *Circuit Judges*).

AFFIRMED. *See* Fed. Cir. R. 36.

Entered By Order Of The Court

February 12, 2018	/s/ Peter R. Marksteiner
Date	Peter R. Marksteiner
	Clerk of Court

APPENDIX C

Trials@uspto.gov Paper 43
571-272-7822 Entered: July 5, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC., CIENA CORPORATION, CORIANT OPERATIONS, INC., CORIANT (USA) INC., and FUJITSU NETWORK COMMUNICATIONS, INC.,
Petitioner,

v.

CAPELLA PHOTONICS, INC.,
Patent Owner.

Case IPR2014-01276[1]
Patent RE42,678 E1

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[1] IPR2015-00894 was joined with IPR2014-01276 on September 22, 2015, by Order in IPR2015-00894, Paper 12 (IPR2014-01276, Paper 25).

Before JOSIAH C. COCKS, KALYAN K. DESHPANDE, and JAMES A. TARTAL, *Administrative Patent Judges*.

TARTAL, *Administrative Patent Judge*.

DECISION
Denying Request for Rehearing
37 C.F.R. § 42.71(d)

I. INTRODUCTION

In the Final Written Decision concerning U.S. Patent No. RE42,678 E1 ("the '678 patent"), we determined Petitioner Cisco Systems, Inc., Ciena Corporation, Coriant Operations, Inc., Coriant (USA) Inc., and Fujitsu Network Communications, Inc., had shown by a preponderance of the evidence that, under 35 U.S.C. § 103(a), claims 1–4, 9, 10, 13, 19–23, 27, 44–46, and 61–65 would have been obvious over Bouevitch,[2] Smith,[3] and Lin;[4] and, claims 17, 29, and 53 would have been obvious over Bouevitch, Smith, Lin, and Dueck.[5] (Paper 40, "Final Decision" or "Dec."). Patent Owner, Capella Photonics, Inc.,

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[2] U.S. Patent No. 6,498,872 B2, issued December 24, 2002 (Ex. 1003, "Bouevitch").

[3] U.S. Patent No. 6,798,941 B2, issued September 28, 2004 (Ex. 1004, "Smith").

[4] U.S. Patent No. 5,661,591, issued August 26, 1997 (Ex. 1010, "Lin").

[5] U.S. Patent No. 6,011,884, issued January 4, 2000 (Ex. 1021, "Dueck").

requests rehearing of the Final Written Decision. Paper 42 ("Request" or "Req. Reh'g."). For the reasons discussed below, Patent Owner's Request is denied.

II. DISCUSSION

"When rehearing a decision on petition, a panel will review the decision for an abuse of discretion." 37 C.F.R. § 42.71(c). The requirements for a request for rehearing are set forth in 37 C.F.R. § 42.71(d), which provides in relevant part:

> A party dissatisfied with a decision may file a request for rehearing, without prior authorization from the Board. The burden of showing a decision should be modified lies with the party challenging the decision. The request must specifically identify all matters the party believes the Board misapprehended or overlooked, and the place where each matter was previously addressed in a motion, an opposition, or a reply.

A. *Patent Owner's Contention that Bouevitch Teaches Away from Misalignment to Control Power*

In its Request, Patent Owner first argues that "the facts prove that Bouevitch teaches away from misalignment and angular displacement to control power." Req. Reh'g. 2. We are not persuaded that we misapprehended or overlooked this argument. The Final Decision states:

> as explained by Dr. Marom, Bouevitch discloses the use of variable attenuation for power control, and a person of ordinary skill in the art would understand that the necessary level of control required to balance the optical power differentials among the wavelength channels is achieved in Bouevitch with continuous control over the mirror tilt via analog voltage control. *See* Ex. 1028 ¶ 63, *see also* Ex. 1003, 7:35–37 ("The degree of attenuation is based on the degree of deflection provided by the reflector (i.e., the angle of reflection).").

Dec. 29–30. Patent Owner's "teaching away" argument was further addressed at length in the Final Decision:

> Next, Patent Owner argues that a person of ordinary skill in the art would not have been motivated to combine Smith's tiltable mirrors with Bouevitch because it "would disrupt Bouevitch's explicit teaching of parallel alignment," and "Bouevitch discourages, if not teaches away from, misalignment to control power." PO Resp. 27–30. "The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the … application." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Although Bouevitch discusses how angular displacement is disadvantageous

> in certain respects (*see* Ex. 1003, 2:1–7), we are not persuaded such discussion is sufficient to constitute a teaching away. To the contrary, Petitioner has shown persuasively that Bouevitch uses angular misalignment to control power in at least some embodiments of Bouevitch. Pet. Reply 3–5; *see also* Ex. 1028 ¶ 76.

Dec. 38. Patent Owner directs us to no additional expert testimony in support of its argument that we overlooked, and cites no testimony from its expert, Dr. Sergienko, in support of its attorney argument. To the extent Dr. Sergienko's testimony "that Bouevitch could control power using misalignment" failed to support Patent Owner's argument, Patent Owner instead argues that it was "mischaracterized" by Petitioner. Req. Reh'g. 7. Thus, we determine that Patent Owner fails to identify any matter that we misapprehended or overlooked. Req. Reh'g. 2

Furthermore, Patent Owner fails to address in its Request Bouevitch's disclosure, as quoted in the Final Decision, that the "degree of attenuation is based on the degree of deflection provided by the reflector (i.e., the angle of reflection)." Dec. 30 (quoting Ex. 1003, 7:35–37). Instead, Patent Owner argues that "Bouevitch's embodiments comprising MEMS do not *necessarily* control power using misalignment." Req. Reh'g. 9. Patent Owner's focus on whether a disclosed feature was "necessarily" used is misplaced. The challenged claims were found to have been obvious over the asserted prior art, and even if we were to consider Patent Owner's argument, Patent Owner fails to address what would have been understood by one of ordinary skill in the art at the time of the invention. Patent Owner has not established that we overlooked an argument or evidence regarding "teaching away," and has not shown that we erred in determining that Bouevitch does not teach away from the power-control method taught in Smith.

B. Patent Owner's Contention that Combining Bouevitch with a Two-Axis Mirror Would Change Its Basic Principle of Operation

In its Request, Patent Owner argues second that we misinterpreted its argument that a person of ordinary skill "would not have combined Bouevitch and a two-axis mirror because 'the combination would disrupt Bouevitch's polarization-based switch.'" Req. Reh'g. 10.

The Final Decision states:

> Patent Owner also argues that a person of ordinary skill in the art would not have combined Bouevitch and Smith for various reasons. PO Resp. 23–32. Patent Owner argues that Petitioner has not reconciled "the technical differences between the references," or explained whether the components "would continue to operate as desired." *Id.* at 23. Patent Owner lists many considerations an optical system architect would have to take into account purportedly not addressed in the

> Petition. *Id.* at 23–25. Patent Owner further asserts that Dr. Marom has designed a two-axis mirror to replace a two-axis mirror, and that "[r]e-designing micromirrors is not a simple substitution because the redesign is complex." *Id.* at 25–26. In this proceeding, however, Dr. Sergienko was asked whether such technical considerations presented problems that could not be overcome by one of skill in the art, and indicated "no." Ex. 1049, 266:16–267:25. Moreover, "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . . Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

Dec. 37. Patent Owner asserts that it "did not argue that Bouevitch and Smith are not combinable because Smith's mirrors cannot be bodily incorporated into Bouevitch." Req. Reh'g. 10. Patent Owner's argument misrepresents the thrust of its argument in the Patent Owner's Response. Patent Owner argued that replacing a single axis mirror with a two-axis mirror was not a simple substitution for various reasons including "temperature issues" and "moisture," and further argued that "two-axis gimbal mirrors were not suitable because a gap between adjacent gimbal mirrors limited perimeter-to-perimeter spacing." Paper 19 ("PO Resp.") 23–25.

Patent Owner's arguments were properly addressed as disputing whether certain features could be bodily incorporated, rather than adequately addressing what the combined teachings of those references would have suggested to those of ordinary skill in the art. Accordingly, Patent Owner has not shown that we misapprehended or overlooked this argument.

Patent Owner also mischaracterizes the argument it raised in its Response concerning the motivation to combine Smith and Bouevitch. In the Response, Patent Owner argued a person of ordinary skill "would not have been motivated to use Smith's mirrors *in the Bouevitch's Figure 5 embodiment* because the combination would disrupt Bouevitch's polarization-based switch. PO Resp. 26 (emphasis added). The Final Decision states that "Patent Owner's argument is not persuasive because, as discussed above, Petitioner does not rely on the Figure 5 embodiment in Bouevitch." Dec. 38. Contrary to the Request, Patent Owner has not shown where it previously raised the argument that a person of ordinary skill "would not have combined Bouevitch and a two-axis mirror because the combination would disrupt Bouevitch's polarization-based switch" outside of the context of an embodiment not relied upon by Petitioner. Patent Owner's omission of "*in the Figure 5 embodiment*" from its argument in the Request is a misrepresentation of the record. Thus, Patent Owner has not established that we overlooked its argument or evidence.

III. CONCLUSION

We have considered Patent Owner's Request, but find no point of law or fact which we overlooked or misapprehended in arriving at our Final Decision.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Patent Owner's Request is *denied*.

For PETITIONER:

Wayne O. Stacy
Sarah Guske
Matthew J. Leary
COOLEY LLP
wstacy@cooley.com
CapellaCisco@cooley.com
mleary@cooley.com

For PATENT OWNER:

Jason D. Eisenberg
Jon E. Wright
Robert Greene Sterne
Nicholas Nowak
Jonathan Tuminaro
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
jasone-PTAB@skgf.com
jwright-PTAB@skgf.com
rsterne-PTAB@skgf.com
nnowak-PTAB@skgf.com
jtuminar-PTAB@skgf.com

APPENDIX D

Trials@uspto.gov Paper 40
571-272-7822 Entered: February 17, 2016

UNITED STATES PATENT AND
TRADEMARK OFFICE

———————

BEFORE THE PATENT TRIAL
AND APPEAL BOARD

———————

CISCO SYSTEMS, INC., CIENA CORPORATION,
CORIANT OPERATIONS, INC., CORIANT (USA)
INC., and FUJITSU NETWORK
COMMUNICATIONS, INC.,
Petitioner,

v.

CAPELLA PHOTONICS, INC.,
Patent Owner.

———————

Case IPR2014-01276[1]
Patent RE42,678 E1

———————

[1] IPR2015-00894 was joined with IPR2014-01276 on September 22, 2015, by Order in IPR2015-00894, Paper 12 (IPR2014-01276, Paper 25).

Before JOSIAH C. COCKS, KALYAN K. DESHPANDE, and JAMES A. TARTAL, *Administrative Patent Judges*.

TARTAL, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and *37 C.F.R. § 42.73*

I. INTRODUCTION

Petitioner, Cisco Systems, Inc., Ciena Corporation, Coriant Operations, Inc., Coriant (USA) Inc., and Fujitsu Network Communications, Inc., filed petitions requesting an *inter partes* review of claims 1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53, and 61–65 of U.S. Patent No. RE42,678 E1 ("the '678 patent"). Paper 2 ("Petition" or "Pet."); *see also* IPR2015- 00894, Paper 5. Based on the information provided in the Petition, and in consideration of the Preliminary Response (Paper 7; *see also* IPR2015-00894, Paper 10) of Patent Owner, Capella Photonics, Inc., we instituted a trial pursuant to 35 U.S.C. § 314(a) of: (1) claims 1–4, 9, 10, 13, 19–23, 27, 44–46, and 61–65 as obvious over Bouevitch,[2] Smith,[3] and Lin[4] under 35 U.S.C. § 103(a); and, (2)

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[2] U.S. Patent No. 6,498,872 B2, issued December 24, 2002 (Ex. 1003,"Bouevitch").

[3] U.S. Patent No. 6,798,941 B2, issued September 28, 2004 (Ex. 1004,"Smith").

[4] U.S. Patent No. 5,661,591, issued August 26, 1997 (Ex. 1010, "Lin").

claims 17, 29, and 53 as obvious over Bouevitch, Smith, Lin, and Dueck[5] under 35 U.S.C. § 103(a). Paper 8 ("Institution Decision"); *see also* IPR2015-00894, Paper 11.

After institution of trial, Patent Owner filed a Response (Paper 15, "Response" or "PO Resp."), and Petitioner filed a Reply (Paper 20, "Pet. Reply"). The Petition is supported by the Declaration of Dr. Dan Marom (Ex. 1028). The Response is supported by the Declaration of Dr. Alexander V. Sergienko (Ex. 2004).

A transcript of the Oral Hearing conducted on November 5, 2015, is entered. Paper 39 ("Tr.").[6]

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, Petitioner has shown by a preponderance of the evidence that claims 1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53, and 61–65 of the '678 patent are unpatentable.

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[5] U.S. Patent No. 6,011,884, issued January 4, 2000 (Ex. 1021, "Dueck").

[6] Patent Owner's objections to Petitioner's demonstrative slides for the oral hearing are denied because we are not persuaded that Petitioner's demonstratives add new argument. *See* Paper 36. Moreover, demonstrative slides are not evidence and have not been relied upon for this final decision.

II. BACKGROUND

A. The '678 patent (Ex. 1001)

The '678 patent, titled "Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities," reissued September 6, 2011, from U.S. Patent No. RE 39,397 ("the '397 patent"). Ex. 1001. The '397 patent reissued November 14, 2006, from U.S. Patent No. 6,625,346 ("the '346 patent"). *Id.* The '346 patent issued September 23, 2003, from U.S. Patent Application No. 09/938,426, filed August 23, 2001.

According to the '678 patent, "fiber-optic communications networks commonly employ wavelength division multiplexing (WDM), for it allows multiple information (or data) channels to be simultaneously transmitted on a single optical fiber by using different wavelengths and thereby significantly enhances the information bandwidth of the fiber." *Id.* at 1:37–42. An optical add-drop multiplexer (OADM) is used both to remove wavelengths selectively from a multiplicity of wavelengths on an optical 4 fiber (taking away one or more data channels from the traffic stream on the fiber), and to add wavelengths back onto the fiber (inserting new data channels in the same stream of traffic). *Id.* at 1:45–51.

The '678 patent describes a "wavelength-separating-routing (WSR) apparatus that uses a diffraction grating to separate a multi-wavelength optical signal by wavelength into multiple spectral channels, which are then focused onto an array of corresponding channel micromirrors." *Id.* at Abstract. "The channel micromirrors are individually controllable and continuously pivotable to reflect the spectral channels into selected output ports." *Id.* According to Petitioner, the small, tilting mirrors are sometimes called Micro ElectroMechanical Systems or "MEMS." Pet. 7. The WSR described in the '678 patent may be used to construct dynamically reconfigurable OADMs for WDM optical networking applications. *Id.*

Figure 1A of the '678 patent is reproduced below.

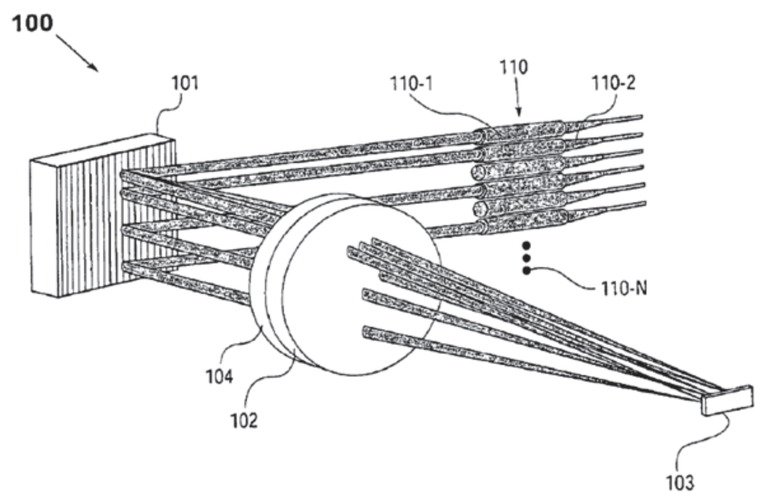

Fig. 1A

Figure 1A depicts wavelength-separating-routing (WSR) apparatus 100, in accordance with the '678 patent. WSR apparatus 100 is composed of an array of fiber collimators 110 (multiple input/output ports, including input port 110-1 and output ports 110-2 through 110-N), diffraction grating 101 (a wavelength separator), quarter wave plate 104, focusing lens 102 (a beamfocuser), and array of channel micromirrors 103. Ex. 1001, 6:57–63, 7:55–56.

A multi-wavelength optical signal emerges from input port 110-1 and is separated into multiple spectral channels by diffraction grating 101, which are then focused by focusing lens 102 into a spatial array of distinct spectral spots (not shown). *Id.* at 6:64–7:2. Channel micromirrors 103 are positioned such that each channel micromirror receives one of the spectral channels. *Id.* at 7:2–5.

Figure 1B of the '678 patent is reproduced below.

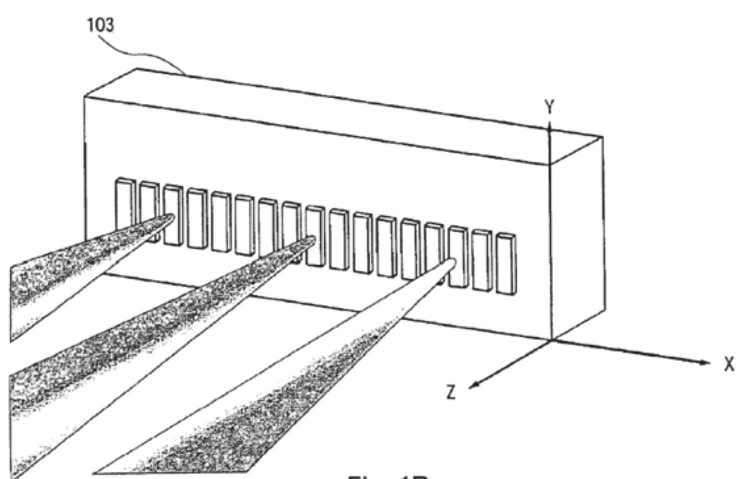

Fig. 1B

Figure 1B depicts a close-up view of the array of channel micromirrors 103 shown above in Figure 1A. *Id.* at 8:6–7. The channel micromirrors "are individually controllable and movable, e.g. pivotable (or rotatable) under analog (or continuous) control, such that, upon reflection, the spectral channels are directed" into selected output ports by way of focusing lens 102 and diffraction grating 101. *Id.* at 7:6–11.

According to the '678 patent:

> [e]ach micromirror may be pivoted about one or two axes. What is important is that the pivoting (or rotational) motion of each channel micromirror be individually controllable in an analog manner, whereby the pivoting angle can be continuously adjusted so as to enable the channel micromirror to scan a spectral channel across all possible output ports.

Id. at 9:8–14.

Figure 3 of the '678 patent is reproduced below.

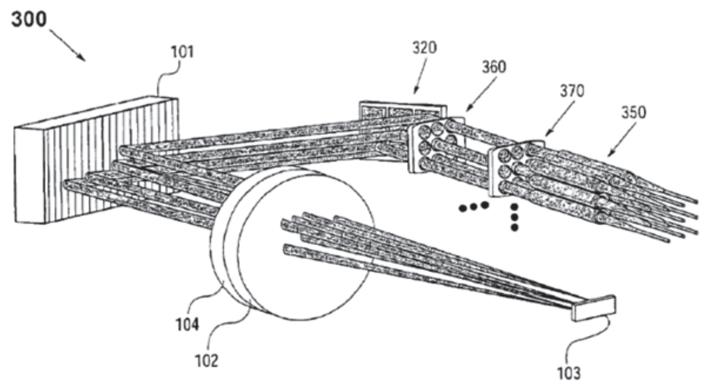

Fig. 3

Similar to Figure 1A, above, Figure 3 also shows a WSR apparatus as described by the '678 patent. *Id.* at 10:25–26. In this embodiment, two-dimensional array of fiber collimators 350 provides an input port and plurality of output ports. *Id.* at 10:31–32. First and second two-dimensional arrays of imaging lenses 360, 370 are placed in a telecentric arrangement between two-dimensional collimator-alignment mirror array 320 and two-dimensional fiber collimator array 350. *Id.* at 10:37–43. "The channel micromirror 103 must be pivotable biaxially in this case (in order to direct its corresponding spectral channel to any one of the output ports)." *Id.* at 10:43–46.

The WSR also may incorporate a servo-control assembly (together termed a "WSR-S apparatus"). *Id.* at 4:65–67. According to the '678 patent:

> The servo-control assembly serves to monitor the power levels of the spectral channels coupled into the output ports and further provide control of the channel micromirrors on an individual basis, so as to maintain a predetermined coupling efficiency of each spectral channel in one of the output ports. As such, the servo-control assembly provides dynamic control of the coupling of the spectral channels into the respective output ports and actively manages the power levels of the spectral channels coupled into the output ports.

Id. at 4:47–56.

Figure 5 of the ’678 patent is reproduced below.

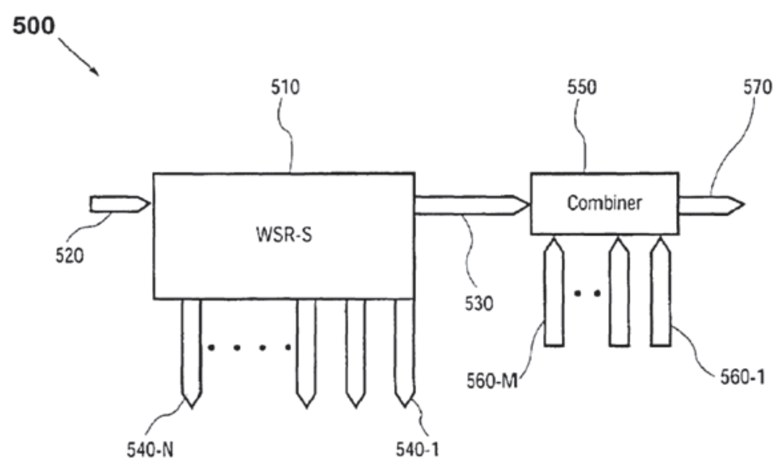

Fig. 5

Figure 5 depicts OADM 500 in accordance with the ’678 patent composed of WSR-S (or WSR) apparatus 510 and optical combiner 550. *Id.* at 12:40–44. Input port 520 transmits a multi-wavelength optical signal, which is separated and routed into a plurality of output ports, including pass-through port 530 and one or more drop ports 540-1 through 540-N. *Id.* at 12:44–48. Pass-through port 530 is optically coupled to optical combiner 550, which combines the pass-through spectral channels with one or more add spectral channels provided by one or more add ports 560-1 through 560-M. *Id.* at 12:52–56. The combined optical signal is then routed into an existing port 570, providing an output multi-wavelength optical signal. *Id.* at 12:56–58.

B. Illustrative Claims

Challenged claims 1, 21, 44, and 61 of the ’678 patent are independent. Challenged claims 2–4, 9, 10, 13, 17, 19, and 20 ultimately depend from claim 1; claims 22, 23, 27, and 29 ultimately depend from claim 21; claims 45, 46, and 53 ultimately depend from claim 44; and, claims 62–65 ultimately depend from claim 61. Claims 1, 21, and 61 of the ’678 patent are illustrative of the claims at issue:

> 1. A wavelength-separating-routing apparatus, comprising:
>
> a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multiwavelength optical signal from said input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being *pivotal about two axes and being* individually and continuously controllable to reflect [[said]] *corresponding received* spectral channels into *any* selected ones of said output ports *and to control the power of said received spectral channels coupled into said output ports*.

Ex. 1001, 14:6–23 (emphases in original, "[[ ]]" indicating matter in the first reissue that forms no part of the second reissue, and matter in italics indicating additions made by second reissue).

21. A servo-based optical apparatus comprising:

a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multiwavelength optical signal from said input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said output ports; and

e) a servo-control assembly, in communication with said channel micromirrors and said output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.

Ex. 1001, 15:29–48.

61. A method of performing dynamic wavelength separating and routing, comprising:

a) receiving a multi-wavelength optical signal from an input port;

> b) separating said multi -wavelength optical signal into multiple spectral channels;
>
> c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and
>
> d) dynamically and continuously controlling said beam-deflecting elements [[, thereby directing]] *in two dimensions to direct* said spectral channels into [[a plurality]] *any selected ones of said* output ports *and to control the power of the spectral channels coupled into said selected output ports*.

Ex. 1001, 18:55–19:3 (emphases in original, with "[[ ]]" indicating matter in the first reissue that forms no part of the second reissue, and matter in italics indicating additions made by second reissue).

III. ANALYSIS

A. Real Party-In-Interest

Patent Owner contends that trial should be terminated because Petitioner did not identify all real parties-in-interest. PO Resp. 60. Patent Owner does not expressly state who else it contends is a real party-in-interest or why. Patent Owner merely identifies a supplier "of the accused products," and asserts that supplier is "is required to indemnify . . . pursuant to California Commercial Code § 2312(3)."

Id. Patent Owner provides no explanation of its contention, fails to analyze any facts relative to its contention, and directs us to no legal authority in support of its contention. Accordingly, we are not persuaded that trial should be terminated under the circumstances presented.

B. Claim Construction

Only terms which are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

1. "*to reflect*" and "*to control*"

> Independent claims 1 and 44 each recite outside of the preamble:
>
> [A] spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect corresponding received spectral channels into any selected ones of said output ports and to control the power of said received spectral channels coupled into said output ports.

Ex. 1001, 14:16–23, 17:43–52 (emphases added and omitted). Independent claim 61 contains a similar limitation.[7] Independent claim 21 recites "to reflect said spectral channels," but does not contain a "to control" limitation. *Id.* at 15:43. Petitioner contends that the "to reflect" and "to control" clauses are non-functional clauses that say nothing about the claimed structure, and, therefore, are non-limiting. Pet. 10–11. We disagree. Although "apparatus claims cover what a device is, not what a device does," the language at issue here describes the function that the apparatus must be capable of performing. *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1468 (Fed. Cir. 1990); *see also K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1363 (Fed. Cir. 1999) (explaining that functional language is an additional limitation in the claim).[8] In that regard, the apparatus must be capable of performing the functions "to reflect" and "to control," and, therefore, the pertinent clauses are functional rather than non-functional. Accordingly, the claimed "spatial array of channel micromirrors" is further limited to a spatial array that satisfies the "to reflect" and "to control" functional limitations.

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[7] Claim 61 recites: "dynamically and continuously controlling said beam-deflecting elements in two dimensions to direct said spectral channels into any selected ones of said output ports and to control the power of the spectral channels coupled into said selected output ports." Ex. 1001, 18:65–19:3 (emphases omitted).

[8] For the same reasons we decline to adopt for purposes of this decision Petitioner's proposition that other claim phrases reciting "wherein," "whereby," and "for" should be considered non-limiting. *See* Pet. 10–11.

2. “*continuously controllable*”

Claims 1 and 44 require “a spatial array of channel micromirrors . . . being individually and continuously controllable.” Ex. 1001, 14:16–20; 17:43–47. Similarly, claim 61 requires “dynamically and continuously controlling said beam-deflecting elements.” *Id.* at 18:65–66. Petitioner asserts that “continuously controllable” should be construed to mean “under analog control.” Pet. 11. Petitioner identifies the following disclosures of the ’678 patent as supporting its proposed construction:

> The patent explains that “[a] distinct feature of the channel micromirrors in the present invention, in contrast to those used in the prior art, is that the motion…of each channel micromirror is under *analog control* such that its pivoting angle can be *continuously adjusted*.” ([Ex. 1001], 4:7–11). Another passage in the specification states that “[w]hat is important is that the pivoting (or rotational) motion of each channel micromirror be individually *controllable in an analog manner, whereby the pivoting angle can be continuously adjusted* so as to enable the channel micromirror to scan a spectral channel across all possible output ports.” ([Ex. 1001], 9:9–14). Yet another passage states that “channel micromirrors 103 are individually controllable and movable, e.g., pivotable (or rotatable) under analog (or continuous) control.” (*Id.*, 7:6–8).

Pet. 11–12.

Dr. Marom also explains that "MEMS can be operated using analog voltage for continuous control," and states that a person of ordinary skill in the art would understand continuous control "is achieved via analog voltage control." Ex. 1028 ¶¶ 37, 63.

Patent Owner suggests in its Response that analog control does not necessarily provide the claimed "continuous control" (PO Resp. 46 n.8), but during the oral hearing counsel for Patent Owner indicated that "continuously controllable" was defined as "analog control," and then clarified that Patent Owner "did not offer a specific definition of continuously control." Tr. 57:1–58:2. Additionally, according to Dr. Sergienko, "continuous control cannot be shown by the input signal (*i.e.*, analog vs. digital) alone." Ex. 2004 ¶ 181.

Based on all of the evidence presented, we are not persuaded that "continuously controllable" is limited to "analog control," or that "analog control" necessarily corresponds to "continuous" control under all circumstances. Indeed, counsel for Petitioner suggested that, although the art at issue disclosed analog control that provided continuous control, counsel further recognized that it may operate differently outside of that art. *See* Tr. 30:24–31–6. We determine that "continuously controllable," in light of the specification of the '678 patent, encompasses "under analog control such that it can be continuously adjusted."

3. “*providing*”

Claims 1, 21, and 44 recite “collimators, providing an input port . . . and a plurality of output ports.” Petitioner contends that the ’678 patent does not use “providing” outside of its ordinary and customary meaning “to make available.” Pet. Reply 8 (citing Ex. 1054). Patent Owner did not propose an express meaning of “providing,” but according to Petitioner, Patent Owner implicitly argues that it required some element of exclusivity and one-to-one correspondence. *Id.* at 9–10. Indeed, Patent Owner argues that “the structure or elements making up the ports are collimators,” and that “[a]s uniformly described and claimed in the ’678 [p]atent, multiple fiber collimators provide at least one input port and respective multiple output ports.” PO Resp. 35. To the extent Patent Owner can be understood to be arguing for a construction of “providing” that requires that only one collimator directly provide one port, Patent Owner has provided no persuasive support for such a contention. *See also* Pet. Reply 10–11 (noting that a provisional application to the ’678 patent disclosed ports being made available through both collimators and circulators). In light of the specification of the ’678 patent, we apply the plain and ordinary meaning of “providing” as “making available.”

4. “port”

Claim 61 recites “receiving a multi-wavelength optical signal from an input port,” and “controlling said beam deflecting elements . . . to direct said spectral channels into . . . output ports." Ex. 1001, 18:57–19:1. Patent Owner contends that in the '678 patent "the structure or elements making up the ports are collimators." PO Resp. 34. Patent Owner offers no definition of "port," and does not suggest that the '678 patent provides an express definition of the term, but instead argues that a "port," as claimed, is not a "circulator port" because the '678 patent "disavows circulator-based optical systems." *Id.* at 35. We disagree.

There is no dispute that the ordinary and customary meaning of "port" encompasses circulator ports, and, indeed, any "point of entry or exit of light." *See* Dr. Sergienko Deposition Transcript (Ex. 1049), 43:16–23, 45:12–13 ("The circulator ports are ports with constraints."). Nor does the '678 patent equate the term "port" to "collimator," as both "port" and "collimator" appear separately in the claims of the '678 patent. Ex. 1001, 14:8–10. We have considered the testimony of Dr. Sergienko as well (Ex. 2004 ¶¶ 146–167), and find that even if certain fiber collimators serve as ports in the '678 patent, that does not redefine the term "port" to mean "collimator." *See id.* ¶ 154. Thus, the primary issue is whether the '678 patent disavows circulator ports from the scope of the term "port."

Although the broad scope of a claim term may be intentionally disavowed, "this intention must be clear," *see Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002) ("The patentee may demonstrate an intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope,”), and cannot draw limitations into the claim from a preferred embodiment.” *Conoco, Inc. v. Energy & Envtl. Int’l., L.C.*, 460 F.3d 1349, 1357 (Fed. Cir. 2006).

Patent Owner fails to show any “expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope” with respect to the use of “port” in the ’678 patent. Patent Owner argues that the ’678 patent provides a scalable system without circulator ports (PO Resp. 9–10), that a provisional application to the ’678 patent “describes existing add/drop architectures that had a number of problems” (PO Resp. 36), that Dr. Marom obtained a patent in which collimators serve as the ports (PO Resp. 40–41), and that “[b]ecause the inventors of the ’678 [p]atent consistently emphasized the limitations of circulator-based switches and the ’678 [p]atent discloses an alternative configuration, a [person of ordinary skill in the art] would have understood that the inventors were disavowing the use of optical circulators.” PO Resp. 37 (citing Ex 2004 ¶ 161).

We do not discern any “clear disavowal of claim scope” from the arguments advanced by Patent Owner. Dr. Sergienko merely states that a person of ordinary skill in the art “would have read the ’678 patent as teaching away from or at the least discouraging the use of circulators.” Ex. 2004, ¶ 160. Even if the ’678 patent were viewed as Dr. Sergienko suggests, teaching away or discouragement is not disavowal. Moreover, Petitioner further demonstrates that a provisional application to the '678 patent in fact uses circulator ports as "ports." Pet. Reply 11–13 (citing Ex. 1008, 4, Fig. 9). Such usage undermines Patent Owner's disavowal contention. We have considered all of the arguments advanced by Patent Owner in its effort to redefine "port" as excluding "circulator ports" (PO Resp. 34–41), and find insufficient support for Patent Owner's contention that the '678 patent disavows circulator ports from the scope of the term "port." We determine that "port," in light of the specification of the '678 patent, encompasses "circulator port."

5. "*beam-focuser*"

Claims 1, 21, and 44 require a "beam-focuser, for focusing said spectral channels into corresponding spectral spots." Ex. 1001, 14:14–15, 15:37–38, 17:41–42. The '678 patent states that "[t]he beam-focuser may be a single lens, an assembly of lenses, or other beam focusing means known in the art." *Id.* at 4:20–22.

Petitioner contends that "beam-focuser" is "a device that directs a beam of light to a spot." Pet. 14. According to Petitioner:

> The Summary of the '678 patent states that the "beam-focuser focuses the spectral channels into corresponding spectral spots." ([Ex. 1001], 3:63–64.) The specification also explains that the beams of light are "focused by the focusing lens 102 into a spatial array of

> distinct spectral spots (not shown in FIG. lA) in a one-to-one correspondence." (*Id.*, 6:65–7:5.) The MEMS mirrors are in turn "positioned in accordance with the spatial array formed by the spectral spots, such that each channel micromirror receives one of the spectral channels." (*Id.*)

Id. at 14–15. Patent Owner does not dispute expressly Petitioner's proposed construction, and provides no alternative construction of "beam-focuser." Consistent with Petitioner's proposed construction, Dr. Sergienko testified that "focusing means bringing of the energy in the original image limited to the focal spot." Dr. Sergienko Deposition Transcript (Ex. 1049), 245:17–19. We agree that, based on the specification of the '678 patent, "beam-focuser" means "a device that directs a beam of light to a spot."

6. "*servo-control assembly*"

Claims 2–4, 21–23, 45, and 46 recite a "servo-control assembly." Petitioner asserts "servo-control assembly" means "feedback-based control assembly." Pet. 12. Patent Owner offers no construction of the term.

We are not persuaded that "servo" necessarily means "feedbackbased," as suggested by Petitioner, merely because the '678 patent describes a processing unit within a servo-control assembly as using power measurements from the spectral monitor to provide feedback control of the channel mirrors. *Id.* at 12–13. the ’678 patent states that the “servo-control assembly serves to monitor the power levels of the spectral channels coupled into the output ports and further provide control of the channel micro mirrors on an individual basis.” Ex. 1001, 4:47–50. Further, “[i]f the WSR apparatus includes an array of collimator-alignment mirrors . . . the servo-control assembly may additionally provide dynamic control of the collimator-alignment mirrors. *Id.* at 4:56–60. According to the ’678 patent, “[a] skilled artisan will know how to implement a suitable spectral monitor along with an appropriate processing unit to provide a servo-control assembly in a WSP-S apparatus according to the present invention, for a given application.” Ex. 1001, 12:11–15.

Based on the specification and the present record, a “servo-control assembly” encompasses a spectral monitor and processing unit to monitor spectral channel power levels and control channel micro mirrors on an individual basis. *See id.* at 11:10–36.

7. “*servo-based*”

Claims 21–23, 27, and 29 recite a “servo-based optical apparatus.” Petitioner asserts that “servo-based” means “feedback-based control.” Pet. 12. Patent Owner offers no construction of the term.

The ’678 patent does not use the term “servo-based” outside of the preamble of the claims.

> If . . . the body of the claim fully and intrinsically sets forth the complete invention, including all of its limitations, and the preamble offers no distinct definition of any of the claimed invention's limitations, . . . then the preamble is of no significance to claim construction because it cannot be said to constitute or explain a claim limitation.

Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1305 (Fed. Cir. 1999) (citations omitted). The bodies of claims 21–23, 27, and 29 fully and intrinsically set forth the complete invention; therefore, the use of "servo-based" in the preamble does not serve as a limitation and need not be construed.

8. "*dynamically*"

Claim 61 recites "[a] method of performing dynamic wavelength separating and routing, comprising: . . . dynamically and continuously controlling said beam-deflecting elements in two dimensions." Ex. 1001, 18:65–67. Petitioner contends that "[t]he plain and ordinary meaning of 'dynamically' controlling in the context of the '678 patent is 'during operation.'" Pet. 57 (citing Ex. 1001, 3:22–23 (contrasting routing that is fixed during operation: "the [prior art] wavelength routing is intrinsically static, rendering it difficult to dynamically reconfigure these OADMs."); Ex. 1028 ¶¶ 142–144). It is unclear how Petitioner equates "dynamically" to "during operation" from the citation provided. Patent Owner does not propose a definition of "dynamically."

The '678 patent uses "dynamic" and "dynamically" throughout the specification, stating, for example, that "[t]he power levels of the spectral channels in the output ports may be dynamically managed according to demand." Ex. 1001, 11:30–32. We determine from the specification that the '678 patent uses "dynamically" in contrast to "static," in accordance with its ordinary and customary meaning.

9. Additional Claim Terms

Petitioner addresses several additional claim terms, including "spectral monitor" and "in two dimensions." Pet. 13–16. For purposes of this decision, no express construction of any additional claim term is necessary.

C. References Asserted as Prior Art

Petitioner relies on Bouevitch, Smith, Lin, and Dueck with respect to its assertion that the challenged claims would have been obvious.

1. Bouevitch

Bouevitch describes an optical device for rerouting and modifying an optical signal, including modifying means such as a MEMS array and a liquid crystal array which function as an attenuator when the device operates as a dynamic gain equalizer

(DGE), and as a switching array when the device operates as a configurable optical add/drop multiplexer (COADM). Ex. 1003, Abstract. According to Petitioner, the COADM described in Bouevitch "uses MEMS mirrors with 1 axis of rotation." Pet. 18. Petitioner also contends that the Bouevitch COADM controls the power of its output channels by tilting beam-deflecting mirrors at varying angles. *Id.*

2. Smith

Smith describes an optical switch including an array of mirrors tiltable about two axes, permitting a mirror tilt axis to be used for switching and a perpendicular axis to be used for power control. Ex. 1004, Abstract, 16:34–51; *see also* Ex. 1005 (the Smith '683 Provisional), 6 (describing the same). Petitioner contends that "to the extent Bouevitch does not disclose 2-axis mirrors and their intended use for power control, both the Smith Patent and the Smith ['683] Provisional each does so." Pet. 19. Petitioner asserts that Smith is § 102(e) prior art as of the September 22, 2000, filing date of the Smith '683 Provisional. Pet. 17. Patent Owner argues that Smith is not prior art to the '678 patent because the portions of Smith Petitioner relies upon are not entitled to the filing date of the Smith '683 Provisional. PO Resp. 58–60.

During this proceeding, the Federal Circuit issued a decision in *Dynamic Drinkware, LLC, v. National Graphics, Inc.*, 800 F.3d 1375 (Fed. Cir. 2015), addressing the necessary showing for a patent to claim priority from the filing date of its provisional application. The court found that the petitioner in the underlying *inter partes* review proceeding did not demonstrate that the prior art patent relied upon was entitled to the benefit of the filing date of its provisional application because the petitioner did not show written description support in the prior art provisional application *for the claims of the prior art patent*. *Id.* at 1378. Thus, demonstrating only that the provisional application of the prior art patent provided a written description of the *subject matter* in the prior art patent relied upon to establish the unpatentability of the challenged claims was insufficient to show that the prior art patent was entitled to the benefit of the filing date of its provisional application. *Id.*

In this case, Petitioner recognized that it had not shown in the Petition that the Smith '683 Provisional provided written description support *for the claims of Smith* and requested an opportunity to address the issue in light of *Dynamic Drinkware*. *See* Paper 22 (authorizing additional briefing). With our authorization, Petitioner filed a brief addressing the holding in *Dynamic Drinkware* and whether the Smith '683 Provisional provides written description support for the claims of Smith. Paper 30. Patent Owner filed a brief in response. Paper 33.

The parties generally agree that Smith is § 102(e) prior art as of the filing date of the Smith '683 Provisional if the Smith '683 Provisional provides written description support for: (1) the subject matter Petitioner relies upon in Smith to show the unpatentability of the challenged claims of the '678 patent, and (2) the invention of Smith.[9] *See* Paper 30, 2; *see also* Paper 33, 1 ("When relying on a provisional's filing date for a § 103 rejection, a petitioner must show: (1) the subject matter was carried over from the provisional application and (2) the patent's claims have § 112 support in the provisional application.").

First, Petitioner has shown sufficiently that the Smith '683 Provisional provides written description support for at least two claims of Smith. Petitioner provides a claim chart identifying each of the limitations of claim 1 of Smith and the corresponding written description support as disclosed by the Smith '683 Provisional. Paper 30,

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[9] We agree with Petitioner that it need not show that every claim of Smith is supported by the Smith '683 Provisional to demonstrate that subject matter disclosed in both Smith and the Smith '683 Provisional is entitled to the benefit of the filing date of the Smith '683 Provisional. *See* Paper 30, 3. We also need not reach, and take no position on Petitioner's suggestion that *Dynamic Drinkware* is invalid to the extent it conflicts with *In re Klesper*, 397 F.2d 882 (CCPA 1968) (stating "[i]t is also well settled that where a patent purports on its face to be a 'continuation-in-part' of a prior application, the continuation-in-part application is entitled to the filing date of the parent application as to all subject matter carried over into it from the parent application, whether for purposes of obtaining a patent or subsequently utilizing the patent disclosure as evidence to defeat another's right to a patent. 35 U.S.C. §§ 102(e), 120; *Goodyear Tire & Rubber Co. v. Ladd*, 121 U.S. App. D.C. 275, 349 F.2d 710 (1965), certiorari denied 382 U.S. 973, 86 S. Ct. 536, 15 L. Ed. 2d 465; *Asseff v. Marzall*, 88 U. S. App. D.C. 358, 189 F.2d 660 (1951), certiorari denied 342 U.S. 828, 72 S. Ct. 51, 96 L. Ed. 626; *In re Switzer*, 166 F.2d 827, 35 CCPA 1013.").

attached claim chart. Petitioner also identifies written description support in the Smith ’683 Provisional for Smith claim 28. *Id.* at 5.

We have considered Patent Owner’s argument that the claim chart provided by Petitioner “is mere attorney argument and does not even attempt to demonstrate what a [person of ordinary skill in the art] would understand or whether the disclosure has § 112 support in the Provisional,” and are not persuaded. Paper 33, 5. Patent Owner identifies no authority for the proposition that an expert declaration is necessary to show written description support. Patent Owner’s further argument that Petitioner “is wrong” in its assertion that the “movable mirror” of Smith is supported by the disclosure of “elements that can be rotated in an analog fashion,” is not persuasive because it is conclusory and does not address the full disclosure identified by Petitioner.

Second, Petitioner has shown sufficiently that the Smith ’683 Provisional provides written description support for certain subject matter Petitioner relies upon in Smith to show the unpatentability of the challenged claims of the ’678 patent (i.e., that “the subject matter was carried over from the provisional application.”) According to Petitioner, the Smith ’683 Provisional “describes ‘a mirror array with elements that can be rotated in an analog fashion about two orthogonal axes,’ with one axis for switching, and one axis for power.” Pet. 19 (quoting Ex. 1005, 6). In support of Petitioner’s contention that Smith is § 102(e) prior art, Dr.

Marom testifies that the Smith '683 Provisional discloses all of the features of Smith relied upon to demonstrate unpatentability. Ex. 1028 ¶ 153. In his declaration, Dr. Marom provides a chart identifying the claimed subject matter of the '678 patent and the corresponding disclosures in both Smith and the Smith '683 Provisional. *Id.* ¶ 154. In particular, Dr. Marom identifies the individually and continuously controllable in two dimensions limitation of claims 1, 21, 44, and 61 of the '678 patent as being described by the Smith '683 Provisional as a "mirror array with elements that can be rotated in an analog fashion about two orthogonal axes." *Id.* (quoting Ex. 1005, 6) (emphasis omitted).

Patent Owner argues that the Smith '683 Provisional does not provide written description support for Smith's disclosure of the "continuously controllable" limitation of the '678 patent. PO Resp. 59–60. Although Dr. Marom expressed the opinion that the Smith '683 Provisional discloses the "continuously controllable" limitation based on its disclosure of "analog" control, Petitioner does not rely only on Smith as disclosing the "continuously controllable" limitation. *See* Pet. 28, 30. Accordingly, whether the Smith '683 Provisional discloses the "continuously controllable" limitation has no bearing on whether Smith is available as prior art for any other disclosure upon which Petitioner relies. Similarly, to the extent Patent Owner argues that a gimbal structure described in Smith was not disclosed in the Smith '683 Provisional, Patent Owner's argument is beyond the scope of the claims of the ’678 patent, which do not require a particular gimbal structure, and is not persuasive as Petitioner does not rely on the disclosure of a gimbal structure to demonstrate the unpatentability of any claim of the ’678 patent.

We determine that Smith is available as prior art with an effective date of the filing date of the Smith ’683 Provisional for subject matter carried over to Smith from the provisional application, including the disclosure of 2-axis mirrors to control switching and power.

3. Lin

Lin describes a “spatial light modulator . . . operable in the analog mode for light beam steering or scanning applications.” Ex. 1010, Abstract. Lin explains that the angular deflection of a mirror about the torsional axis is a function of the voltage potential applied to an address electrode. *Id.* at 6:29–32. Petitioner contends that Figure 3B of Lin depicts a continuous and linear relationship between the deflection angle of the MEMS mirrors and the applied voltage. Pet. 30.

4. Dueck

Dueck describes a wavelength division multiplexer that integrates an axial gradient refractive index element with a diffraction grating to provide efficient coupling from a plurality of input sources. Ex. 1021, Abstract. Petitioner contends that

Dueck describes various diffraction gratings for use in WDM devices. Pet. 17.

D. Asserted Obviousness Over Bouevitch, Smith, and Lin

Petitioner asserts that claims 1–4, 9, 10, 13, 19–23, 27, 44–46, and 61–65 would have been obvious over Bouevitch, Smith, and Lin.[10] Pet. 23–60.

1. Claim 1

Claim 1, directed to a wavelength-separating-routing apparatus, requires "multiple fiber collimators, providing an input port . . . and a plurality of output ports." Ex. 1001, 14:6–10. Petitioner contends that Bouevitch describes microlenses 12a and 12b, corresponding to the recited "multiple fiber collimators." Pet. 24. Petitioner's declarant, Dr. Marom, equates microlenses 12a and 12b to fiber collimators.

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[10] Petitioner initially argues that Patent Owner admitted in a Replacement Reissue Application Declaration by Assignee that all elements of claim 1, except for two-axis mirrors, were disclosed by Bouevitch. Pet. 7–9 (quoting Ex. 1002, 81–82). Petitioner identifies no persuasive authority for the proposition that such a statement should be treated as an admission in this proceeding. Moreover, rather than admit that all original elements of claim 1 are disclosed by Bouevitch, the statement makes clear that three additional references not relied upon by Petitioner in this proceeding were considered in combination with Bouevitch. As a result, we are not persuaded that Patent Owner has admitted all elements of claim 1, except for two-axis mirrors, were disclosed by Bouevitch.

Petitioner further asserts that the microlenses of Bouevitch, in conjunction with fiber waveguides and circulators, provide an input port (labeled "IN"), and a plurality of output ports (labeled "OUT EXPRESS" and "OUT DROP"). Pet. 24–25 (citing Ex. 1003, 14:14–21, Fig. 11). Petitioner's contentions are supported by Dr. Marom. Ex. 1028 ¶¶ 52–53.

Patent Owner argues that under the "proper meaning" of the claim, Bouevitch's two circulators coupled to two microlenses "do not meet the distinct structure" of the claimed "multiple fiber collimators, providing an input port . . . and a plurality of output ports."[11] PO Resp. 34–35. We find no support for Patent Owner's contentions. Patent Owner does not articulate any express construction of a claim term as corresponding to the "proper meaning" to which it refers. As discussed above, we construe "providing" to mean "making available," and Patent Owner does not expressly argue to the contrary. Instead, Patent Owner identifies a figure from the specification of the '678 patent and argues that the specification describes "one collimator providing one input port and five collimators providing respective five output ports." *Id.* That, however, is not the language of claim 1, and we will not read limitations from the specification into the claims of the '678 patent.

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[11] Patent Owner contends that claim 1 is "representative" of claims 21, 44, and 61, and states that "[t]he claims of the patent refer not merely to ports, but to fiber collimators, providing ports." PO Resp. 33–34. Contrary to Patent Owner's assertion, claim 61 recites "ports," and does not recite "collimators."

Patent Owner also argues that, under its proposed claim construction of "port," Bouevitch discloses at most two ports because the '678 patent equates "port" to "collimator," and disavows "circulator-based optical systems." PO Resp. 35–42. For the reasons explained above in our claim construction analysis for "port," we reject Patent Owner's claim construction for "port." Accordingly, we do not agree with Patent Owner's contention that the only ports disclosed by Bouevitch are collimator lenses 12a and 12b. Petitioner has shown, as discussed above and as supported by Dr. Marom, that Bouevitch discloses the "multiple fiber collimators, providing an input port . . . and a plurality of output ports," as recited by claim 1.

Claim 1 further requires "a wavelength-separator." Petitioner identifies diffraction grating 20 of Bouevitch as corresponding to the recited "wavelength-separator." Pet. 25. Petitioner contends, and we agree, that Bouevitch discloses a "wavelength-separator, for separating said multiwave-length optical signal from said input port into multiple spectral channels" at Figure 11, where diffraction grating 20 spatially separates combined channels $\lambda_1\lambda_2$ into spatially-separated channels. *Id.* at 25–26 (citing Ex. 1003, 14:48–53, 8:10–22; Ex. 1028 ¶ 54).

Claim 1 also requires "a beam-focuser." Petitioner identifies reflector 10 of Bouevitch (as well as the lens system 202 of Smith) as corresponding to the recited "beam-focuser." Pet. 26–27. Petitioner explains that in Bouevitch "reflector 10 focuses the separated spectral channels of light λ_1 and λ_2 from the points on the reflector annotated as 'R' onto point on the corresponding mirrors 51 & 52 in MEMS array 50." *Id.* Petitioner identifies MEMS mirror array 50 of Bouevitch as corresponding to the recited "spatial array of channel micromirrors positioned such that each channel micromirror receives a corresponding one of said spectral channels." Pet. 27–28. Patent Owner does not dispute Petitioner's contentions, with which we agree.

For each of the channel micromirrors, claim 1 further requires that they be "*pivotal about two axes*," and be "individually and continuously controllable to reflect *corresponding received* spectral channels into *any* selected ones of said output ports *and to control the power of said received spectral channels coupled into said output ports*." Petitioner contends that each micromirror in MEMS array 50 of Bouevitch is "individually" controllable to deflect a beam to either output port 80a or 80b. Pet. 28 (citing Ex. 1028 ¶ 62). Petitioner also contends that both Bouevitch and Smith "describe how the goal of controlling the MEMS mirrors is to effect the add/drop process, which includes reflecting the spectral channels to selected add/drop ports. Pet. 33 (citing Ex. 1003, 14:66–15:18; Ex. 1004, Fig. 5, 8:47–59, 12:4–12, 10:37–44; Ex. 1028 ¶ 75.)

Patent Owner argues that the beam in Bouevitch is "propagated" to an output port, and that Petitioner has not shown that "deflecting" or "propagating" to an output port is "reflecting," as claimed. PO Resp. 42–43. We find Patent Owner's argument not persuasive. First, Patent Owner does not dispute that Smith discloses "reflecting" as claimed. Second, Patent Owner provides no construction of "to reflect" to explain why a beam that is reflected and then propagated or deflected is excluded. Third, Petitioner has shown that Patent Owner's argument implies a requirement that the beam be directly reflected to an output port which is contrary to an embodiment of the '678 patent. *See* Pet. Reply 17–18. We agree with Petitioner, as discussed above, that both Smith and Bouevitch disclose micromirrors that "reflect" spectral channels to output ports, as claimed.

With regard to continuous control, as explained by Dr. Marom, Bouevitch discloses the use of variable attenuation for power control, and a person of ordinary skill in the art would understand that the necessary level of control required to balance the optical power differentials among the wavelength channels is achieved in Bouevitch with continuous control over the mirror tilt via analog voltage control. *See* Ex. 1028 ¶ 63, *see also* Ex. 1003, 7:35–37 ("The degree of attenuation is based on the degree of deflection provided by the reflector (i.e., the angle of reflection).").

Patent Owner does not dispute Petitioner's contention that Bouevitch discloses continuous control of beam-deflecting elements via analog voltage control with respect to a single axis. Instead, Patent Owner argues that "Petitioner explicitly concedes that Bouevitch does not teach or suggest micromirrors being pivotable about two axes." PO Resp. 44.

There is no dispute that Petitioner relies on Smith as disclosing micromirrors being pivotable about two axes. Petitioner explains that Smith describes a "multi-wavelength . . . optical switch including an array of mirrors tiltable about two axes, both to control the switching and to provide variable power transmission." Pet. 31 (quoting Ex. 1004, Abstract). Patent Owner does not dispute that Smith discloses individually controllable micromirrors pivotable about two axes, or that such control is used "to reflect" and "to control the power," as recited by claim 1.

The dispute of the parties with regard to Smith more significantly focuses on whether Smith discloses "continuous control." As discussed above, we reject Petitioner's assertion that "continuous control" means "under analog control," and determine instead that the term encompasses "under analog control such that it can be continuously adjusted." According to Petitioner:

> Smith teaches continuous control of its MEMS mirrors in an analog manner, where the force used to tilt the mirrors is "approximately ***linearly*** proportional to the magnitude of the applied voltage." ([Ex. 1004], 15:41–42, emphasis added, 6–35; 17:1–23; [Ex. 1028] ¶ 64.) This linear proportionality is another way of describing a continuous, analog, relationship between the voltage

> driving the mirrors and the resulting mirror angle. ([Ex. 1028] ¶¶ 64–65.)

Pet. 29. The Smith ’683 Provisional also states that elements “can be rotated in an analog fashion.” Ex. 1005, 6. Stating that the control is “in an analog manner” or reflects an “analog” relationship, however, is not sufficient to persuasively establish that the mirrors of Smith are “under analog control.” Nor has Petitioner sufficiently shown that the “analog fashion” referred to in the Smith ’683 Provisional necessarily was carried forward to Smith.

Patent Owner further asserts with respect to Smith that a person of ordinary skill in the art “would have viewed tilting according to large angles and small angles and [pulse width modulation] more akin to step-wise digital control than analog control.” PO Resp. 47 (further indicating that other patents and patent applications related to Smith use digital control). In response, Petitioner does not dispute that Smith relies on digital control, but instead argues that Dr. Sergienko testified that digital control does not preclude “continuous control.” Pet. Reply 22. We agree that “continuous control” is not limited to analog control; however, Petitioner’s contention is that Smith discloses “continuous control” because Smith discloses “analog control,” not that digital control in Smith is “continuous control.” We are not persuaded that Smith discloses “continuous control” on this record because Petitioner has not shown either that the mirrors of

Smith are "under analog control" or that Smith's use of digital control constitutes "continuous control."

Petitioner also contends that Lin discloses "continuous control." Pet. 30–31. Lin describes a spatial light modulator (SLM) operable in the analog mode for light beam steering or scanning applications. Ex. 1010,

Abstract. Figures 3A and 3B of Lin are reproduced below.

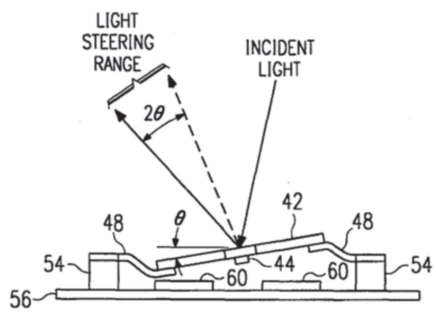

FIG. 3A

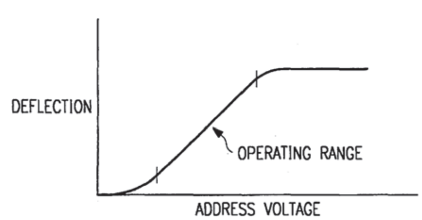

FIG. 3B

Figure 3A is a spatial light modulator, "illustrating the pixel being deflected about the torsion hinge to steer incident light in a selected direction, the deflection of the pixel being a function of the voltage applied to the underlying address electrode." Ex. 1010, 5:20–25. As Petitioner explains, Figure 3B shows a graph disclosing the continuous deflection angle of MEMS mirrors as a function of the voltage applied to affect that deflection.

Pet. 30. Dr. Marom testifies that Lin "confirms that continuous and analog control of MEMS mirrors was known prior to the '678 patent's priority date." Ex. 1028 ¶ 66. Lin explains that "the angular deflection of mirror 42 about the torsional axis defined by hinges 44 is seen to be a function of the voltage potential applied to one of the address electrodes 60." Ex. 1010, 6:29–32. Lin further explains that:

> With an address voltage being applied to one address electrode 60 being from 0 to 20 volts, mirror 42 is deflected proportional to the address voltage. When SLM 40 is operated as an optical switch or light steerer, incident light can be precisely steered to a receiver such as an optical sensor or scanner. The mirror tilt angle can be achieved with a excellent accuracy for pixel steering.

Id. at 7:13–19.

Patent Owner argues that Petitioner hasn't shown that Lin discloses continuous control because such control cannot be shown by the input signal alone, and Petitioner did not "look at the structure of the mirror and how the voltage affects movement of the mirror." PO Resp. 51. Patent Owner's conclusory and unsupported argument is not persuasive because it does not address the disclosures of Lin as summarized above, which we find establish "continuous control," as recited in claim 1.

Patent Owner also argues that Lin does not disclose micromirrors "pivotable about two axes." *Id.* at 51–52. Petitioner, however, relies on Smith, not Lin, as disclosing 2-axis mirrors, and there is no contention that Lin, alone, discloses continuous control in two dimensions.

In summary, for the reasons discussed above, Petitioner has established that Bouevitch discloses all of the recited limitations of claim l for multiple fiber collimators, a wavelength-separator, a beam-focuser, and a spatial array of channel micromirrors individually and continuously controllable on a single axis, but not on a two axis (i.e., "pivotal about two axes") array "to reflect said corresponding received spectral channels into any selected ones of said output ports and to control the power of said received spectral channels coupled into said output ports." Patent Owner did not dispute that Bouevitch discloses continuous control of beam-deflecting elements via analog voltage control with respect to a single axis, and Petitioner has demonstrated that Lin also discloses such "continuous control." Finally, Petitioner has established that Smith discloses an array of mirrors controllable in two dimensions "to reflect" and "to control," as recited by claim 1. Thus, the remaining issue is whether Petitioner has provided "some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).[12]

With respect to a rationale for combining Bouevitch and Smith, Petitioner contends the use of the two-axis mirror of Smith in Bouevitch: (1) is a simple substitution of one known element for another yielding predictable results, (2) is the use of a known technique to improve similar devices, (3) would be obvious to try as there are only two options for tilting MEMS mirrors: one-axis and two-axis mirrors, and (4) would be motivated to reduce crosstalk in attenuation and to increase port density. Pet. 19–22.[13]

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[12] The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, and (3) the level of skill in the art; and (4) secondary considerations, i.e. objective evidence of unobviousness. *See Graham v. John Deere Co.*, 383 U.S. 1, 17– 18 (1966). We have considered each of the Graham factors and incorporate our discussion of those considerations, to the extent there is a dispute, in our evaluation of the reasoning that supports the asserted combination. We further observe that, in this proceeding, evidence of secondary considerations has not been offered for evaluation.

[13] Petitioner also argues, without citing authority, that Patent Owner admitted the "combinability" of references during prosecution, and that such admission applies to the references identified by Petitioner in "the identical technology area." Pet. 22. We find no such admission.

Petitioner also contends that several reasons support the addition of Lin's continuous, analog control to the asserted combination, including interchangeability with discrete-step mirrors and more precision in matching the optimal coupling value. Pet. 30–31.

Patent Owner disputes the sufficiency of the rationale provided in the Petition. PO Resp. 15–32. First, Patent Owner argues that Petitioner "conflates disparate embodiments of Bouevitch," "one functioning in a DGE to control power [shown in Bouevitch Figure 5] and one functioning in a COADM to control switching [shown in Bouevitch Figure 11]." *Id.* at 16–17. Petitioner, however, persuasively explains that it does not rely on an embodiment of Bouevitch functioning to control power to show that the features of claim 1 were disclosed in the asserted art. Pet. Reply 2–3 ("[Bouevitch] Fig. 5 is not relevant to Petitioner's positions or the institution."). Instead, Petitioner relies on Smith as disclosing power control, stating in the Petition that "Smith describes a 'multi-wavelength . . . optical switch including an array of mirrors tiltable about two axes, both to control the switching and to provide variable power transmission.'" Pet. 31 (quoting Ex. 1004, Abstract).

Although Petitioner includes a discussion of Bouevitch's disclosure of power control in the Petition, it is clear that the asserted combination does not stand or fall on that disclosure. The Petition states that a person of ordinary skill in the art "would be motivated to use the 2-axis system of

Smith within the system of Bouevitch for power control." Pet. 34 (citing Ex. 1028 ¶ 78). Petitioner's discussion of the power control embodiment of Bouevitch in support of the rationale for the asserted combination with Smith (i.e., both Smith and Bouevitch address power control) does not impose an obligation on Petitioner to articulate a rationale for including the power control embodiment of Bouevitch in the asserted combination.

Patent Owner also argues that Petitioner implicitly relies on the power control embodiment of Bouevitch to show that Bouevitch discloses beam-deflecting mirrors that are continuously controllable. PO Resp. 21. We are persuaded that, to the extent Petitioner relies on Bouevitch as disclosing reflectors that are continuously controllable based on the power control embodiment of Bouevitch (*see* Pet. 28–29 (quoting Ex. 1001 discussing the embodiment shown in Figure 5 of Bouevitch)), Petitioner was obligated to, and did not, provide a rationale for combining an embodiment of Bouevitch directed to power control with an embodiment relied on by Petitioner to show switching control.[14] Petitioner,

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[14] Petitioner argues in its Reply that Bouevitch teaches a MEMS structure for switching in Figure 11 that also performs power control; however, Petitioner has not shown sufficiently that it presented this contention in the Petition, or that its arguments were not intertwined with its assertions related to Bouevitch Figure 5. Similarly, Petitioner did not contend in the Petition, as it does in its Reply, that Bouevitch inherently discloses angular misalignment for power control. *See* Pet. Reply 4. Arguments made for the first time in a reply generally are not given consideration.

however, further relies on Lin as disclosing continuous control. Accordingly, Petitioner may show unpatentability based on the combination of Bouevitch, Smith, and Lin without relying on the power control embodiment of Bouevitch, and without providing a rationale for incorporating the power control embodiment of Bouevitch in the asserted combination.

Patent Owner also argues that a person of ordinary skill in the art would not have combined Bouevitch and Smith for various reasons. PO Resp. 23–32. Patent Owner argues that Petitioner has not reconciled "the technical differences between the references," or explained whether the components "would continue to operate as desired." *Id.* at 23. Patent Owner lists many considerations an optical system architect would have to take into account purportedly not addressed in the Petition. *Id.* at 23–25. Patent Owner further asserts that Dr. Marom has designed a two-axis mirror to replace a two-axis mirror, and that "[r]e-designing micromirrors is not a simple substitution because the redesign is complex." *Id.* at 25–26. In this proceeding, however, Dr. Sergienko was asked whether such technical considerations presented problems that could not be overcome by one of skill in the art, and indicated "no." Ex. 1049, 266:16–267:25. Moreover, "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Here, the test for obviousness reflects what the combined teachings of Bouevitch, Lin, and Smith would have suggested to one of ordinary skill in the art, and does not require that any one particular component of a reference must be bodily incorporated, or physically inserted, into another reference.

Patent Owner argues more particularly that a person of ordinary skill in the art "would not have been motivated to use Smith's mirrors in the Bouevitch's Figure 5 embodiment." PO Resp. 26–27. Patent Owner's argument is not persuasive because, as discussed above, Petitioner does not rely on the Figure 5 embodiment in Bouevitch.

Next, Patent Owner argues that a person of ordinary skill in the art would not have been motivated to combine Smith's tiltable mirrors with Bouevitch because it "would disrupt Bouevitch's explicit teaching of parallel alignment," and "Bouevitch discourages, if not teaches away from, misalignment to control power." PO Resp. 27–30. "The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the . . . application." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Although Bouevitch discusses how angular displacement is disadvantageous in certain respects (*see* Ex. 1003, 2:1–7), we are not persuaded such discussion is sufficient to constitute a teaching away.

To the contrary, Petitioner has shown persuasively that Bouevitch uses angular misalignment to control power in at least some embodiments of Bouevitch. Pet. Reply 3–5; *see also* Ex. 1028 ¶ 76.

Patent Owner also argues that absent hindsight, a person of ordinary skill would not have incorporated the two-axis mirror of Smith into Bouevitch, which uses a one-axis mirror, because a two-axis mirror is "a more complex structure." PO Resp. 30–32. We find Patent Owner's argument conclusory and not persuasive because it fails to address the benefits of a two-axis mirror disclosed by Smith, which would be apparent to one of skill in the art without hindsight. *See* Ex. 1004, 7:1–52. We also find persuasive Petitioner's contention that it would have been obvious to try, because, as Dr. Marom testified, (1) there were only two solutions to the known need to deflect light beams with MEMS: 1-axis or 2-axis, (2) a person of ordinary skill would have had a high expectation of success to try two-axis mirror control in Bouevitch, and (3) the result of the combination would be predictable. *See* Pet. 21; Pet. Reply 6–7; Ex. 1028 ¶ 46.

With respect to Lin, Patent Owner argues that Petitioner fails to explain either how the multiple axes of Smith could be combined with Lin's analog control or how to modify Lin's structural elements to incorporate a two-dimensional rotation, and further asserts that, because Lin's structural elements would be considered obstacles, a person of ordinary skill "would not necessarily have found it obvious to combine Smit and Lin." PO Resp. 53–54. As explained above, however, the test for obviousness is not whether the features of one reference may be bodily incorporated into the structure of another reference. Moreover, the references of record reflect that there are routinely complex design considerations in the fiber optic communications field. Patent Owner does not explain persuasively why combining the teachings of Smith and Lin would be beyond the skill of a skilled artisan.

Petitioner has articulated sufficiently reasoning with some rational underpinning to support the legal conclusion of obviousness based on the asserted combination of Bouevitch, Smith, and Lin. With regard to incorporating the teaching of a two-axis mirror in Smith with Bouevitch, we are persuaded that it is a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter. Single-axis and two-axis mirrors were known to be interchangeable. Smith not only expressly acknowledges this interchangeability, but also identifies benefits to the use of a two-axis mirror: "[i]n comparison to the two-axis embodiment, single axis systems may be realized using simpler, single axis MEMS arrays but suffer from increased potential for crosstalk between channels." Ex. 1004, 18:17–18; Ex. 1005, 12; *see also* Ex. 1004, 16:55–58, Ex. 1005, 11 ("[b]oth single and dual axis mirror arrays may be used in a variety of switching configurations, although, the two-axis components are preferred."). The asserted combination of Smith and Bouevitch and Lin yields a predictable result.

See KSR, 550 U.S. at 416 ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.").

We are further persuaded that Petitioner has identified additional "rational underpinning" in support of the asserted combination. Dr. Marom testified that applying the two-axis mirror of Smith to Bouevitch would have been beneficial "because choosing only a single axis for both port selection and attenuation may result in dynamic fluctuations of power crosstalk between ports as attenuation level is varied," would reduce "the risk of the signal bleeding into a port that is adjacent to the output port along the switching axis," and would provide "finer control over the attenuation value" by allowing the use of "the full dynamic range of the mirror tilt in the first axis for attenuation." *See* Ex. 1028 ¶¶ 78–80; *see also* Pet. 21–22. For similar reasons Petitioner has also shown that the application of Smith to Bouevitch constitutes the use of known techniques to improve similar devices. *See* Pet. 20–21.

We also find persuasive Petitioner's contention that a person of ordinary skill in the art would have combined the teachings of Lin with Bouevitch and Smith because:

> (1) continuously controlled mirrors were known to be interchangeable with discrete-step mirrors; (2) continuously controlled mirrors allow arbitrary positioning of mirrors

> and can more precisely match the optimal coupling value; and (3) Lin specifically teaches that its analog, continuous MEMS mirrors would be useful in optical switching applications like Bouevitch's and Smith's ROADM devices.

Pet. 30–31 (citing Ex. 1010, 2:6–9; Ex. 1028 ¶ 67). Petitioner also has shown that the use of analog continuous control was the known alternative to discrete (or step-wise) control, and would have been obvious to try and expected to work when applied to Bouevitch. Pet. 31 (citing Ex. 1028 ¶¶ 68–70).

For the foregoing reasons, Petitioner has established by a preponderance of the evidence that claim 1 would have been obvious over Bouevitch, Smith, and Lin.[15]

2. Claims 2–4

Claim 2 depends from claim 1, and further requires "a servo-control assembly, in communication with said channel micromirrors and said output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports." Claim 3 depends from claim 2, and further requires "said servo-control assembly comprises a spectral monitor

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[15] Patent Owner provides no persuasive evidence of secondary considerations to support the patentability of claims of the '678 patent.

for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors." Claim 4 depends from claim 3, and further requires that "said servo-control assembly maintains said power levels at a predetermined value."

The '678 patent states that:

> The electronic circuitry and the associated signal processing algorithm/software for such processing unit in a servo-control system are known in the art. A skilled artisan will know how to implement a suitable spectral monitor along with an appropriate processing unit to provide a servo-control assembly in a WSP-S apparatus according to the present invention, for a given application.

Ex. 1001, 12:9–15. Accordingly, the '678 patent expressly recognizes that the additional features of claims 2–4 were "known in the art" to a skilled artisan and would have been obvious to implement.

We agree with Petitioner's contention that Smith's disclosure of a controller that receives feedback from an optical power monitor corresponds to the servo-control assembly and spectral monitor of claims 2–4, and serves the same purpose. Pet. 35–43 (citing, *inter alia*, Ex. 1004, Fig. 8, 18:42–53, 13:20–24). Concerning "coupling," as claimed, we find persuasive Petitioner's explanation that:

> Smith discloses the use of "fine control along one or more minor axes…to moderate the degree of coupling of a wavelength channel," and shows at least two different types of coupling control in Figures 17 and 18. (Smith Pat., 7:32–44; 16:63–17:53 ("The fundamental control mechanism of the optical switches based on tilting mirrors is the degree of coupling between the free-space optical beams within the switch and the waveguides of the concentrator."); Marom Decl., ¶ 87; *see also* Smith Prov., 10, Fig. 4, 22:17–19.) This coupling angle must be predetermined because the coupling controls the power levels, which are themselves predetermined.

Pet. 38.

With regard to claim 4, we agree with Petitioner that Smith teaches that the controller "adjust[s] the mirror positions to adjust the transmitted power to conform to one or more *predetermined criteria*." Pet. 42–43 (quoting Ex. 1004, 11:48–51).

Petitioner also provides sufficient articulated reasoning with some rational underpinning to support the combination of the Smith controller and optical power monitor with Bouevitch, including "as an alternative to the 'external feedback' for power control that Bouevitch explains should be eliminated," and that a person of ordinary skill "would appreciate that the feedback-driven control of Smith would improve the precision of the mirror-based switching system of Bouevitch." Pet. 36–41. Petitioner also reasons that it would have been obvious to try the predetermined power settings of Smith within Bouevitch, because "Smith teaches that predetermined power values could make up for inherent problems in optical switching, such as power variations from optical amplifiers and manufacturing and environmental variations, and because 'WDM systems must maintain a significant degree of uniformity of power levels across the WDM spectrum.'" *Id.* at 43 (quoting Ex. 1004, 6:24–50; citing Ex. 1028 ¶ 92).

Patent Owner argues that Petitioner fails to explain how or why a person of ordinary skill would have been able to add Smith's control features to Bouevitch without disrupting Bouevitch's operation. PO Resp. 55–57. As noted above, the obviousness test has no bodily incorporation requirement, and is instead focused on "what the combined teachings of those references would have suggested to those of ordinary skill in the art." *See Keller*, 642 F.2d at 425. Patent Owner does not address the disclosure of the '678 patent, which states that a "skilled artisan will know how to implement a suitable spectral monitor," or the reasoning provided by Petitioner.[16] We have

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[16] For example, Patent Owner argues that "Petitioner says that Smith's internal feedback is an alternative to Bouevitch's external feedback." PO Resp. 57. Patent Owner misrepresents Petitioner's argument. Petitioner actually states that "[i]t would be obvious to [a person of ordinary skill] to try the internal feedback loop in Smith for use in Bouevitch as an alternative to the 'external feedback' for power control that Bouevitch explains should be eliminated." Pet. 36.

considered Patent Owner's arguments and find them to be insufficiently supported and conclusory. On the other hand, we conclude that Petitioner's reasoning (Pet. 35–43) is sound and supported adequately by the record. Petitioner has established by a preponderance of the evidence that claims 2–4 would have been obvious over Bouevitch, Smith, and Lin.

3. Claims 9, 10, 13, 19, and 20

Claims 9, 10, 13, 19, and 20 ultimately depend from claim 1. In addition to addressing the elements of claim 1, we agree with Petitioner's identification of how claims 9, 10, 13, 19, and 20 would have been obvious over Bouevitch, Smith, and Lin. Claim 9 requires that "each channel micromirror is continuously pivotable about one axis," while claim 10 requires "each channel micromirror is pivotable about two axes." Bouevitch discloses micromirrors continuously pivotable about one axis (Ex. 1003, 14:5–65, 15:30–34), Smith discloses mirrors that are continuously-pivotable in two axes (which includes "pivotable about one axis") (Ex. 1004, Abstract, 7:1–44, Fig. 14), and Bouevitch, Smith and Lin all disclose mirrors that are "continuously" pivotable. (Ex. 1003, 7:35–37, 12:59–60; Ex. 1004, 15:41–42; Ex. 1010, Fig. 3B, 2:66–3:14).

Claim 13 requires that the fiber collimators "are arranged in a one-dimensional array." Both Bouevitch and Smith disclose the claimed feature. *See* Pet. 44–45 (citing Ex. 1003, 13:9–18, Figs. 2a, 2b, 9b–9d, 5:22–42; Ex. 1004, Figs. 5, 6, 4:16–24).

Claim 19 requires that "each output port carries a single one of said spectral channels," a feature disclosed by Bouevitch. Pet. 47 (citing Ex. 1003, 14:27–15:18).

Claim 20 requires "one or more optical sensors, optically coupled to said output ports," a feature disclosed by Smith. Pet. 48 (Citing Ex. 1004, 9:11–15, 9:7–52). We also find persuasive Petitioner's rationale for applying the optical sensors taught by Smith to Bouevitch to "provide a more accurate measurement of the device's output power" and to provide "increased accuracy for power control." Pet. 48.

Patent Owner has not raised additional arguments with respect to claims 9, 10, 13, 19, and 20 beyond those asserted with respect to claim 1, addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 9, 10, 13, 19, and 20 would have been obvious over Bouevitch, Smith, and Lin for the same reasons discussed above with respect to claim 1.

4. Claims 21–23 and 27

Independent claim 21 recites many features substantially the same as features of claim 1, with the addition of "a servo-control assembly," as recited by claim 2. However, unlike claim 1, claim 21 does not require that the channel micromirrors be "pivotal about two axes" or that they "control the power." Petitioner provides an element-by-element analysis of each feature of claim 21, relying in substantial part on its discussion of the same features from claims 1 and 2. Pet. 49–51. Claim 22 depends from claim 21 and requires the same additional features recited in claim 3. Claim 23 depends from claim 22 and requires the same additional features recited in claim 4. Claim 27 depends from claim 21 and requires the same additional features recited in claim 9. Petitioner contends claims 22, 23, and 27 would have been obvious for the same reasons provided with respect to claims 3, 4, and 9.

Patent Owner has not raised additional arguments with respect to claims 21–23 and 27 beyond those asserted with respect to claims 1–4 and 9, addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 21–23 and 27 would have been obvious over Bouevitch, Smith, and Lin for the same reasons discussed above with respect to claims 1–4 and 9.

5. Claims 44–46

Independent claim 44 generally recites features substantially the same as features of claim 1, with relatively minor differences. For example, claim 1 recites a "wavelength-separating-routing apparatus" and "multiple fiber collimators," whereas claim 44 recites an "optical system comprising a wavelength-separating-routing apparatus" and "an array of fiber collimators." Unlike claim 1, claim 44 further requires "a pass-through port and one or more drop ports" among the plurality of output ports, and recites "said pass-through port receives a subset of said spectral channels."

We agree with Petitioner's contentions with respect to claim 44:

> Bouevitch also discloses that the output port can be used as the pass-through port of element 44[a] when the "modifying means" of the Bouevitch's ROADM allows a light beam to pass through unchanged. ([Ex. 1003], 6:20–25; [Ex. 1028] ¶ 131). Bouevitch teaches another output port in the form of "OUT DROP" drop port in element 80b, port 3. [] Bouevitch also discloses additional output ports. (*Id.*, 10:56–61 ("wherein each band has its own corresponding in/out/add/drop ports.") Each of these ports is provided by and comprised of microlens microcollimators. ([Ex. 1028] ¶ 131.)

Pet. 53–54. Claim 45 depends from claim 44 and requires the same additional features recited in claim 2. Claim 46 depends from claim 45 and requires the same additional features recited in claim 3.

Patent Owner has not raised additional arguments with respect to claims 44–46 beyond those asserted with respect to claims 1–3, addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 44–46 would have been obvious over Bouevitch, Smith, and Lin as discussed above, and for the same reasons provided with respect to claims 1–3.

6. Claims 61–65

Claim 61 is a method claim that parallels the features of claim 1. For example, claim 1 recites "a wavelength-separator, for separating said multiwavelength optical signal from said input port into multiple spectral channels," whereas claim 61 recites "separating said multi-wavelength optical signal into multiple spectral channels." Petitioner contends, and Patent Owner does not dispute, that the only substantive difference between claim 1 and claim 61 is the replacement of the term "individually and continuously controllable" in claim 1 with "dynamically and continuously controlling" in claim 61. Pet. 55. Although we do not adopt Petitioner's proposed construction of "dynamically," Petitioner has demonstrated that both Bouevitch and Smith disclose "dynamically" controlling. We agree with Petitioner's contentions with respect to claim 61:

> Both Bouevitch and Smith teach "dynamic" control during the operation of their add/drop devices. ([Ex. 1028], ¶ 145.) Bouevitch discloses a "dynamic gain equalizer and/or configurable add/drop multiplexer," which includes dynamic control of the mirrors that perform those actions. ([Ex. 1003], 2:24–25; [Ex. 1028] ¶ 145.) Smith notes that it "is well known" that power control "should be dynamic and under feedback control since the

> various wavelength components vary in intensity with time." [Ex. 1004], 6:37–50 (emphasis added); 2:23–31, 7:24–31.) The Smith Provisional also supports dynamic control, as is apparent from the fact that the Smith ROADM processes control signals/commands as it operates. (*See* [Ex. 1005], Figs. 11, 7; [Ex. 1028] ¶ 145.)

Pet. 58.

Claim 62 depends from claim 61 and, similar to claim 2, further requires "the step of providing feedback control of said beam-deflecting elements to maintain a predetermining coupling of each spectral channel directed into one of said signal output ports." We agree with Petitioner that "Smith discloses this feedback control in the form of a "controller" that receives feedback from an 'optical power monitor.' ([Ex. 1004], 18:42–53, 8:2–4, 13:20–24, Fig. 12, 8:3–4, 9:29–10:13, 13:20–14:15; [Ex. 1005], Figs. 4, 11.)."

Claim 63 depends from claim 62 and substantively requires the same additional features recited in claim 4. Claim 64 depends from claim 62 and substantively requires the same additional features recited in claim 19. Claim 65 depends from claim 61 and requires the same additional features recited in claim 44.

Patent Owner has not raised additional arguments with respect to claims 61–65 beyond those asserted with respect to claims 1, 2, 4, 19, and

44 addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 61–65 would have been obvious over Bouevitch, Smith, and Lin as discussed above, and for the same reasons provided with respect to claims 1, 2, 4, 19, and 44.

E. Asserted Obviousness Over Bouevitch, Smith, Lin, and Dueck

Petitioner contends claims 17, 29, and 53 would have been obvious over Bouevitch, Smith, Lin, and Dueck. Pet. 45–47, 55. Claim 17, which depends from claim 1, and claim 53, which depends from claim 44, both further require "said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, h[o]lographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing gratings."[17] Claim 29 contains essentially the same recitation, but refers to "dispersing prisms" in place of "dispersing gratings."

Petitioner contends that any of the types of wavelength-selective devices recited in claim 12 would have been obvious because "[e]ach type was known in the prior art, each was interchangeable as a wavelength selective device, and each was one of a small set of possible choices." Pet. 46 (citing Ex. 1028

[17] Claim 17 appears to misspell "holographic" as "halographic."

¶ 112).[18] Petitioner also contends that Dueck discloses ruled diffraction gratings, as claimed. Pet. 48. Petitioner further asserts that it would have been obvious to try Dueck's ruled diffraction gratings in the devices of Bouevitch and Smith because it represents the "best mode" of separating wavelengths in WDM devices. *Id.* at 46–47. We agree with Petitioner's contentions.

Patent Owner argues that a person of ordinary skill would not have been motivated to use Dueck's diffraction grating. PO Resp. 55–55. According to Patent Owner, Dueck discloses a diffraction grating that reflects an input light beam to an output port at very nearly the same angle as the incident angle. *Id.* Patent Owner reasons that because no configuration shown in Bouevitch is designed to reflect a light beam at the same angle as Dueck, there is no motivation to use Dueck's diffraction grating in Bouevitch. *Id.* In reply, Petitioner asserts that Dueck was relied on only to show "prior-art knowledge of diffraction gratings in general." Pet. Reply 23. As noted above, the obviousness test has no bodily incorporation requirement, and is instead focused on "what the combined teachings of those references would have suggested to those of ordinary skill in the art." *See*

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[18] Patent Owner suggests that because trial was instituted on a ground that included Dueck, we are precluded from considering Petitioner's arguments that claims 17, 29, and 53 would have been obvious without Dueck. *See* PO Resp. 54. Our Institution Decision in this case contained no such limitation.

Keller, 642 F.2d at 425. While the particular configuration of the ruled diffraction grating in Dueck may not be readily incorporated into Bouevitch, Dueck nonetheless discloses the broader concept of a ruled diffraction grating. Indeed, Dr. Sergienko testified that a ruled diffraction grating could have been used in Bouevitch, as well as holographic diffraction grating, or an echelle grating, as they are all reasonable substitutes for one another and would be expected to work. *See* Ex. 1049, 256:13–259:7.

We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 17, 29, and 53 would have been obvious over Bouevitch, Smith, Lin, and Dueck.

F. Conclusion

Petitioner has shown by a preponderance of the evidence that claims 1–4, 9, 10, 13, 19–23, 27, 44–46, and 61–65 would have been obvious over Bouevitch, Smith, and Lin, and that claims 17, 29, and 53 would have been obvious over Bouevitch, Smith, Lin, and Dueck.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, based on a preponderance of the evidence, claims 1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53, and 61–65 of U.S. Patent No. RE42,678 E1 are unpatentable; and,

FURTHER ORDERED that, because this is a Final Written Decision, the parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

For PETITIONER:

Wayne O. Stacy
Sarah Guske
Matthew J. Leary
COOLEY LLP
wstacy@cooley.com
CapellaCisco@cooley.com
mleary@cooley.com

For PATENT OWNER:

Jason D. Eisenberg
Jon E. Wright
Robert Greene Sterne
Nicholas Nowak
Jonathan Tuminaro
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
jasone-PTAB@skgf.com
jwright-PTAB@skgf.com
rsterne-PTAB@skgf.com
nnowak-PTAB@skgf.com
jtuminar-PTAB@skgf.com

APPENDIX E

Trials@uspto.gov | Paper 46
571-272-7822 | Entered: June 28, 2016

UNITED STATES PATENT AND
TRADEMARK OFFICE

BEFORE THE PATENT TRIAL
AND APPEAL BOARD

CISCO SYSTEMS, INC., CIENA CORPORATION,
CORIANT OPERATIONS, INC., CORIANT (USA)
INC., and FUJITSU NETWORK
COMMUNICATIONS, INC.,
Petitioner,

v.

CAPELLA PHOTONICS, INC.,
Patent Owner.

Case IPR2014-01166[1]
Patent RE42,368

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[1] IPR2015-00816 was joined with IPR2014-01166 on September 4, 2015, by Order in IPR2015-00816, Paper 12 (IPR2014-01166, Paper 26).

Before JOSIAH C. COCKS, KALYAN K. DESHPANDE, and JAMES A. TARTAL, *Administrative Patent Judges*.

TARTAL, *Administrative Patent Judge*.

DECISION
Denying Request for Rehearing
37 C.F.R. § 42.71(d)

I. INTRODUCTION

In the Final Written Decision concerning U.S. Patent No. RE42,368 ("the '368 patent"), we determined Petitioner Cisco Systems, Inc., Ciena Corporation, Coriant Operations, Inc., Coriant (USA) Inc., and Fujitsu Network Communications, Inc., had shown by a preponderance of the evidence that, under 35 U.S.C. § 103(a), claims 1–6, 9–11, 13, and 15–22 would have been obvious over Bouevitch,[2] Smith,[3] and Lin;[4] and, claim 12 would have been obvious over Bouevitch, Smith, Lin, and Dueck.[5] (Paper 44, "Final Decision" or "Dec."). Patent Owner, Capella Photonics, Inc., requests rehearing

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[2] U.S. Patent No. 6,498,872 B2, issued December 24, 2002 (Ex. 1003, "Bouevitch").

[3] U.S. Patent No. 6,798,941 B2, issued September 28, 2004 (Ex. 1004, "Smith").

[4] U.S. Patent No. 5,661,591, issued August 26, 1997 (Ex. 1010, "Lin").

[5] U.S. Patent No. 6,011,884, issued January 4, 2000 (Ex. 1021, "Dueck").

of the Final Written Decision. Paper 45 ("Request" or "Req. Reh'g."). For the reasons discussed below, Patent Owner's Request is denied.

II. DISCUSSION

"When rehearing a decision on petition, a panel will review the decision for an abuse of discretion." 37 C.F.R. § 42.71(c). The requirements for a request for rehearing are set forth in 37 C.F.R. § 42.71(d), which provides in relevant part:

> A party dissatisfied with a decision may file a request for rehearing, without prior authorization from the Board. The burden of showing a decision should be modified lies with the party challenging the decision. The request must specifically identify all matters the party believes the Board misapprehended or overlooked, and the place where each matter was previously addressed in a motion, an opposition, or a reply.

A. Patent Owner's Contention that Bouevitch Teaches Away from Misalignment to Control Power

In its Request, Patent Owner first argues that "the facts prove that Bouevitch teaches away from misalignment and angular displacement to control power." Req. Reh'g. 2. We are not persuaded that we misapprehended or overlooked this argument. The Final Decision states:

> As explained by Dr. Marom, Bouevitch discloses the use of variable attenuation for power control, and a person of ordinary skill in the art would understand that the necessary level of control required to balance the optical power differentials among the wavelength channels is achieved in Bouevitch with continuous control over the mirror tilt via analog voltage control. *See* Ex. 1028 ¶ 58, *see also* Ex. 1003, 7:35–37 ("The degree of attenuation is based on the degree of deflection provided by the reflector (i.e., the angle of reflection)."

Dec. 23. Patent Owner's "teaching away" argument was further addressed at length in the Final Decision:

> Next, Patent Owner argues that a person of ordinary skill in the art would not have been motivated to combine Smith's tiltable mirrors with Bouevitch because it would disrupt Bouevitch's explicit teaching of parallel alignment," and "Bouevitch discourages, if not teaches away from, misalignment to control power." PO Resp. 26–30. "The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the … application." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). While Bouevitch discusses how angular displacement is disadvantageous

> in certain respects (*see* Ex. [1003], 2:1–7), we are not persuaded such discussion is sufficient to constitute a teaching away. To the contrary, Petitioner has shown persuasively that Bouevitch uses angular misalignment to control power in at least some embodiments of Bouevitch. Pet. Reply 3–5; *see also* Ex. 1028 ¶ 71.

Dec. 32. Patent Owner directs us to no additional expert testimony in support of its argument that we overlooked, and cites no testimony from its expert, Dr. Sergienko, in support of its attorney argument. To the extent Dr. Sergienko's testimony "that Bouevitch could control power using misalignment" failed to support Patent Owner's argument, Patent Owner instead argues that it was "mischaracterized" by Petitioner. Req. Reh'g. 7. Thus, we determine that Patent Owner fails to identify any matter that we misapprehended or overlooked. Req. Reh'g. 2.

Furthermore, Patent Owner fails to address in its Request Bouevitch's disclosure, as quoted in the Final Decision, that the "degree of attenuation is based on the degree of deflection provided by the reflector (i.e., the angle of reflection)." Dec. 23 (quoting Ex. 1003, 7:35–37). Instead, Patent Owner argues that "Bouevitch's embodiments comprising MEMS do not *necessarily* control power using misalignment." Req. Reh'g. 9. Patent Owner's focus on whether a disclosed feature was "necessarily" used is misplaced. The challenged claims were found to have been obvious over the asserted prior art, and even if we were to consider Patent Owner's argument, Patent Owner fails to address what would have been understood by one of ordinary skill in the art at the time of the invention. Patent Owner has not established that we overlooked an argument or evidence regarding "teaching away," and has not shown that we erred in determining that Bouevitch does not teach away from the power-control method taught in Smith.

B. Patent Owner's Contention that Combining Bouevitch with a Two-Axis Mirror Would Change Its Basic Principle of Operation

In its Request, Patent Owner argues second that we misinterpreted its argument that a person of ordinary skill "would not have combined Bouevitch and a two-axis mirror because the combination would disrupt Bouevitch's polarization-based switch." Req. Reh'g. 10.

The Final Decision states:

> Patent Owner also argues that a person of ordinary skill in the art would not have combined Bouevitch and Smith for various reasons. PO Resp. 22–31. Patent Owner argues that Petitioner has not reconciled "the technical differences between the references," or explained whether the components "would continue to operate as desired." *Id.* at 23. Patent Owner lists many considerations an optical system architect would have to take into account purportedly not addressed in the

> Petition. *Id.* at 23–24. Patent Owner further asserts that Dr. Marom has designed a two-axis mirror to replace a two-axis mirror, and that "[r]e-designing micromirrors is not a simple substitution because the redesign is complex." *Id.* at 24–25. In this proceeding, however, Dr. Sergienko was asked whether such technical considerations presented problems that could not be overcome by one of skill in the art, and indicated "no." Ex. 1039, 266:16–267:25. Moreover, "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . . Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425 (CCPA 1981).

Dec. 30–31. Patent Owner asserts that it "did not argue that Bouevitch and Smith are not combinable because Smith's mirrors cannot be bodily incorporated into Bouevitch." Req. Reh'g. 9. Patent Owner's argument misrepresents the thrust of Patent Owner's Response. Patent Owner argued that replacing a single axis mirror with a two-axis mirror was not a simple substitution for various reasons including "temperature issues" and "moisture," and further argued that "two-axis gimbal mirrors were not suitable because a gap between adjacent gimbal mirrors limited perimeter-to-perimeter spacing." Paper 19 ("PO Resp.") 23–24. Patent Owner's arguments were properly addressed as disputing whether certain features could be bodily incorporated, rather than adequately addressing what the combined teachings of those references would have suggested to those of ordinary skill in the art. Accordingly, Patent Owner has not shown that we misapprehended or overlooked this argument.

Patent Owner also mischaracterizes the argument it raised in its Response concerning the motivation to combine Smith and Bouevitch. In the Response, Patent Owner argued a person of ordinary skill "would not have been motivated to use Smith's mirrors *in the Figure 5 embodiment* in Bouevitch because the combination would disrupt Bouevitch's polarization-based switch. PO Resp. 25 (emphasis added). The Final Decision states that "Patent Owner's argument is not persuasive because, as discussed above, Petitioner does not rely on the Figure 5 embodiment in Bouevitch." Dec. 31. Contrary to the Request, Patent Owner has not shown where it previously raised the argument that a person of ordinary skill "would not have combined Bouevitch and a two-axis mirror because the combination would disrupt Bouevitch's polarization-based switch" outside of the context of an embodiment not relied upon by Petitioner. Patent Owner's omission of "*in the Figure 5 embodiment*" from its argument in the Request is a misrepresentation of the record. Thus, Patent Owner has not established that we overlooked its argument or evidence.

III. CONCLUSION

We have considered Patent Owner's Request, but find no point of law or fact which we overlooked or misapprehended in arriving at our Final Decision.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Patent Owner's Request is *denied*.

Wayne O. Stacy
Sarah Guske
COOLEY LLP
wstacy@cooley.com
CapellaCisco@cooley.com

For PATENT OWNER:

Jason D. Eisenberg
Jon E. Wright
Robert Greene Sterne
Jonathan Tuminaro
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
jasone-PTAB@skgf.com
jwright-PTAB@skgf.com
rsterne-PTAB@skgf.com
jtuminar-PTAB@skgf.com

APPENDIX F

Trials@uspto.gov Paper 44
571-272-7822 Entered: January 28, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC., CIENA CORPORATION, CORIANT OPERATIONS, INC., CORIANT (USA) INC., and FUJITSU NETWORK COMMUNICATIONS, INC.,
Petitioner,

v.

CAPELLA PHOTONICS, INC.,
Patent Owner.

Case IPR2014-01166[1]
Patent RE42,368

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[1] IPR2015-00816 was joined with IPR2014-01166 on September 4, 2015, by Order in IPR2015-00816, Paper 12 (IPR2014-01166, Paper 26).

Before JOSIAH C. COCKS, KALYAN K. DESHPANDE, and JAMES A. TARTAL, *Administrative Patent Judges*.

TARTAL, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and *37 C.F.R. § 42.73*

I. INTRODUCTION

Petitioner, Cisco Systems, Inc., Ciena Corporation, Coriant Operations, Inc., Coriant (USA) Inc., and Fujitsu Network Communications, Inc., filed petitions requesting an *inter partes* review of claims 1–6, 9–13, and 15–22 of U.S. Patent No. RE42,368 ("the '368 patent"). Paper 2 ("Petition" or "Pet."); *see also* IPR2015-00816, Paper 1. Based on the information provided in the Petition, and in consideration of the Preliminary Response (Paper 7; *see also* IPR2015-00816, Paper 10) of Patent Owner, Capella Photonics, Inc., we instituted a trial pursuant to 35 U.S.C. § 314(a) of: (1) claims 1–6, 9–11, 13, and 15–22 as obvious over Bouevitch,[2] Smith,[3] and Lin[4] under 35 U.S.C. § 103(a); and, (2) claim 12 as obvious over Bouevitch, Smith, Lin, and

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[2] U.S. Patent No. 6,498,872 B2, issued December 24, 2002 (Ex. 1003, "Bouevitch").

[3] U.S. Patent No. 6,798,941 B2, issued September 28, 2004 (Ex. 1004, "Smith").

[4] U.S. Patent No. 5,661,591, issued August 26, 1997 (Ex. 1010, "Lin").

Dueck[5] under 35 U.S.C. § 103(a). Paper 8 ("Institution Decision"); *see also* IPR2015-00816, Paper 11.

After institution of trial, Patent Owner filed a Response (Paper 19, "Response" or "PO Resp.") and Petitioner filed a Reply (Paper 25, "Pet. Reply"). The Petition is supported by the Declaration of Dr. Dan Marom (Ex. 1028). The Response is supported by the Declaration of Dr. Alexander V. Sergienko (Ex. 2004).

A transcript of the Oral Hearing conducted on November 5, 2015, is entered as Paper 43 ("Tr.").[6]

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, Petitioner has shown by a preponderance of the evidence that claims 1–6, 9–13, and 15–22 of the '368 patent are unpatentable.

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[5] U.S. Patent No. 6,011,884, issued January 4, 2000 (Ex. 1021, "Dueck").

[6] Patent Owner's objections to Petitioner's demonstrative slides for the oral hearing are denied because we are not persuaded that Petitioner's demonstratives add new argument. *See* Paper 41. Moreover, demonstrative slides are not evidence and have not been relied upon for this final decision.

II. BACKGROUND

A. The ’368 patent (Ex. 1001)

The ’368 patent, titled “Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities,” reissued May 17, 2011, from U.S. Patent No. 6,879,750 (“the ’750 patent”). Ex. 1001. The ’750 patent issued April 12, 2005, from application number 10/745,364, filed December 22, 2003.

According to the ’368 patent, “fiber-optic communications networks commonly employ wavelength division multiplexing (WDM), for it allows multiple information (or data) channels to be simultaneously transmitted on a single optical fiber by using different wavelengths and thereby significantly enhances the information bandwidth of the fiber.” *Id.* at 1:37–42. An optical add-drop multiplexer (OADM) is used both to remove wavelengths selectively from a multiplicity of wavelengths on an optical fiber (taking away one or more data channels from the traffic stream on the fiber), and to add wavelengths back onto the fiber (inserting new data channels in the same stream of traffic). *Id.* at 1:45–51.

The ’368 patent describes a “wavelength-separating-routing (WSR) apparatus that uses a diffraction grating to separate a multi-wavelength optical signal by wavelength into multiple spectral channels, which are then focused onto an array of corresponding channel micromirrors.” *Id.* at

Abstract. "The channel micromirrors are individually controllable and continuously pivotable to reflect the spectral channels into selected output ports." *Id*. According to Petitioner, the small, tilting mirrors are sometimes called Micro ElectroMechanical Systems or "MEMS." Pet. 7.

The WSR described in the '368 patent may be used to construct dynamically reconfigurable OADMs for WDM optical networking applications. *Id*. Figure 1A of the '368 patent is reproduced below.

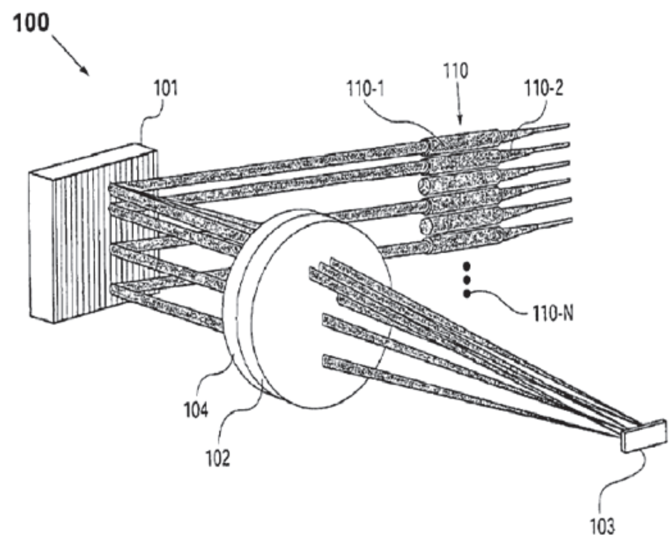

Fig. 1A

Figure 1A depicts wavelength-separating-routing (WSR) apparatus 100, in accordance with the '368 patent. WSR apparatus 100 is comprised of an array of fiber collimators 110 (multiple input/output ports, including input port 110-1 and output ports 110-2 through 110-N), diffraction grating 101 (a wavelength separator), quarter wave plate 104, focusing lens 102 (a beam-focuser), and array of channel micromirrors 103. Ex. 1001, 6:57–63, 7:55–56.

A multi-wavelength optical signal emerges from input port 110-1 and is separated into multiple spectral channels by diffraction grating 101, which are then focused by focusing lens 102 into a spatial array of distinct spectral spots (not shown). *Id.* at 6:64–7:2. Channel micromirrors 103 are positioned such that each channel micromirror receives one of the spectral channels.

Figure 1B of the ’368 patent is reproduced below.

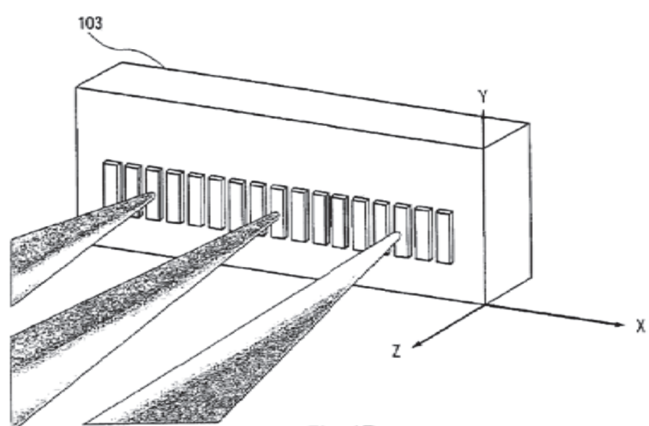

Fig. 1B

Figure 1B depicts a close-up view of the array of channel micromirrors 103 shown above in Figure

1A. *Id*. at 8:6–7. The channel micromirrors "are individually controllable and movable, e.g. pivotable (or rotatable) under analog (or continuous) control, such that, upon reflection, the spectral channels are directed" into selected output ports by way of focusing lens 102 and diffraction grating 101. *Id*. at 7:6–11.

According to the '368 patent:

> each micromirror may be pivoted about one or two axes. What is important is that the pivoting (or rotational) motion of each channel micromirror be individually controllable in an analog manner, whereby the pivoting angle can be continuously adjusted so as to enable the channel micromirror to scan a spectral channel across all possible output ports.

Id. at 9:8–14.

Figure 3 of the '368 patent is reproduced below.

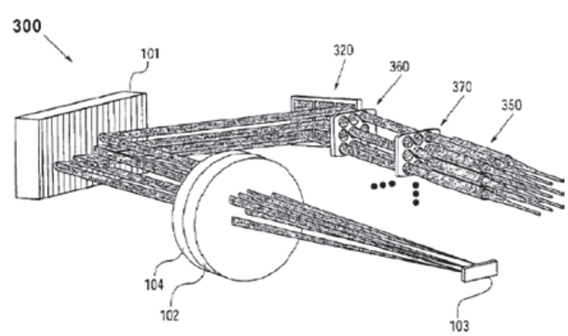

Fig. 3

Similar to Figure 1A, above, Figure 3 also shows a WSR apparatus as described by the ’368 patent. Ex. 1001, 10:25–26. In this embodiment, two-dimensional array of fiber collimators 350 provides an input port and plurality of output ports. *Id*. at 10:31–32. First and second two-dimensional arrays of imaging lenses 360, 370 are placed in a telecentric arrangement between two-dimensional collimator-alignment mirror array 320 and two-dimensional fiber collimator array 350. *Id*. at 10:37–43. “The channel micromirrors 103 must be pivotable biaxially in this case (in order to direct its corresponding spectral channel to anyone of the output ports).” *Id*. at 10:43–46.

The WSR also may incorporate a servo-control assembly (together termed a “WSR-S apparatus”). *Id*. at 4:65–67. According to the ’368 patent:

> The servo-control assembly serves to monitor the power levels of the spectral channels coupled into the output ports and further provide control of the channel micromirrors on an individual basis, so as to maintain a predetermined coupling efficiency of each spectral channel in one of the output ports. As such, the servo-control assembly provides dynamic control of the coupling of the spectral channels into the respective output ports and actively manages the power levels of the spectral channels coupled into the output ports.

Id. at 4:47–56.

Figure 5 of the '368 patent is reproduced below.

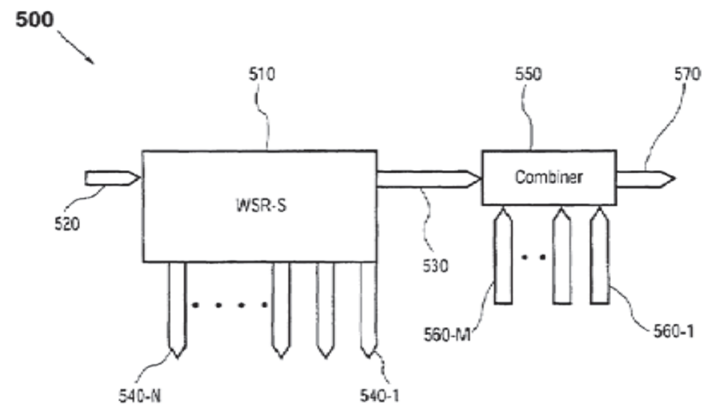

Fig. 5

Figure 5 depicts OADM 500 in accordance with the '368 patent composed of WSR-S (or WSR) apparatus 510 and optical combiner 550. *Id.* at 12:40–44. Input port 520 transmits a multi-wavelength optical signal, which is separated and routed into a plurality of output ports, including pass-through port 530 and one or more drop ports 540-1 through 540-N. *Id.* at 12:44–48. Pass-through port 530 is optically coupled to optical combiner 550, which combines the pass-through spectral channels with one or more add spectral channels provided by one or more add ports 560-1 through 560-M. *Id.* at 12:52–56. The combined optical signal is then routed into an existing port 570, providing an output multi-wavelength optical signal. *Id.* at 12:56–58.

B. Illustrative Claims

Challenged claims 1, 15, 16, and 17 of the ’368 patent are independent. Claims 2–6 and 9–13 ultimately depend from claim 1 and claims 18–22 ultimately depend from claim 17. Claims 1 and 17 of the ’368 patent are illustrative of the claims at issue:

> 1. An optical add-drop apparatus comprising an input port for an input multi-wavelength optical signal having first spectral channels;
>
> one or more other ports for second spectral channels; an output port for an output multi-wavelength optical signal;
>
> a wavelength-selective device for spatially separating said spectral channels; [and]
>
> a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels, each of said elements being individually and continuously controllable *in two dimensions* to reflect its corresponding spectral channel to a selected one of said ports *and to control the power of the spectral channel reflected to said selected port*.

Ex. 1001, 14:6–20.

> 17. A method of performing dynamic add and drop in a WDM optical network, comprising

separating an input multi-wavelength optical signal into spectral channels;

imaging each of said spectral channels onto a corresponding beam-deflecting element; and

controlling dynamically and continuously said beam-deflecting elements *in two dimensions* so as to combine selected ones of said spectral channels into an output

multi-wavelength optical signal *and to control the power of the spectral channels combined into said output multi-wavelength optical signal.*

Ex. 1001, 16:3–14.

III. ANALYSIS

A. Real Party-In-Interest

Patent Owner contends that trial should be terminated because Petitioner did not identify "Cisco's indemnified for the accused products" as a real party-in-interest "pursuant to California Commercial Code § 2312(3)." PO Resp. 59. Patent Owner provides virtually no explanation of its contention, fails to analyze any facts relative to its contention, and directs us to no legal authority in support of its contention. Accordingly, we are not persuaded that trial should be terminated under the circumstances presented.

B. Claim Construction

Only terms which are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

1. *"to reflect"* and *"to control"*

> Independent claims 1, 15, and 16 each recite outside of the preamble:
>
> a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels, each of said elements being individually and continuously controllable in two dimensions to reflect its corresponding spectral channel to a selected one of said ports and to control the power of the spectral channel reflected to said selected port.

Ex. 1001, 14:14– 20, 15:14–20, 15:31–37 (emphases added). Independent claim 17 contains a similar limitation.[7]7 Petitioner contends that the "to reflect" and "to control" clauses are non-functional clauses that say nothing about the claimed structure, and, therefore, are non-limiting. Pet. 10–11. We disagree.

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[7] Claim 17 recites: "controlling dynamically and continuously said beam-deflecting elements in two dimensions so as to combine selected ones of said spectral channels into an output multi-wavelength optical signal and to control the power of the spectral channels combined into said output multi-wavelength optical signal." Ex. 1001, 16:9–14.

Although "apparatus claims cover what a device is, not what a device does," the language at issue here describes the function that the apparatus must be capable of performing. *Hewlett-Packard Co. v. Bausch & Lomb, Inc.*, 909 F.2d 1464, 1468 (Fed.Cir.1990); *see also K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1363 (Fed. Cir. 1999) (explaining that functional language is an additional limitation in the claim). In that regard, the pertinent clauses are, thus, functional rather than non-functional. Accordingly, the claimed "spatial array of beam-deflecting elements" is further limited to a spatial array that satisfies the "to reflect" and "to control" functional limitations.

2. "*continuously controllable*"

Claim 1 requires "a spatial array of beam-deflecting elements . . . each of said elements being individually and continuously controllable." Similarly, claim 17 requires "controlling dynamically and continuously said beam-deflecting elements." Petitioner asserts that "continuously controllable" should be construed to mean "under analog control." Pet. 12.

Petitioner identifies the following disclosures of the '368 patent as supporting its proposed construction:

> The patent explains that "[a] distinct feature of the channel micromirrors in the present invention, in contrast to those used in the prior art, is that the motion…of each channel micromirror is under ***analog control***

> such that its pivoting angle can be ***continuously adjusted***." ([Ex. 1001], 4:7–11; emphasis added). Another passage in the specification states that "[w]hat is important is that the pivoting (or rotational) motion of each channel micromirror be individually ***controllable in an analog manner***, whereby the pivoting angle can be continuously adjusted so as to enable the channel micromirror to scan a spectral channel across all possible output ports." (*Id*., 9:9–14; emphasis added). Yet another passage states that "channel micromirrors 103 are individually controllable and movable, e.g., pivotable (or rotatable) under analog (or continuous) control." (*Id*., 7:6–8).

Pet. 12–13.

Dr. Marom also explains that "MEMS can be operated using analog voltage for continuous control," and states that a person of ordinary skill in the art would understand continuous control "is achieved via analog voltage control." Ex. 1028 ¶¶ 36, 58.

Patent Owner suggests in its Response that analog control does not necessarily provide the claimed "continuously controllable" beam deflecting elements (PO Resp. 42 n.4),but during the oral hearing counsel for Patent Owner indicated that "continuously controllable" was defined as "analog control," and then clarified that Patent Owner "did not offer a specific definition of continuously control."

Paper 43, 57:1–58:2. Additionally, according to Dr. Sergienko, "continuous control cannot be shown by the input signal (*i.e.*, analog vs. digital) alone." Ex. 2004 ¶ 181.

Based on all of the evidence presented, we are not persuaded that "continuously controllable" is limited to "analog control," or that "analog control" necessarily corresponds to "continuous" control under all circumstances. Indeed, counsel for Petitioner suggested that although the art at issue disclosed analog control that provided continuous control, counsel further recognized that it may operate differently outside of that art. *See* Paper 43, 30:24–31–6. We determine that "continuously controllable," in light of the specification of the '368 patent, encompasses "under analog control such that it can be continuously adjusted."

3. "port"

Claim 1 requires "an input port . . . one or more other ports. . . [and] an output port." Patent Owner contends that in the '368 patent "the structure or elements making up the ports are collimators." PO Resp. 33. Patent Owner offers no definition of "port," and does not suggest that the '368 patent provides an express definition of the term, but instead argues that a "port," as claimed, is not a "circulator port" because the '368 patent "disavows circulator-based optical systems." *Id.* at 34. We disagree.

There is no dispute that the ordinary and customary meaning of "port" encompasses circulator ports, and, indeed, any "point of entry or exit of light." *See* Dr. Sergienko Deposition Transcript (Ex. 1039), 43:16–23, 45:12–13 ("The circulator ports are ports with constraints."). Nor does the '368 patent equate the term "port" to "collimator," as both "port" and "collimator" appear separately in the claims of the '368 patent. Ex. 1001, 14:7, 14:48–51. We have considered the testimony of Dr. Sergienko as well (Ex. 2004 ¶¶ 146–167), and find that even if certain fiber collimators serve as ports in the '368 patent, that does not redefine the term "port" to mean "collimator." *See id.* at ¶ 154. Thus, the primary issue is whether the '368 patent disavows circulator ports from the scope of the term "port."

Although the broad scope of a claim term may be intentionally disavowed, "this intention must be clear," *see Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002) ("The patentee may demonstrate an intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope,"), and cannot draw limitations into the claim from a preferred embodiment." *Conoco, Inc. v. Energy & Envtl. Int'l.*, 460 F.3d 1349, 1357 (Fed. Cir. 2006).

Patent Owner fails to show any "expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope" with respect to the use of "port" in the '368 patent. Patent Owner argues that the ’368 patent provides a scalable system without circulator ports, that a provisional application to the ’368 patent “describes existing add/drop architectures that had a number of problems” (PO Resp. 36), that Dr. Marom obtained a patent in which collimators serve as the ports, and that “[b]ecause the inventors of the ’368 [p]atent consistently emphasized the limitations of circulators and the ’368 [p]atent discloses an alternative configuration, a [person of ordinary skill in the art] would have understood that the inventors were disavowing the use of optical circulators.” PO Resp. 37; *see also* PO Resp. 33–35 and 38–40 (citing Ex. 2004 161).

We do not discern any “clear disavowal of claim scope” from the arguments advanced by Patent Owner. Dr. Sergienko merely states that a person of ordinary skill in the art “would read the ’368 patent as teaching away from or at the least discouraging the use of circulators.” Ex. 2004, ¶ 160. Even if the ’368 patent were viewed as Dr. Sergienko suggests, teaching away or discouragement is not disavowal. Moreover, Petitioner further demonstrates that a provisional application to the ’368 patent in fact uses circulator ports as “ports.” Pet. Reply 12–13 (citing Ex. 1008, 4, Fig. 9). Such usage undermines Patent Owner’s disavowal contention. We have considered all of the arguments advanced by Patent Owner in its effort to redefine “port” as excluding “circulator ports” (PO Resp. 33–40), and find insufficient support for Patent Owner’s contention that the ’368 patent disavows circulator ports from the scope of the term "port." We determine that "port," in light of the specification of the '368 patent, encompasses "circulator port."

4. "*beam focuser*"

Claim 11 requires a "beam-focuser for focusing said separated spectral channels onto said beam deflecting elements." The '368 patent states that "[t]he beam-focuser may be a single lens, an assembly of lenses, or other beam focusing means known in the art." Ex. 1001, 4:20–22.

Petitioner contends that "beam focuser" is "a device that directs a beam of light to a spot." Pet. 15–16. According to Petitioner:

> The Summary of the '368 patent states that the "beam-focuser focuses the spectral channels into corresponding spectral spots." ([Ex. 1001], 3:63-64.) The specification also explains that the beams of light are "focused by the focusing lens 102 into a spatial array of distinct spectral spots (not shown in FIG. lA) in a one-to-one correspondence." (*Id.*, 6:65-7:5.) The MEMS mirrors are in turn "positioned in accordance with the spatial array formed by the spectral spots, such that each channel micromirror receives one of the spectral channels." *Id.*)

Id. Patent Owner does not dispute expressly Petitioner's proposed construction, and provides no alternative construction of "beam focuser."

Consistent with Petitioner's proposed construction, Dr. Sergienko testified that "focusing means bringing of the energy in the original image limited to the focal spot." Ex. 1039, 245:17–19. We agree that, based on the specification of the '368 patent, "beam focuser" means "a device that directs a beam of light to a spot."

5. "*dynamically*"

Claim 17 recites "[a] method of performing dynamic add and drop in a WDM optical network, comprising: . . . controlling dynamically and continuously said beam-deflecting elements in two dimensions." Ex. 1001, 16:3–10. Petitioner contends that "[t]he plain and ordinary meaning of 'dynamically' in the context of the '368 patent is 'during operation.'" Pet. 55 (citing Ex. 1003, 3:22–23 (contrasting routing that is fixed during operation: "the [prior art] wavelength routing is intrinsically static, rendering it difficult to dynamically reconfigure these OADMs."); Ex. 1028 ¶ 121)). It is unclear how Petitioner equates "dynamically" to "during operation" from the citation provided. Patent Owner does not propose a definition of "dynamically."

The '368 patent uses "dynamic" and "dynamically" throughout the specification, stating, for example, that "[t]he power levels of the spectral channels in the output ports may be dynamically managed according to demand." Ex. 1001, 11:30–32. We determine from the specification that the '368 patent uses "dynamically" in contrast to "static," in accordance with its ordinary and customary meaning.

6. Additional Claim Terms

Petitioner addresses several additional claim terms, including “servo-control assembly,” “spectral monitor,” and “in two dimensions.” Pet. 9–15. For purposes of this decision, no express construction of any additional claim term is necessary.

C. References Asserted as Prior Art

Petitioner relies on Bouevitch, Smith, Lin, and Dueck with respect to its assertion that the challenged claims would have been obvious.

1. Bouevitch

Bouevitch describes an optical device for rerouting and modifying an optical signal, including modifying means such as a MEMS array and a liquid crystal array which function as an attenuator when the device operates as a dynamic gain equalizer (DGE), and as a switching array when the device operates as a configurable optical add/drop multiplexer (COADM). Ex. 1003, Abstract. According to Petitioner, the COADM described in Bouevitch “uses MEMS mirrors with 1 axis of rotation.” Pet. 19. Petitioner also contends that the Bouevitch COADM controls the power of its output channels by tilting beam-deflecting mirrors at varying angles. Pet. 18.

2. Smith

Smith describes an optical switch including an array of mirrors tiltable about two axes, permitting a mirror tilt axis to be used for switching and a perpendicular axis to be used for power control. Ex. 1004, Abstract, 16:34–51; *see also* Ex. 1005, 6 (describing the same). Petitioner contends that "to the extent Bouevitch does not disclose 2-axis mirrors and their intended use for power control, both the Smith Patent and the Smith ['683] Provisional each does so." Pet. 19. Petitioner asserts that Smith is § 102(e) prior art as of the September 22, 2000, filing date of the Smith '683 Provisional. Pet. 17–18, 60. Patent Owner argues that Smith is not prior art to the '368 patent because the portions of Smith Petitioner relies upon are not entitled to the filing date of the Smith '683 Provisional. PO Resp. 56–59.

During this proceeding, the Federal Circuit issued a decision in *Dynamic Drinkware, LLC, v. National Graphics, Inc.*, 800 F.3d 1375 (Fed. Cir. 2015), addressing the necessary showing for a patent to claim priority from the filing date of its provisional application. The court found that the petitioner in the underlying *inter partes* review proceeding did not demonstrate that the prior art patent relied upon was entitled to the benefit of the filing date of its provisional application because the petitioner did not show written description support in the prior art provisional application f*or the claims of the prior art patent*. *Id.* at 1378. Thus, demonstrating only that the provisional application of the prior art patent provided a written description of the *subject matter* in the prior art patent relied upon to establish the unpatentability of the challenged claims was insufficient to show that the prior art patent was entitled to the benefit of the filing date of its provisional application. *Id*.

In this case, Petitioner recognized that it had not shown in the Petition that the Smith '683 Provisional provided written description support *for the claims of Smith* and requested an opportunity to address the issue in light of *Dynamic Drinkware*. *See* Paper 28 (authorizing additional briefing). With our prior authorization, Petitioner filed a brief addressing the holding in *Dynamic Drinkware* and whether the Smith '683 Provisional provides written description support for the claims of Smith (Paper 34). Patent Owner filed a brief in response (Paper 37).

The parties generally agree that Smith is § 102(e) prior art as of the filing date of the Smith '683 Provisional if the Smith '683 Provisional provides written description support for: (1) the subject matter Petitioner relies upon in Smith to show the unpatentability of the challenged claims of the '368 patent, and (2) the invention of Smith.[8] *See*

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[8] We agree with Petitioner that it need not show that every claim of Smith is supported by the Smith '683 Provisional to demonstrate that subject matter disclosed in both Smith and the Smith '683 Provisional is entitled to the benefit of the filing date of the Smith '683 Provisional. *See* Paper 34, 3. We also need not reach, and take no position on Petitioner's suggestion that *Dynamic Drinkware* is invalid to the extent it conflicts with *In re Klesper*, 397 F.2d 882 (CCPA 1968) (stating "[i]t is

Paper 34, 2; *see also* Paper 37, 1 ("When relying on a provisional's filing date for a § 103 rejection, a petitioner must show: (1) the subject matter was carried over from the provisional application and (2) the patent's claims have § 112 support in the provisional application.")

First, Petitioner has shown sufficiently that the Smith '683 Provisional provides written description support for at least two claims of Smith. Petitioner provides a claim chart identifying each of the limitations of claim 1 of Smith and the corresponding written description support as disclosed by the Smith '683 Provisional. Paper 34, attached claim chart. Petitioner also identifies written description support in the Smith '683 Provisional for Smith claim 28. *Id*. at 5.

We have considered Patent Owner's argument that the claim chart provided by Petitioner "is mere attorney argument and does not even attempt to

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also well settled that where a patent purports on its face to be a "continuation-in-part" of a prior application, the continuation-in-part application is entitled to the filing date of the parent application as to all subject matter carried over into it from the parent application, whether for purposes of obtaining a patent or subsequently utilizing the patent disclosure as evidence to defeat another's right to a patent. 35 U.S.C. §§ 102(e), 120; *Goodyear Tire & Rubber Co. v. Ladd*, 121 U.S. App. D.C. 275, 349 F.2d 710 (1965), certiorari denied 382 U.S. 973, 86 S. Ct. 536, 15 L. Ed. 2d 465; *Asseff v. Marzall*, 88 U. S. App. D.C. 358, 189 F.2d 660 (1951), certiorari denied 342 U.S. 828, 72 S. Ct. 51, 96 L. Ed. 626; *In re Switzer*, 166 F.2d 827, 35 CCPA 1013.").

demonstrate what a [person of ordinary skill in the art] would understand or whether the disclosure has § 112 support in the Provisional," and find it not persuasive. Paper 37, 5. Patent Owner identifies no authority for the proposition that an expert declaration is necessary to show written description support. Patent Owner's further argument that Petitioner "is wrong" in its assertion that the "movable mirror" of Smith is supported by the disclosure of "elements that can be rotated in an analog fashion," is not persuasive because it is conclusory and does not address the full disclosure identified by Petitioner.

Second, Petitioner has shown sufficiently that the Smith '683 Provisional provides written description support for certain subject matter Petitioner relies upon in Smith to show the unpatentability of the challenged claims of the '368 patent (i.e., that "the subject matter was carried over from the provisional application.") According to Petitioner, the Smith '683 Provisional "describes 'a mirror array with elements that can be rotated in an analog fashion about two orthogonal axes,' with one axis for switching, and one axis for power." Pet. 19 (quoting Ex. 1004, 6). In support of Petitioner's contention that Smith is § 102(e) prior art, Dr. Marom testifies that the Smith '683 Provisional discloses all of the features of Smith relied upon to demonstrate unpatentability. Ex. 1028 ¶ 131. In his declaration, Dr. Marom provides a chart identifying the claimed subject matter of the '368 patent and the corresponding disclosures in both Smith and the

Smith ’683 Provisional. *Id.* ¶ 132. In particular, Dr. Marom identifies the “individually and continuously controllable in two dimensions” limitation of claims 1, 15, 16, and 17 of the ’368 patent as being described by the Smith ’683 Provisional as a “mirror array with elements that can be rotated in an analog fashion about two orthogonal axes.” *Id.* (quoting Ex. 1005, 6) (emphasis omitted).

Patent Owner argues that the Smith ’683 Provisional does not provide written description support for Smith’s disclosure of the “continuously controllable” limitation of the ’368 patent. PO Resp. 57–58. Although Dr. Marom expressed the opinion that the Smith ’683 Provisional discloses the “continuously controllable” limitation based on its disclosure of “analog” control, Petitioner does not rely only on Smith as disclosing the “continuously controllable” limitation. *See* Pet. 19. Accordingly, whether the Smith ’683 Provisional discloses the “continuously controllable” limitation has no bearing on whether Smith is available as prior art for any other disclosure upon which Petitioner relies. Similarly, to the extent Patent Owner argues that a gimbal structure described in Smith was not disclosed in the Smith ’683 Provisional, Patent Owner’s argument is beyond the scope of the claims of the ’368 patent, which do not require a particular gimbal structure, and is not persuasive as Petitioner does not rely on the disclosure of a gimbal structure to demonstrate the unpatentability of any claim of the ’368 patent.

Patent Owner also contends that the Smith ’683 Provisional does not disclose certain limitations of claim 17 concerning dynamic control. We will discuss whether the Smith ’683 Provisional and Smith disclose these features of claim 17 in our analysis of claim 17 below. *See* PO Resp. 58–59. More broadly, we determine that Smith is available as prior art with an effective date of the filing date of the Smith ’683 Provisional for subject matter carried over to Smith from the provisional application, including the disclosure of 2-axis mirrors to control switching and power.

3. Lin

Lin describes a “spatial light modulator…operable in the analog mode for light beam steering or scanning applications.” Ex. 1010, Abstract. Lin explains that the angular deflection of a mirror about the torsional axis is a function of the voltage potential applied to an address electrode. *Id.* at 6:29–32. Petitioner contends that Figure 3B of Lin depicts a continuous and linear relationship between the deflection angle of the MEMS mirrors and the applied voltage. Pet. 29.

4. Dueck

Dueck describes a wavelength division multiplexer that integrates an axial gradient refractive index element with a diffraction grating to provide efficient coupling from a plurality of input sources. Ex. 1021, Abstract. Petitioner contends that

Dueck describes various diffraction gratings for use in WDM devices. Pet. 18.

D. Asserted Obviousness Over Bouevitch, Smith, and Lin

Petitioner asserts that claims 1–6, 9–11, 13, and 15–22 would have been obvious over Bouevitch, Smith, and Lin.[9] Pet. 23–60.

1. Claim 1

Claim 1, directed to an optical add-drop apparatus, requires "an input port . . . one or more other ports . . . [and] an output port." Petitioner asserts that Bouevitch discloses an optical add-drop apparatus, including an input port (labeled "IN"), one or more other ports (labeled 80b "IN ADD" and "OUT DROP"), and an output port (labeled "OUT EXPRESS"), as recited by claim 1 of the '368 patent. Pet. 24 (citing Ex. 1003, Fig. 11). Petitioner's

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[9] Petitioner initially argues that Patent Owner admitted in a Replacement Reissue Application Declaration by Assignee that all elements of claim 1, except for two-axis mirrors, were disclosed by Bouevitch. Pet.7–9 (quoting Ex. 1002, 81–82). Petitioner identifies no persuasive authority for the proposition that such a statement should be treated as an admission in this proceeding. Moreover, rather than admit that all original elements of claim 1 are disclosed by Bouevitch, the statement makes clear that three additional references not relied upon by Petitioner in this proceeding were considered in combination with Bouevitch. As a result, we are not persuaded that Patent Owner has admitted all elements of claim 1, except for two-axis mirrors, were disclosed by Bouevitch.

contentions are supported by Dr. Marom. Ex. 1028 ¶¶ 49–52.

Patent Owner argues that, under its proposed claim construction of "port," Bouevitch discloses at most two ports because the '368 patent equates "port" to "collimator" and disavows circulator ports. PO Resp. 31–41. For the reasons explained above in our claim construction analysis for "port," we reject Patent Owner's claim construction for "port." Accordingly, we do not agree with Patent Owner's contention that the only ports disclosed by Bouevitch are collimator lenses 12a and 12b. Petitioner has shown, as discussed above and as supported by Dr. Marom, that Bouevitch discloses the recited input, output, and one or more other ports, as recited by claim 1.

Claim 1 requires "a wavelength-selective device" for spatially separating spectral channels. Petitioner identifies diffraction grating 20 of Bouevitch as corresponding to the recited "wavelength-selective device." Pet. 26. Claim 1 also requires "a spatial array of beam-deflecting elements." Petitioner identifies MEMS mirror array 50 of Bouevitch as corresponding to the recited "spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels." Pet. 26–27. Patent Owner does not dispute Petitioner's contentions, with which we agree.

For each of the beam-deflecting elements, claim 1 further requires that they be "individually and continuously controllable *in two dimensions* to reflect its corresponding spectral channel to a selected one of said ports *and to control the power of the spectral channel reflected to said selected port*." As explained by Dr. Marom, Bouevitch discloses the use of variable attenuation for power control, and a person of ordinary skill in the art would understand that the necessary level of control required to balance the optical power differentials among the wavelength channels is achieved in Bouevitch with continuous control over the mirror tilt via analog voltage control. *See* Ex. 1028 ¶ 58, *see also* Ex. 1003, 7:35–37 ("The degree of attenuation is based on the degree of deflection provided by the reflector (i.e., the angle of reflection)." Patent Owner does not dispute Petitioner's contention that Bouevitch discloses continuous control of beam-deflecting elements via analog voltage control with respect to a single axis. Instead, Patent Owner argues that "Petitioner explicitly concedes that Bouevitch does not teach or suggest beam-deflection elements that are continuously controllable *in two dimensions*." PO Resp. 42 (emphasis added).

There is no dispute that Petitioner relies on Smith as disclosing the control of beam-deflection elements in two dimensions. Petitioner explains that Smith describes a "multi-wavelength . . . optical switch including an array of mirrors tiltable about two axes, both to control the switching and to provide variable power transmission." Pet. 31 (quoting Ex. 1004, Abstract). Patent Owner does not dispute that Smith discloses beam-deflecting elements individually controllable in two dimensions, or that such control is used “to reflect” and “to control the power,” as recited by claim 1.

The dispute of the parties with regard to Smith more significantly focuses on whether Smith discloses “continuous control.” As discussed above, we reject Petitioner’s assertion that “continuous control” means “under analog control,” and determine instead that the term encompasses “under analog control such that it can be continuously adjusted.” According to Petitioner:

> Smith teaches continuous control of its MEMS mirrors in an analog manner, where the force used to tilt the mirrors is “approximately ***linearly*** proportional to the magnitude of the applied voltage.” (*Id.*, 15:41–42, 6–35; 17:1–23; Ex. 1028 at ¶ 59.) This linear proportionality is another way of describing a continuous, analog, relationship between the voltage driving the mirrors and the resulting mirror angle. (Ex. 1028 at ¶ 59.)

Pet. 28. The Smith ’683 Provisional also states that elements “can be rotated in an analog fashion.” Ex. 1005, 7. Stating that the control is “in an analog manner” or reflects an “analog” relationship, however, is not sufficient to persuasively establish that the mirrors of Smith are “under analog control.” Nor has Petitioner sufficiently shown that the “analog fashion” referred to in the Smith ’683 Provisional necessarily was carried forward to Smith.

Patent Owner further asserts with respect to Smith that a person of ordinary skill in the art "would view tilting according to large and small angles and [pulse width modulation] more akin to step-wise digital control than analog control." PO Resp. 45–46 (further indicating that other patents and patent applications related to Smith use digital control). In response, Petitioner does not dispute that Smith relies on digital control, but instead argues that Dr. Sergienko testified that digital control does not preclude "continuous control." Pet. Reply 22. We agree that "continuous control" is not limited to analog control; however, Petitioner's contention is that Smith discloses "continuous control" because Smith discloses "analog control," not that digital control in Smith is "continuous control." We are not persuaded that Smith discloses "continuous control" on this record because Petitioner has not shown either that the mirrors of Smith are "under analog control" or that Smith's use of digital control constitutes "continuous control."

Petitioner also contends that Lin discloses "continuous control." Pet. 29–30. Lin describes a spatial light modulator (SLM) operable in the analog mode for light beam steering or scanning applications. Ex. 1010, Abstract. Figures 3A and 3B of Lin are reproduced below.

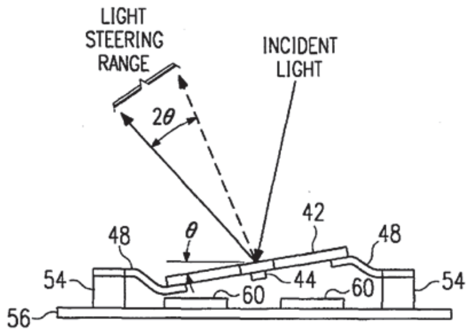

FIG. 3A

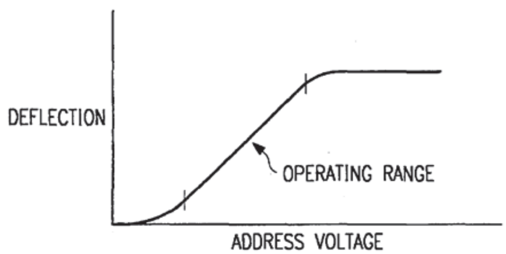

FIG. 3B

Figure 3A is a spatial light modulator, "illustrating the pixel being deflected about the torsion hinge to steer incident light in a selected direction, the deflection of the pixel being a function of the voltage applied to the underlying address electrode." Ex. 1010, 5:20–25. As Petitioner explains, Figure 3B shows a graph disclosing the continuous deflection angle of MEMS mirrors as a function of the voltage applied to affect that deflection. Pet. 29. Dr. Marom testifies that Lin "confirms that continuous and analog control of MEMS mirrors was known prior to the '368 patent's priority date." Ex. 1028 ¶ 61. Lin explains that "the angular deflection of mirror 42 about the torsional axis defined by hinges 44 is seen to be a function of the voltage potential applied to one of the address electrodes 60." Ex. 1010, 6:29–32. Lin further explains that:

> With an address voltage being applied to one address electrode 60 being from 0 to 20 volts, mirror 42 is deflected proportional to the address voltage. When SLM 40 is operated as an optical switch or light steerer, incident light can be precisely steered to a receiver such as an optical sensor or scanner. The mirror tilt angle can be achieved with a excellent accuracy for pixel steering.

Id. at 7:13–19.

Patent Owner argues that Petitioner hasn't shown that Lin discloses continuous control because such control cannot be shown by the input signal alone, and Petitioner did not "look at the structure of the mirror and how the voltage affects movement of the mirror." PO Resp. 49. Patent Owner's conclusory and unsupported argument is not persuasive because it does not address the disclosures of Lin as summarized above, which we find establish "continuous control," as recited in claim 1.

Patent Owner also argues that Lin does not disclose continuous control in two dimensions. *Id*. at 49–50. Petitioner, however, relies on Smith, not Lin, as disclosing 2-axis mirrors, and there is no contention that Lin, alone, discloses continuous control in two dimensions.

In summary, for the reasons discussed above, Petitioner has established that Bouevitch discloses all of the recited limitations of claim 1 for an array of mirrors individually and continuously controllable on a single axis, but not on a two axis (i.e., two dimension) array "to reflect its corresponding spectral channel to a selected one of said ports and to control the power of the spectral channel reflected to said selected port." Patent Owner did not dispute that Bouevitch discloses continuous control of beam-deflecting elements via analog voltage control with respect to a single axis, and Petitioner has demonstrated that Lin also discloses such "continuous control." Finally, Petitioner has established that Smith discloses an array of mirrors controllable in two dimensions "to reflect" and "to control," as recited by claim 1. Thus, the remaining issue is whether Petitioner has provided "some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007).[10]

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[10] The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, and (3) the level of skill in the art; and (4) secondary considerations, i.e. objective evidence of unobviousness. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We have considered each of the Graham factors and incorporate our discussion of those considerations, to the extent there is a dispute, in our evaluation of the reasoning that supports the asserted combination. We further observe that, in this proceeding, evidence of secondary considerations has not been offered for evaluation.

With respect to a rationale for combining Bouevitch and Smith, Petitioner contends the use of the two-axis mirror of Smith in Bouevitch: (1) is a simple substitution of one known element for another yielding predictable results, (2) is the use of a known technique to improve similar devices, (3) would be obvious to try as there are only two options for tilting MEMS mirrors: one-axis and two-axis mirrors, and (4) would be motivated to reduce crosstalk in attenuation and to increase port density. Pet. 20–21.[11]

Petitioner also contends that several reasons support the addition of Lin's continuous, analog control to the asserted combination, including interchangeability with discrete-step mirrors and more precision in matching the optimal coupling value. Pet. 30.

Patent Owner disputes the sufficiency of the rationale provided in the Petition. PO Resp. 17–31. First, Patent Owner argues that Petitioner "conflates disparate embodiments of Bouevitch," "one functioning in a DGE to control power [shown in Bouevitch Figure 5] and one functioning in COADM to control switching [shown in Bouevitch Figure 11]." *Id*. at 17–18. Petitioner, however, persuasively explains that it does not rely on an embodiment of

[11] Petitioner also argues, without citing authority, that Patent Owner admitted the "combinability" of references during prosecution, and that such admission applies to the references identified by Petitioner in "the identical technology area." Pet. 22–23. We find no such admission.

Bouevitch functioning to control power to show that the features of claim 1 were disclosed in the asserted art. Pet. Reply 2–3 ("[Bouevitch] Fig. 5 is not relevant to Petitioner's positions or the institution. . . . Figure 11 includes the relevant disclosure."). Instead, Petitioner relies on Smith as disclosing power control, stating in the Petition that "Smith describes a 'multi-wavelength . . . optical switch including an array of mirrors tiltable about two axes, both to control the switching and to provide variable power transmission.'" Pet. 31 (quoting Ex. 1004, Abstract).

Although Petitioner includes a discussion of Bouevitch's disclosure of power control in the Petition, it is clear that the asserted combination does not stand or fall on that disclosure. The Petition states that a person of ordinary skill in the art "would be motivated to use the 2-axis system of Smith within the system of Bouevitch for power control." Pet. 34. Petitioner's discussion of the power control embodiment of Bouevitch in support of the rationale for the asserted combination with Smith (i.e., both Smith and Bouevitch address power control) does not impose an obligation on Petitioner to articulate a rationale for including the power control embodiment of Bouevitch in the asserted combination.

Patent Owner also argues that Petitioner implicitly relies on the power control embodiment of Bouevitch to show that Bouevitch discloses beam deflecting mirrors that are continuously controllable. PO Resp. 21. We are persuaded that, to the extent

Petitioner relies on Bouevitch as disclosing reflectors that are continuously controllable based on the power control embodiment of Bouevitch (*see* Pet. 28 (quoting Ex. 1001 discussing the embodiment shown in Figure 5 of Bouevitch)), Petitioner was obligated to, and did not, provide a rationale for combining an embodiment of Bouevitch directed to power control with an embodiment relied on by Petitioner to show switching control.[12] Petitioner, however, further relies on Lin as disclosing continuous control. Accordingly, Petitioner may show unpatentability based on the combination of Bouevitch, Smith, and Lin without relying on the power control embodiment of Bouevitch, and without providing a rationale for incorporating the power control embodiment of Bouevitch in the asserted combination.

Patent Owner also argues that a person of ordinary skill in the art would not have combined Bouevitch and Smith for various reasons. PO Resp. 22–31. Patent Owner argues that Petitioner has not reconciled "the technical differences between the references," or explained whether the components

[12] Petitioner argues in its Reply that Bouevitch teaches a MEMS structure for switching in Figure 11 that also performs power control; however, Petitioner has not shown sufficiently that it presented this contention in the Petition, or that its arguments were not intertwined with its assertions related to Bouevitch Figure 5. Similarly, Petitioner did not contend in the Petition, as it does in its Reply, that Bouevitch inherently discloses angular misalignment for power control. *See* Pet. Reply 5–6. Arguments made for the first time in a reply generally are not given consideration.

"would continue to operate as desired." *Id*. at 23. Patent Owner lists many considerations an optical system architect would have to take into account purportedly not addressed in the Petition. *Id*. at 23–24. Patent Owner further asserts that Dr. Marom has designed a two-axis mirror to replace a two-axis mirror, and that "[r]e-designing micromirrors is not a simple substitution because the redesign is complex." *Id*. at 24–25. In this proceeding, however, Dr. Sergienko was asked whether such technical considerations presented problems that could not be overcome by one of skill in the art, and indicated "no." Ex. 1039, 266:16–267:25. Moreover, "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . . Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Here, the test for obviousness reflects what the combined teachings of Bouevitch, Lin, and Smith would have suggested to one of ordinary skill in the art, and does not require that any one particular component of a reference must be bodily incorporated, or physically inserted, into another reference.

Patent Owner argues more particularly that a person of ordinary skill in the art "would not have been motivated to use Smith's mirrors in the Figure 5 embodiment in Bouevitch." PO Resp. 25. Patent Owner's argument is not persuasive because, as discussed above, Petitioner does not rely on the Figure 5 embodiment in Bouevitch.

Next, Patent Owner argues that a person of ordinary skill in the art would not have been motivated to combine Smith's tiltable mirrors with Bouevitch because it would disrupt Bouevitch's explicit teaching of parallel alignment," and "Bouevitch discourages, if not teaches away from, misalignment to control power." PO Resp. 26–30. "The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the … application." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). While Bouevitch discusses how angular displacement is disadvantageous in certain respects (*see* Ex. 1028, 2:1–7), we are not persuaded such discussion is sufficient to constitute a teaching away. To the contrary, Petitioner has shown persuasively that Bouevitch uses angular misalignment to control power in at least some embodiments of Bouevitch. Pet. Reply 3–5; *see also* Ex. 1028 ¶ 71.

Patent Owner also argues that absent hindsight, a person of ordinary skill would not have incorporated the two-axis mirror of Smith into Bouevitch, which uses a one-axis mirror, because a two-axis mirror is "a more complex structure." PO Resp. 30–31. We find Patent Owner's argument conclusory and not persuasive because it fails to address the benefits of a two-axis mirror disclosed by Smith which would be apparent to one of skill in the art without hindsight. *See* Ex. 1004, 7:1–52. We also find persuasive Petitioner's contention that it would have been obvious to try, because, as Dr. Marom testified, (1) there were only two solutions to the known need to deflect light beams with MEMS: 1-axis or 2-axis, (2) a person of ordinary skill would have had a high expectation of success to try two-axis mirror control in Bouevitch, and (3) the result of the combination would be predictable. *See* Pet. 21–22; Reply 8–9; Ex. 1045 ¶ 45.

With respect to Lin, Patent Owner argues that Petitioner fails to explain either how the multiple axes of Smith could be combined with Lin's analog control or how to modify Lin's structural elements to incorporate a two-dimensional rotation, and further asserts that, because it would require an engineering feat, it is not a simple substitution. PO Resp. 50–51. As explained above, however, the test for obviousness is not whether the features of one reference may be bodily incorporated into the structure of another reference. Moreover, the references of record reflect that there are routinely complex design considerations in the fiber optic communications field. Patent Owner does not explain persuasively why combining the teachings of Smith and Lin would be beyond the skill of a skilled artisan, even if feats of engineering are contemplated.

Petitioner has articulated sufficiently reasoning with some rational underpinning to support the legal conclusion of obviousness based on the asserted combination of Bouevitch, Smith, and

Lin. With regard to incorporating the teaching of a two-axis mirror in Smith with Bouevitch, we are persuaded that it is a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter. Single-axis and two-axis mirrors were known to be interchangeable. Smith not only expressly acknowledges this interchangeability, but also identifies benefits to the use of a two-axis mirror: "in comparison to the two-axis embodiment, single axis systems may be realized using simpler, single axis MEMS arrays but suffer from increased potential for crosstalk between channels." Ex. 1004, 18:17–18; Ex. 1005, 12; *see also* Ex. 1004, 16:55–58, Ex. 1005, 11 ("both single and dual axis mirror arrays may be used in a variety of switching configurations, although the two-axis components are preferred.") The asserted combination of Smith and Bouevitch and Lin yields a predictable result. *See KSR*, 550 U.S. at 416 ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.").

We are further persuaded that Petitioner has identified additional "rational underpinning" in supported of the asserted combination. Dr. Marom testified that applying the two-axis mirror of Smith to Bouevitch would have been beneficial "because choosing only a single axis for both port selection and attenuation may result in dynamic fluctuations of power crosstalk between ports as attenuation level is varied," would reduce "the risk of the signal bleeding into a port that is adjacent to the output port along the switching axis, and would provide finer control over attenuation by allowing the use of the full dynamic range of the mirror tilt in the first axis for attenuation. *See* Ex. 1028 ¶¶ 73–75; *see also* Pet. 22. For similar reasons Petitioner has also shown that the application of Smith to Bouevitch constitutes the use of known techniques to improve similar devices. *See* Pet. 20–21.

We also find persuasive Petitioner's contention that a person of ordinary skill in the art would have combined the teachings of Lin with Bouevitch and Smith because:

> (1) continuously controlled mirrors were known to be interchangeable with discrete-step mirrors; (2) continuously controlled mirrors allow arbitrary positioning of mirrors and can more precisely match the optimal coupling value; and (3) Lin specifically teaches that its analog, continuous MEMS mirrors would be useful in optical switching applications like Bouevitch's and Smith's ROADM devices.

Pet. 30 (citing Ex. 1010 at 2:6–9; Ex. 1028 ¶ 62). Petitioner also has shown that the use of analog continuous control was the known alternative to discrete (or step-wise) control, and would have been obvious to try and expected to work when applied to Bouevitch. Pet. 30–31 (citing Ex. 1028 ¶¶ 61–65).

For the foregoing reasons, Petitioner has established by a preponderance of the evidence that claim 1 would have been obvious over Bouevitch, Smith, and Lin.[13]

2. Claims 2, 5, 6, 9, 10, 13, 15, and 16

Claims 2, 5, 6, 9, 10, 13, 15, and 16 ultimately depend from claim 1. In addition to addressing the elements of claim 1, we agree with Petitioner's identification of how claims 2, 5, 6, 9, 10, 13, 15, and 16 would have been obvious over Bouevitch, Smith, and Lin, as supported by the declaration of Dr. Marom. Pet. 35–37, 42–46, 49–53. For example, claim 2 requires "a control unit for controlling each of said beam-deflecting elements," and Petitioner has shown that it would have been obvious to apply the control unit disclosed by Smith to Bouevitch as it is the addition of a known element which yields the predictable result of electronic control. *See* Pet. 35–37. As another example, claim 13 requires that "beam-deflecting elements comprise micromachined mirrors." Petitioner has shown that mirrors disclosed in Bouevitch and Smith are "micromachined mirrors." Pet. 49. Patent Owner has not raised additional arguments with respect to claims 2, 5, 6, 9, 10, 13, 15, and 16 beyond those asserted with respect to claim 1, addressed above. We have assessed the information provided and determine that Petitioner has established by a

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[13] Patent Owner provides no persuasive evidence of secondary considerations to support the patentability of claims of the '368 patent.

preponderance of the evidence that claims 2, 5, 6, 9, 10, 13, 15, and 16 would have been obvious over Bouevitch, Smith, and Lin.

3. Claims 3 and 4

Claim 3, which depends from claim 1, further requires that the control unit "comprises a servo-control assembly, including a spectral monitor for monitoring power levels of selected ones of said spectral channels, and a processing unit responsive to said power levels for controlling said beam deflecting elements." Claim 4, which depends from claim 3, further requires that the "servo-control assembly maintains said power levels at predetermined values." The '368 patent states that:

> The electronic circuitry and the associated signal processing algorithm/software for such processing unit in a servo-control system are known in the art. A skilled artisan will know how to implement a suitable spectral monitor along with an appropriate processing unit to provide a servo-control assembly in a WSP-S apparatus according to the present invention, for a given application.

Ex. 1001, 12:9–15. Accordingly, the '368 patent expressly recognizes that the additional features of claims 3 and 4 were "known in the art" to a skilled artisan and would have been obvious to implement.

We agree with Petitioner's contention that Smith's disclosure of a controller that receives feedback from an optical power monitor corresponds to the claimed servo-control assembly and spectral monitor, and serves the same purpose. Pet. 38–41 (citing, *inter alia*, Ex. 1004, Fig. 8, 18:42–53, 13:20–24). With regard to claim 4, Petitioner directs us to Smith, which teaches that the controller "adjust[s] the mirror positions to adjust the transmitted power to conform to one or more ***predetermined criteria***." Pet. 41–42 (quoting Ex. 1004, 11:48–51).

Petitioner also provides sufficient articulated reasoning with some rational underpinning to support the combination of the Smith controller and optical power monitor with Bouevitch, including "as an alternative to the 'external feedback' for power control that Bouevitch explains should be eliminated," and that a person of ordinary skill "would appreciate that the feedback-driven control of Smith would improve the precision of the mirror-based switching system of Bouevitch." Pet. 39–41. Petitioner also reasons that it would have been obvious to try the predetermined power settings of Smith within Bouevitch, because "Smith teaches that predetermined power values could make up for inherent problems in optical switching, such as power variations from optical amplifiers and manufacturing and environmental variations, and because 'WDM systems must maintain a significant degree of uniformity of power levels across the WDM spectrum.'" *Id.* at 42 (quoting Ex. 1004, 6:24–50; citing Ex. 1028 ¶ 92).

Patent Owner argues, with virtually no explanation, that "Smith does not teach the service control and spectral monitory elements, as claimed." PO Resp. 55. Patent Owner also asserts that Petitioner fails to explain how or why a person of ordinary skill would have been able to add Smith's control features to Bouevitch without disrupting Bouevitch's operation because they are disparate technologies. *Id*. Patent Owner does not address the disclosure of the '368 patent, which states that a "skilled artisan will know how to implement a suitable spectral monitor," or the reasoning provided by Petitioner. We have considered Patent Owner's arguments and find them to be insufficiently supported and conclusory. On the other hand, we conclude that Petitioner's reasoning is sound and supported adequately by the record. Petitioner has established by a preponderance of the evidence that claims 3 and 4 would have been obvious over Bouevitch, Smith, and Lin.

4. Claim 11

Claim 11 depends from claim 1 and further requires "a beam-focuser for focusing said separated spectral channels onto said beam deflecting elements." Petitioner contends, and we agree, that Bouevitch discloses a "beam-focuser element at reflector 10 in Figure 11." Pet. 46; *see also* Ex. 1028 ¶ 101. Petitioner further explains that in Bouevitch "reflector 10 directs the separated beams of light λ_1 and λ_2 from the points on the reflector annotated as R onto the corresponding beam deflecting mirrors 51 and 52 in MEMS array 50." Pet. 46.

Patent Owner argues that Petitioner ignores the distinction between imaging/directing, as recited in claims 1 and 17, and "focusing" as recited in claim 11. PO Resp. 55–56. Patent Owner identifies no persuasive evidence in support of its argument, and does not explain what the distinction is that has been ignored. Claim 21 of the '368 patent recites "imaging comprises focusing," and Dr. Sergienko testified that "focusing" is a type of "imaging" in the '368 patent. *See* Ex. 1039, 245:13–19.

Petitioner has established by a preponderance of the evidence that Bouevitch discloses a "beam focuser," as recited in claim 11, and that claim 11 would have been obvious over Bouevitch, Smith, and Lin.

5. Claims 17–22

Claim 17 is directed to "a method of performing dynamic add and drop in a WDM optical network" which includes elements substantially similar to features of apparatus claim 1. Petitioner contends, and we agree, that Bouevitch discloses the first step of "separating an input multi-wavelength optical signal into spectral channels" at Figure 11, where diffraction grating 20 spatially separates combined channels $\lambda_1\lambda_2$ into spatially-separated channels. Pet. 54 (citing Ex. 1003, 14:48–53, 8:10–22; Ex. 1028 ¶ 117). Petitioner also contends that Bouevitch discloses imaging spectral channels onto a corresponding beam-deflecting element by using reflector 10 to image each channel onto a corresponding MEMS mirror element. Pet. 54.

Petitioner asserts that other than for "dynamically," the method step for "controlling dynamically and continuously said beam-deflecting elements *in two dimensions* so as to combine selected ones of said spectral channels into an output multi-wavelength optical signal *and to control the power of the spectral channels combined into said output multi-wavelength optical signal*" would have been obvious for the same reasons articulated with regard to claim 1. Pet. 55. Petitioner also contends that:

> Both Bouevitch and Smith teach dynamic control during the operation of their add/drop devices. (Ex. 1028 at ¶ 122.) Bouevitch's device can be used as a "dynamic gain equalizer and/or configurable add/drop multiplexer," which plainly includes dynamic control of the mirrors that perform those actions. (*Id.*, 2:24-25.) Smith notes that it "is well known" that power control "should be dynamic and under feedback control since the various wavelength components ***vary in intensity with time***." (*Id.*, 6:37-50; emphasis added, 2:23-31, 7:24-31). The Smith Provisional also supports dynamic control, as is apparent from the fact that the Smith OADM accepts control signals/commands as it operates. (*See* Smith Provisional, Fig. 11 (noting "continuous" calibration and control by "network commands"), 7 (add/drop under control of an external (and thus changeable) signal); Ex. 1028 at ¶ 122.

Id. at 56. We find Petitioner's contentions persuasive.

In addition to relying on its arguments asserted with respect to claim 1, which we address above, Patent Owner further argues that Petitioner mistakenly asserts that Bouevitch teaches "imaging" because it teaches "focusing," and does not describe with any particularity how Bouevitch teaches "imaging." PO Resp. 51–52. As discussed above with regard to claim 11, we find Patent Owner's argument unpersuasive because Patent Owner offers no explanation for how it contends imaging should be distinguished from focusing, and identifies no evidence in support of its argument. Dr. Marom testified that "Claim 21 confirms that one type of such 'imaging' is focusing, by reciting 'the method of claim 17, wherein said ***imaging comprises focusing*** said spectral channels onto said beam–deflecting elements.'" Ex. 1028 ¶ 118. Dr. Sergienko testified that "focusing" is a type of "imaging" in the '368 patent. *See* Ex. 1039, 245:13–19.

Patent Owner also argues that Petitioner has shown no disclosure corresponding to controlling beam-deflecting elements so as to combine spectral channels into an output signal. PO Resp. 52. To the contrary, we agree with Petitioner that Bouevitch discloses a configurable optical add/drop multiplexer (COADM) which combines spectral channels into an output signal. Pet. 55–56. Contrary to Patent Owner's argument, Petitioner also notes that Dr. Sergienko agreed that one point of a COADM is to combine one of the selected signals into the multi-wavelength output of the device. Ex. 1039, 96:14–22.

Claims 18–22 ultimately depend from claim 17. In addition to addressing the elements of claim 17, we agree with Petitioner's identification of how claims 18–22 would have been obvious over Bouevitch, Smith, and Lin, as supported by the declaration of Dr. Marom. Pet. 56–60. We understand Patent Owner to assert the same argument with respect to claim 21, which recites "imaging comprises focusing said spectral channels onto said beam –deflecting element," as Patent Owner asserts in regard to the focusing limitation of claim 11, and we find it not persuasive for the same reasons discussed above.[14] We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 17–22 would have been obvious over Bouevitch, Smith, and Lin.

E. Asserted Obviousness Over Bouevitch, Smith, Lin, and Dueck

Petitioner contends claim 12 would have been obvious over Bouevitch, Smith, Lin, and Dueck. Pet. 47–49. Claim 12 recites the device of claim 1, wherein the wavelength-selective device comprises a device selected from the group consisting of ruled

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[14] The Patent Owner Response refers to claim 22 in regard to Patent Owner's contention that Bouevitch fails to teach "focusing;" however, claim 22 does not recite "focusing," whereas claim 21 does. *See* PO Resp. 55–56.

diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms. Ex. 1001, 14:63–67.

Petitioner contends that any of the types of wavelength-selective devices recited in claim 12 would have been obvious because "[e]ach type was known in the prior art, each was interchangeable as a wavelength selective device, and each was one of a small set of possible choices." Pet. 48 (citing Ex. 1028 ¶¶ 103–104).[15] Petitioner also contends that Dueck discloses ruled diffraction gratings, as claimed. Pet. 48. Petitioner further asserts that it would have been obvious to try Dueck's ruled diffraction gratings in the devices of Bouevitch and Smith because it represents the "best mode" of separating wavelengths in WDM devices. *Id.* at 48–49.

Patent Owner argues that a person of ordinary skill would not have been motivated to use Dueck's diffraction grating. PO Resp. 52–54. According to Patent Owner, Dueck discloses a diffraction grating that reflects an input light beam to an output port at very nearly the same angle as the incident angle. *Id.* Patent Owner reasons that because no configuration shown in Bouevitch is designed to reflect a light beam at the same angle as Dueck, there is no motivation to use Dueck's

[15] Patent Owner suggests that because trial was instituted on a ground that included Dueck, we are precluded from considering Petitioner's arguments that claim 12 would have been obvious without Dueck. Our Institution Decision in this case contained no such limitation.

diffraction grating in Bouevitch. *Id.* In reply, Petitioner asserts that Dueck was relied on only to show "prior art knowledge of diffraction gratings in general." Pet. Reply 23. As noted above, the obviousness test has no bodily incorporation requirement, and is instead focused on "what the combined teachings of those references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d at 425. While the particular configuration of the ruled diffraction grating in Dueck may not be readily incorporated into Bouevitch, Dueck nonetheless discloses the broader concept of a ruled diffraction grating. Indeed, Dr. Sergienko testified that a ruled diffraction grating could have been used in Bouevitch, as well as holographic diffraction grating, or an echelle grating, as they are all reasonable substitutes for one another and would be expected to work. *See* Ex. 1039, 256:13–259:7.

We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claim 12 would have been obvious over Bouevitch, Smith, Lin, and Dueck.

F. Conclusion

Petitioner has shown by a preponderance of the evidence that claims 1–6, 9–11, 13, and 15–22 would have been obvious over Bouevitch, Smith, and Lin, and that claim 12 would have been obvious over Bouevitch, Smith, Lin, and Dueck.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, based on a preponderance of the evidence, claims 1–6, 9–13, and 15–22 of U.S. Patent No. RE42,368 are unpatentable; and,

FURTHER ORDERED that, because this is a Final Written Decision, the parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

For PETITIONER:

Wayne O. Stacy
Sarah Guske
COOLEY LLP
wstacy@cooley.com
CapellaCisco@cooley.com

For PATENT OWNER:

Robert Greene Sterne
Jon E. Wright
Jason D. Eisenberg
Jonathan Tuminaro
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
rsterne-PTAB@skgf.com
jwright-PTAB@skgf.com
jasone-PTAB@skgf.com
jtuminar-PTAB@skgf.com

APPENDIX G

Trials@uspto.gov
571-272-7822

Paper 38
Entered: September 28, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FUJITSU NETWORK COMMUNICATIONS, INC., CORIANT OPERATIONS, INC., CORIANT (USA) INC., and CIENA CORPORATION
Petitioner,

v.

CAPELLA PHOTONICS, INC., Patent Owner.

Cases IPR2015-00726[1]
Patent RE42,368 E

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[1] IPR2015-01958 was joined with IPR2015-00726 on April 1, 2016, by Order in IPR2015-01958, Paper 11 (IPR2015-00726, Paper 28).

Before JOSIAH C. COCKS, KALYAN K. DESHPANDE, and JAMES A. TARTAL, *Administrative Patent Judges*.

TARTAL, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and *37 C.F.R. § 42.73*

I. INTRODUCTION

Petitioner, Fujitsu Network Communications, Inc., Coriant Operations, Inc., Coriant (USA) Inc., and Ciena Corporation filed petitions requesting an *inter partes* review of claims 1–6, 9–12, and 15–22 of U.S. Patent No. RE42,368 (Ex. 1001, "the '368 patent"). Paper 5 ("Petition" or "Pet."); *see also* IPR2015-01958, Paper 4.

Claims 1–6, 9–13, and 15–22 of the '368 patent were previously held to be unpatentable in *Cisco Systems, Inc., Ciena Corporation, Coriant Operations, Inc., Coriant (USA) Inc., and Fujitsu Network Communications, Inc., v. Capella Photonics, Inc.*, IPR2014-01166, (PTAB Jan. 28, 2016) (Paper 44) (the '1166 case). The grounds of unpatentability asserted by Petitioner in this case rely on prior art, evidence, and arguments not asserted in the '1166 case. Likewise, Patent Owner, Capella Photonics, Inc., advances arguments and evidence in response in this case that were not asserted by Patent Owner in the '1166 case.

Based on the information provided in the Petition, and in consideration of the Preliminary Response (Paper 10) of Patent Owner, we instituted a trial pursuant to 35 U.S.C. § 314(a) of: (1) claims 1, 2, 5, 6, 9–12, and 15–21 as obvious over Bouevitch[2] and Carr[3] under 35 U.S.C. § 103(a); and, (2) claims 1–4, 17, and 22 as obvious over Bouevitch and Sparks[4] under 35 U.S.C. § 103(a). Paper 11 ("Institution Decision"); *see also* IPR2015-01958, Paper 11.

After institution of trial, Patent Owner filed a Response (Paper 22, "Response" or "PO Resp.") and Petitioner filed a Reply (Paper 27, "Pet. Reply"). The Petition is supported by the Declaration of Joseph E. Ford, Ph.D. (Ex. 1037).[5] The Response is supported

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[2] U.S. Patent No. 6,498,872 B2, issued Dec. 24, 2002 (Ex. 1002, "Bouevitch")

[3] U.S. Patent No. 6,442,307 B1, issued Aug. 27, 2002 (Ex. 1005, "Carr").

[4] U.S. Patent No. 6,625,340 B1, issued Sep. 23, 2003 (Ex. 1006, "Sparks")

[5] At the time of filing, the Petition was supported by the Declaration of Timothy J. Drabik, Ph.D. Ex. 1016. After institution of trial, and prior to his deposition, Dr. Drabik passed away. *See* Paper 17. Over the opposition of Patent Owner, Petitioner's motion to file as supplemental information the Declaration of Joseph E. Ford in support of the petition was granted (Paper 19), and Patent Owner's Request for Reconsideration of that decision was denied (Paper 23). Patent Owner's further attempts to obtain additional discovery of Dr. Drabik's "notes, comments, and edits" after his death were denied as not relevant to this proceeding as Petitioner no longer relies on Dr. Drabik's declaration as support for the Petition. Paper 26. Patent Owner was informed that "the panel will not

by the Declaration of Dr. Alexander V. Sergienko (Ex. 2033).

A transcript of the Oral Hearing conducted on May 24, 2016, is entered as Paper 37 ("Tr.").

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, Petitioner has shown by a preponderance of the evidence that claims 1–6, 9–12, and 15–22 of the '368 patent are unpatentable.

II. BACKGROUND

A. The '368 patent (Ex. 1001)

The '368 patent, titled "Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities," reissued May 17, 2011, from U.S. Patent No. 6,879,750 ("the '750 patent"). Ex. 1001. The '750

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consider the content of [Dr. Drabik's] Declaration as a part of any Final Written Decision." Paper 19, 4. Patent Owner further argues that Dr. Ford's testimony is based on hindsight reasoning and bias, and should be given little if any weight because Patent Owner was unable to depose Dr. Drabik before his death and a paper published by Dr. Ford purportedly conflicts with Dr. Ford's declaration as it "does not cite to a single reference about wavelength-selective switches that predate [Patent Owner's] 2001 priority date." PO Resp. 43–49. We have considered each of Patent Owner's arguments and reiterate that Patent Owner had the opportunity to cross-examine Dr. Ford prior to filing its Patent Owner Response. We are not persuaded that Dr. Ford's testimony should be afforded little or no weight based on the arguments asserted by Patent Owner.

patent issued April 12, 2005, from application number 10/745,364, filed December 22, 2003.

According to the ’368 patent, “fiber-optic communications networks commonly employ wavelength division multiplexing (WDM), for it allows multiple information (or data) channels to be simultaneously transmitted on a single optical fiber by using different wavelengths and thereby significantly enhances the information-bandwidth of the fiber.” *Id.* at 1:37–42. An optical add-drop multiplexer (OADM) is used both to remove wavelengths selectively from a multiplicity of wavelengths on an optical fiber (taking away one or more data channels from the traffic stream on the fiber) and to add wavelengths back onto the fiber (inserting new data channels in the same stream of traffic). *Id.* at 1:45–51.

The ’368 patent describes a “wavelength-separating-routing (WSR) apparatus that uses a diffraction grating to separate a multi-wavelength optical signal by wavelength into multiple spectral channels, which are then focused onto an array of corresponding channel micromirrors.” *Id.* at Abstract. “The channel micromirrors are individually controllable and continuously pivotable to reflect the spectral channels into selected output ports.” *Id.* According to Petitioner, the small, tilting mirrors are sometimes called Micro Electro Mechanical Systems or “MEMS.” Pet. 6. The WSR described in the ’368 patent may be used to construct dynamically reconfigurable OADMs for WDM optical networking applications. *Id.*

Figure 1A of the '368 patent is reproduced below.

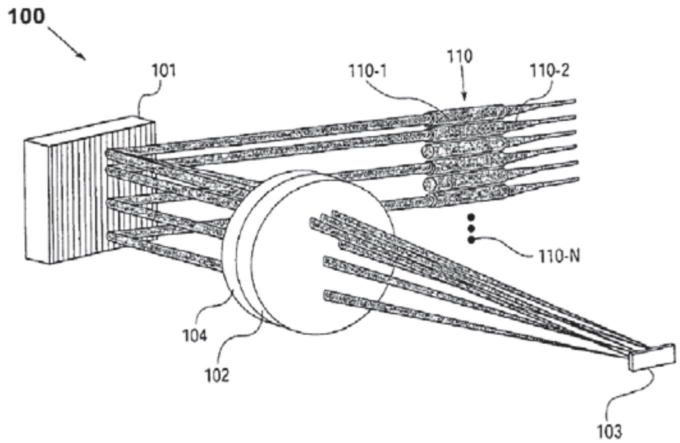

Fig. 1A

Figure 1A depicts wavelength-separating-routing (WSR) apparatus 100, in accordance with the '368 patent. WSR apparatus 100 is comprised of an array of fiber collimators 110 (multiple input/output ports, including input port 110-1 and output ports 110-2 through 110-N), diffraction grating 101 (a wavelength separator), quarter wave plate 104, focusing lens 102 (a beam-focuser), and array of channel micromirrors 103. Ex. 1001, 6:57–63, 7:55–56.

A multi-wavelength optical signal emerges from input port 110-1 and is separated into multiple spectral channels by diffraction grating 101, which are then focused by focusing lens 102 into a spatial array of distinct spectral spots (not shown). *Id.* at 6:64–7:2. Channel micromirrors 103 are positioned such that each channel micromirror receives one of the spectral channels.

Figure 1B of the '368 patent is reproduced below.

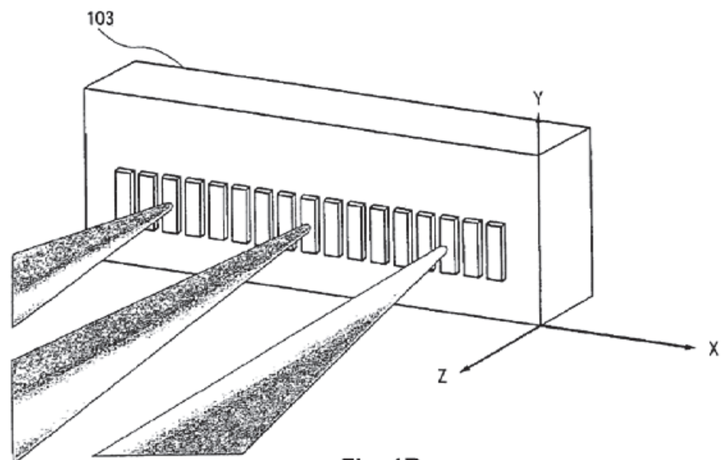

Fig. 1B

Figure 1B depicts a close-up view of the array of channel micromirrors 103 shown above in Figure 1A. *Id.* at 8:6–7. The channel micromirrors "are individually controllable and movable, e.g. pivotable (or rotatable) under analog (or continuous) control, such that, upon reflection, the spectral channels are directed" into selected output ports by way of focusing lens 102 and diffraction grating 101. *Id.* at 7:6–11. According to the '368 patent:

> each micromirror may be pivoted about one or two axes. What is important is that the pivoting (or rotational) motion of each channel micromirror be individually controllable in an

> analog manner, whereby the pivoting angle can be continuously adjusted so as to enable the channel micromirror to scan a spectral channel across all possible output ports.

Id. at 9:8–14.

Figure 3 of the '368 patent is reproduced below.

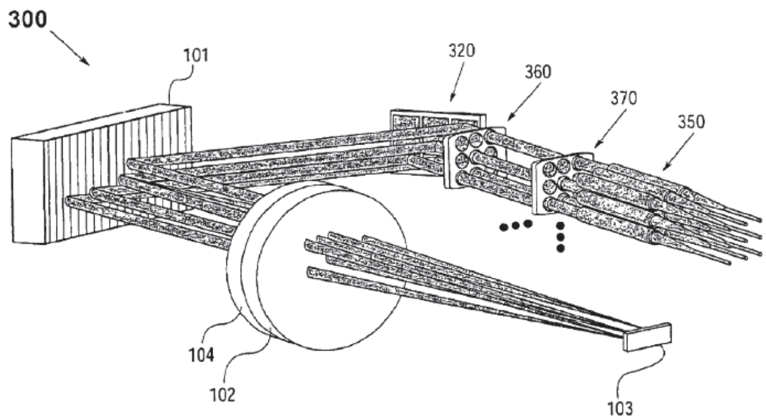

Fig. 3

Similar to Figure 1A, above, Figure 3 also shows a WSR apparatus as described by the '368 patent. Ex. 1001, 10:25–26. In this embodiment, two- dimensional array of fiber collimators 350 provides an input port and plurality of output ports. *Id.* at 10:31–32. First and second two-dimensional arrays of imaging lenses 360, 370 are placed in a telecentric arrangement between two-dimensional collimator-alignment mirror array 320 and two-dimensional fiber collimator array 350. *Id.* at 10:37–

43. "The channel micromirrors 103 must be pivotable biaxially in this case (in order to direct its corresponding spectral channel to anyone of the output ports)." *Id.* at 10:43–46.

The WSR also may incorporate a servo-control assembly (together termed a "WSR-S apparatus"). *Id.* at 4:65–67. According to the '368 patent:

> The servo-control assembly serves to monitor the power levels of the spectral channels coupled into the output ports and further provide control of the channel micromirrors on an individual basis, so as to maintain a predetermined coupling efficiency of each spectral channel in one of the output ports. As such, the servo-control assembly provides dynamic control of the coupling of the spectral channels into the respective output ports and actively manages the power levels of the spectral channels coupled into the output ports.

Id. at 4:47–56.

Figure 5 of the '368 patent is reproduced below.

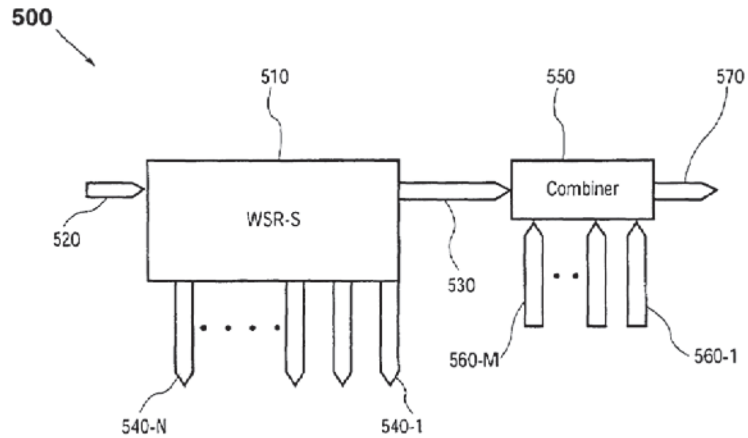

Fig. 5

Figure 5 depicts OADM 500 in accordance with the ’368 patent composed of WSR-S (or WSR) apparatus 510 and optical combiner 550. *Id.* at 12:40–44. Input port 520 transmits a multi-wavelength optical signal, which is separated and routed into a plurality of output ports, including pass-through port 530 and one or more drop ports 540-1 through 540-N. *Id.* at 12:44–48. Pass-through port 530 is optically coupled to optical combiner 550, which combines the pass-through spectral channels with one or more add spectral channels provided by one or more add ports 560-1 through 560-M. *Id.* at 12:52–56. The combined optical signal is then routed into an existing port 570, providing an output multi-wavelength optical signal. *Id.* at 12:56–58.

B. Illustrative Claims

Challenged claims 1, 15, 16, and 17 of the ’368 patent are independent. Claims 2–6 and 9–12 ultimately depend from claim 1 and claims 18–22 ultimately depend from claim 17. Claims 1 and 17 of the ’368 patent are illustrative of the claims at issue:

> 1. An optical add-drop apparatus comprising
>
> an input port for an input multi-wavelength optical signal having first spectral channels; one or more other ports for second spectral channels; an output port for an output multi-wavelength optical signal; a wavelength-selective device for spatially separating said spectral channels; [and] a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels, each of said elements being individually and continuously controllable *in two dimensions* to reflect its corresponding spectral channel to a selected one of said ports *and to control the power of the spectral channel reflected to said selected port*.

Ex. 1001, 14:6–20.

> 17. A method of performing dynamic add and drop in a WDM optical network, comprising separating an input multi-wavelength optical signal into spectral channels; imaging each of said spectral channels onto a corresponding beam-

> deflecting element; and controlling dynamically and continuously said beam-deflecting elements *in two dimensions* so as to combine selected ones of said spectral channels into an output multi-wavelength optical signal *and to control the power of the spectral channels combined into said output multi- wavelength optical signal*.

Ex. 1001, 16:3–14.

III. ANALYSIS

A. Claim Construction

The Board interprets claims using the "broadest reasonable construction in light of the specification of the patent in which [they] appear[]." 37 C.F.R. § 42.100(b). We presume a claim term carries its "ordinary and customary meaning," which is "the meaning that the term would have to a person of ordinary skill in the art in question" at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). A patentee may, however, act as their own lexicographer and give a term a particular meaning in the specification, but must do so with "reasonable clarity, deliberateness, and precision." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Only terms which are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. V*ivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

1. "continuously controllable"

Claim 1 requires "a spatial array of beam-deflecting elements . . . each of said elements being individually and continuously controllable." Similarly, claim 17 requires "controlling dynamically and continuously said beam-deflecting elements." Petitioner asserts that "continuously controllable" should be construed to mean "under analog control." Pet. 9–10. Petitioner identifies the following disclosures of the '368 patent as supporting its proposed construction:

> The patent explains that "[a] distinct feature of the channel micromirrors in the present invention, in contrast to those used in the prior art, is that the motion . . . of each channel micromirror is under ***analog control*** such that its pivoting angle can be ***continuously adjusted***." ([Ex. 1001], 4:7–11; emphasis added). Another passage in the specification states that "[w]hat is important is that the pivoting (or rotational) motion of each channel micromirror be individually ***controllable in an analog manner***, whereby the pivoting angle can be continuously adjusted so as to enable the channel micromirror to scan a spectral channel across all possible output ports." (*Id.*, 9:9–14; emphasis added). Yet another passage states that "channel micromirrors 103 are individually controllable and movable, e.g., pivotable (or rotatable) under analog (or continuous) control." (*Id.*, 7:6–8).

Pet. 10.

Dr. Ford also explains that "[e]lectrostatically driven MEMS mirrors may be driven with an analog voltage for continuous positioning control," and states that a person of ordinary skill in the art "would have known that MEMS mirrors based on analog voltage control can be tilted to any desired angle in their operating range." Ex. 1037 ¶¶ 57, 157.

Patent Owner contends that no express construction should be given to any claim term. PO Resp. 19. Additionally, according to Dr. Sergienko, "[a]nalog controlled mirrors can operate under continuous control." Ex. 2033 ¶ 48. However, there is no evidence that analog controlled mirrors always operate under continuous control or that only analog mirrors operate under continuous control.

Accordingly, based on all of the evidence presented, we are not persuaded that "continuously controllable" is limited to "analog control" or that "analog control" necessarily corresponds to "continuous" control under all circumstances. We determine that "continuously controllable," in light of the specification of the '368 patent, encompasses "under analog control such that it can be continuously adjusted."

2. "port"

Claim 1 requires "an input port . . . one or more other ports. . . [and] an output port." Patent Owner contends that in the '368 patent, the recited at least three ports are all structurally described as "fiber collimators." PO Resp. 38. Patent Owner, however, offers no definition of "port," and does not suggest that the '368 patent provides an express definition of the term. Instead Patent Owner argues that "[n]owhere in the '368 patent or the prosecution history is there an indication that the ports are to be construed to encompass circulator ports." *Id.* at 39. We disagree.

There is no dispute that the ordinary and customary meaning of "port" encompasses circulator ports, and, indeed, any "point of entry or exit of light." *See* Dr. Sergienko Deposition Transcript (Ex. 1041), 43:16–23, 45:12–13 ("The circulator ports are ports with constraints."). Nor does the '368 patent equate the term "port" to "collimator," as both "port" and "collimator" appear separately in the claims of the '368 patent. Ex. 1001, 14:7, 14:48–51. We have considered the testimony of Dr. Sergienko as well (Ex. 2033 ¶¶ 102–123), and find that even if certain fiber collimators serve as ports in the '368 patent, that does not redefine the term "port" to mean "collimator." *See id.* ¶ 102.

Although the broad scope of a claim term may be intentionally disavowed, "this intention must be clear," *see Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002) ("The patentee may demonstrate an intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "However, this intention must be clear, and cannot draw limitations into the claim from a preferred embodiment." *Conoco, Inc. v. Energy & Envtl. Int'l.*, 460 F.3d 1349, 1357–58 (Fed. Cir. 2006).

Patent Owner fails to show any expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope with respect to the use of "port" in the '368 patent. Patent Owner argues that "[t]he inventors of the '368 patent realized that including optical circulators in an OADM was a significant drawback," and that "the claimed ROADMs do not require circulators." PO Resp. 12, 14. Patent Owner further argues that by looking at the specification "as a whole," the '368 patent employs fiber collimators as ports, and that the prosecution history does not indicate "that the ports are to be construed to encompass circulator ports." *Id.* at 39. To the contrary, Petitioner demonstrates that a provisional application to the '368 patent in fact uses circulator ports as "ports." Pet. Reply 19–20 (citing Ex. 2012, 4, Fig. 9). We have considered all of the arguments advanced by Patent Owner in its effort to redefine "port" as excluding "circulator ports" (PO Resp. 38– 45) and find insufficient support for Patent Owner's contention that the '368 patent disavows or otherwise precludes circulator ports from the scope of the term "port." We determine that "port," in light of the specification of the '368 patent, encompasses "circulator port."

3. Additional Claim Terms

Petitioner addresses several additional claim terms, including "in two dimensions," "beam-deflecting elements," and "servo-control assembly." construction of any additional claim terms is necessary.

B. References Asserted as Prior Art

Petitioner relies on Bouevitch, Carr, and Sparks with respect to its assertion that the challenged claims would have been obvious.

1. Bouevitch

Bouevitch describes an optical device for rerouting and modifying an optical signal, including modifying means such as a MEMS array and a liquid crystal array which function as an attenuator when the device operates as a dynamic gain equalizer (DGE), and as a switching array when the device operates as a configurable optical add/drop multiplexer (COADM). Ex. 1002, Abstract. According to Petitioner, the COADM described in Bouevitch "uses MEMS mirrors with one axis of rotation." Pet. 25.

2. Carr

Carr describes a MEMS mirror device comprised of a mirror movably coupled to a frame and an actuator for moving the mirror. Ex. 1005, Abstract. Petitioner contends "Carr discloses a two-dimensional array of double-gimbaled mirrors that can be tilted about two perpendicular torsion bars to any desired orientation," as well as power control or attenuation by tilting the MEMS mirrors such that only a portion of input signals enter the output fibers. Pet. 25 (citing Ex. 1005, 3:44–47, 3:66–4:2, 11:13–20).

3. Sparks

Sparks describes an optical switch arranged to misalign the optical beam path to provide a predetermined optical output power. Ex. 1006, technology and are capable of two axis movement, to carefully align the beams so as to ensure that the maximum possible input optical signal is received at the output of the switch." *Id.* at 4:43–46.

C. Asserted Obviousness Over Bouevitch and Carr

Petitioner asserts that claims 1, 2, 5, 6, 9–12, and 15–21 would have been obvious over Bouevitch and Carr. Pet. 24–47.

1. Claim 1

Claim 1, directed to an optical add-drop apparatus, requires "an input port . . . one or more other ports . . . [and] an output port." Petitioner asserts that Bouevitch discloses an optical add-drop apparatus, including an input port, one or more other ports (labeled 80b "IN ADD" and "OUT DROP") and an output port (labeled "OUT EXPRESS"), as recited by claim 1 of the '368 patent. Pet. 32–33 (citing Ex. 1002, 14:36–44, 14:55–15:1, Fig. 11). Petitioner's contentions are supported by Dr. Ford. Ex. 1037 ¶ 151.

Patent Owner argues that, under its proposed claim construction of "port," Bouevitch discloses at most two ports because the '368 patent equates "port" to "collimator." PO Resp. 36–42. For the reasons explained above in our claim construction analysis for "port," we reject Patent Owner's claim construction for "port." Failing to provide any meaning to a term, "port," and then arguing that the term nevertheless fails to encompass a certain structure in the prior art (a structure Patent Owner's own experts identifies as a "port") is not persuasive. *See* Ex. 1041, 45:12–13. Accordingly, we do not agree with Patent Owner's contention that the only Resp. at 40–42. Petitioner has shown, as discussed above and as supported by Dr. Ford, that Bouevitch discloses the recited input, output, and one or more other ports, as recited by claim 1.

Patent Owner does not dispute Petitioner's contention that Carr and Bouevitch together disclose the remaining limitations of claim 1. In particular, claim 1 requires "a wavelength-selective device" for spatially separating spectral channels. Petitioner identifies diffraction grating 20 of Bouevitch as corresponding to the recited "wavelength-selective device." Pet. 34. Claim 1 also requires "a spatial array of beam-deflecting elements." Petitioner identifies MEMS mirror array 50 of Bouevitch as corresponding to the recited "spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels." Pet. 34 (citing Ex. 1002, 14:48–55).

Petitioner also identifies the two-dimensional array of movable gimballed mirrors shown in Carr Figures 1a and 2b as corresponding to the claimed "spatial array of beam-deflecting elements." Pet. 34–36. For each of the beam-deflecting elements, claim 1 further requires that they be "individually and continuously controllable *in two dimensions* to reflect its corresponding spectral channel to a selected one of said ports *and to control the power of the spectral channel reflected to said selected port*." Petitioner identifies the double gimballed mirror 21 which "can be tilted to any desired orientation." Pet. 34–35 (quoting Ex. 1005, 3:47–48). Carr further discloses intentional misalignment for power control. *See id.* at 35–36 (quoting Ex. 1005, 11:11–23, *see also* Fig. 9). As Explained by Dr. Ford, "Carr discloses effecting closed-loop power control or attenuation by tilting MEMS mirrors to introduce misalignment of channel wavelength beams," and "Carr specifically teaches that its analog, continuously controlled micromirrors would be useful for power control applications in WDM systems." Ex. 1037 ¶¶ 139, 145. In summary, for the reasons discussed above, we agree with Petitioner that Bouevitch and Carr disclose all of the recited limitations of claim 1. *See* Pet. 31–36. Thus, the remaining issue is whether Petitioner has provided "some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).[6]

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[6] The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and

With respect to a rationale for combining Bouevitch and Carr, Petitioner contends that the use of the two-axis mirror of Carr in Bouevitch: (1) is the use of a known technique to improve similar devices, (2) is a simple substitution of one known element for another yielding predictable results, and (3) would be obvious to try as there are only two options for tilting MEMS mirrors: one-axis and two-axis mirrors. Pet. 26–28. In particular, Petitioner explains that "providing the MEMS mirrors of Bouevitch with two-axis tilt capability enables the spatial positioning of returning beams in both transverse directions at the face of microlens array 12," thereby reducing errors in system alignment. *Id.* Petitioner's rationale for combining Bouevitch and Carr is supported by Dr. Ford. Ex. 1037 ¶¶ 141–144 (stating, for example, that "[t]here are only two options for tilting MEMS mirrors: one-axis and two-axis mirrors" and that "[b]ecause Carr already disclosed the use of two-axis mirrors (which were available by the '368 Patent's priority date), a [person having ordinary skill in the art] would have

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content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) secondary considerations, i.e. objective evidence of unobviousness. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We have considered each of the Graham factors and incorporate our discussion of those considerations, to the extent there is a dispute, in our evaluation of the reasoning that supports the asserted combination. We further observe that, in this proceeding, evidence of secondary considerations has not been offered for evaluation.

a high expectation of success upon trying two-axis mirror control in Bouevitch.")

Patent Owner disputes the sufficiency of the rationale provided in the Petition. PO Resp. 23–36. Petitioner demonstrates that the thrust of Patent Owner's arguments do not refute Petitioner's contentions, but instead argue that the asserted combination would not have been obvious for other reasons. *See* Pet. Reply 12–13 (citing Ex. 1040 (noting that Dr. Sergienko agreed that two-axis mirrors were known in the art and provided certain benefits over single axis mirrors)).

First, Patent Owner argues that a person of ordinary skill "would have never used two-axis mirrors in Bouevitch's system to control power through intentional misalignment, because doing so would destroy Bouevitch's principle of operation." PO Resp. 24. Patent Owner contends that Bouevitch discloses "a *folded* 4-*f* system that autocorrects for any unintentional misalignments" and that this advantage would be lost if combined with Carr because Carr controls power through "*intentional* misalignment." *Id.* at 26–27. Patent Owner further argues that Bouevitch "uses a different method to control power . . . by attenuation at the MEMS devices, not intentional misalignment." *Id.* at 28.

There is no dispute that Bouevitch discloses methods other than misalignment for power control. We agree with Petitioner, however, that Bouevitch "recognizes that the degree of attenuation may be based on the angle of deflection off each MEMS mirror." Pet. 30 (citing Ex. 1002, 7:31– 37 (stating that the "degree of attenuation is based on the degree of deflection provided by the reflector (i.e., the angle of reflection)")). Patent Owner argues in response that Bouevitch is referring to "constructive or destructive interference," not misalignment. PO Resp. 29. In reply, Petitioner notes that Dr. Sergienko was unable to identify any portion of Bouevitch to support Patent Owner's theory of attenuation based on interference. Pet. Reply 8 (citing Ex. 1040, 90:8–22). Indeed, the paragraph cited by Patent Owner from Dr. Sergienko's declaration in support of the assertion that Bouevitch "refers" to power control through interference, in fact, says no such thing. PO Resp. 29 (citing Ex. 2033 ¶ 99 (stating that Bouevitch refers to modifying means for power control and that another reference (Ex. 2031) illustrates power control through interference)). We find persuasive Petitioner's explanation that had Bouevitch intended to refer to interference-based attenuation instead of angular misalignment, then Bouevitch would have addressed altering distances, not angles of tilt. *See* Pet. Reply 8–10 (citing Ex. 1040, 126:9–127:7) (explaining that Mechanical Anti-Reflection Switch (MARS) modulator device operates in a 'surface-normal manner' by vertically moving the partially reflective membrane," and noting that Dr. Sergienko agreed that the MARS device does not vary the angle of reflection). We further see no inconsistency between Bouevitch's disclosure of methods to prevent *unintentional* misalignment with other methods that incorporate *intentional* misalignment for power control. The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the . . . application." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). For the same reasons we are not persuaded that applying intentional misalignment for power control as disclosed by Carr would destroy Bouevitch's principle of operation.

Second, Patent Owner argues that Petitioner's combination of Bouevitch and Carr is improper hindsight because it relies on knowledge beyond the level of ordinary skill at the time of the claimed invention and includes knowledge gleaned only from the applicant's disclosure. PO Resp. 31–36. Patent Owner argues that "Dr. Ford assumed wavelength-selective switches were known at the time of the invention, when, in fact, they were not." *Id.* at 31. Patent Owner's argument is premised on its contention that Dr. Ford published a paper in 2006 which did not contain any citations "to confirm that wavelength-selective switches were known when the '368 patent was filed." *Id.* at 32. Patent Owner's argument is not persuasive evidence that wavelength switches were unknown at the relevant time. To the contrary, Dr. Ford's declaration in this proceeding identifies references supporting the contention that wavelength-selective switches were known and described prior to Patent Owner's priority date. *See* Ex. 1037 ¶ 52 (citing Ex. 1002, 5:15–38; Ex. 1027, 1:56–67). That those same references were not cited in an article by Dr. Ford in 2006 is of little relevance to our determination of obviousness in this proceeding.

Next, Patent Owner argues that one of Petitioner's motivations for combining Bouevitch with Carr comes from the '368 patent because (1) Petitioner contends dual axis mirrors compensate for system alignment errors from well-known problems like imperfect assembly or temperature changes, (2) Petitioner and Dr. Ford provide no citation that such problems were "well-known," and (3) the '368 patent states certain prior art provided "no mechanisms implemented for overcoming degradation in the alignment owing to environmental effects such as thermal and mechanical disturbances over the course of operation." PO Resp. 35. We find persuasive Petitioner's reply that Bouevitch and Carr, rather than the '368 patent, sufficiently provide the motivation for the asserted combination. *See* Pet. Reply 16 (describing a "*two-axis MEMS device with 'highly accurate lateral alignment*' that 'permits precise control of the mirrors, a more robust structure, greater packing density, larger mirror sizes, and larger mirror rotation angles than are conventionally obtained and easier electrical connection to the mirrors'" (quoting Ex. 1005, 4:9–17 (emphasis added)) and discussing "alignment problems" and concerns with "small temperature fluctuations" (quoting Ex. 1002, 10:9–10, 64–65)).

Finally, Patent Owner argues that Petitioner's motivations to combine "drastically over simplify the subject matter of the claimed inventions" and no ordinary skilled person would combine Bouevitch and Carr because it "would have injected complexity into Bouevitch's system without any added functionality." PO Resp. 36. We find Patent Owner's argument conclusory and not persuasive because it fails to address the benefits of a two-axis mirror disclosed by Carr which would be apparent to one of skill in the art without hindsight. We also find persuasive Petitioner's contention that it would have been obvious to try, because, as Dr. Ford testified: (1) there were only two solutions to the known need to deflect light beams with MEMS: 1-axis or 2-axis; (2) a person of ordinary skill would have had a high expectation of success to try two-axis mirror control in Bouevitch; and (3) the result of the combination would be predictable. *See* Pet. 27–28; Pet. Reply 12; Ex. 1037 ¶ 144. Although Dr. Sergienko states that a person of ordinary skill "would have considered many factors" before substituting a two-axis mirror for a one-axis mirror, the references of record reflect that there are routinely complex design considerations in the fiber optic communications field. Ex. 2033 ¶ 142. Patent Owner does not explain persuasively why combining the teachings of Bouevitch and Carr would be beyond the skill of a skilled artisan, even if feats of engineering are contemplated.

Petitioner has articulated sufficiently reasoning with some rational underpinning to support the legal conclusion of obviousness based on the asserted combination of Bouevitch and Carr. With regard to incorporating the teaching of a two-axis mirror in Carr with Bouevitch, we are persuaded that it is a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter. Further, the asserted combination of Bouevitch and Carr yields a predictable result. *See KSR*, 550 U.S. at 416 ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."). For the foregoing reasons, Petitioner has established by a preponderance of the evidence that claim 1 would have been obvious over Bouevitch and Carr.[7]

2. Claims 2, 5, 6, 9–12, and 15–21

In addition to addressing the elements of claim 1, we agree with Petitioner's identification of how claims 2, 5, 6, 9–12, and 15–21 would have been obvious over Bouevitch and Carr, as supported by the declaration of Dr. Ford. Pet. 36–47; Ex. 1037 ¶151. Patent Owner has not raised additional arguments with respect to claims 2, 5, 6, 9–12, and 15–21 beyond those asserted with respect to claim 1, addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 2, 5, 6, 9–12, and 15–21 would have been obvious over Bouevitch and Carr.

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[7] Patent Owner provides no persuasive evidence of secondary considerations to support the patentability of claims of the '368 patent.

D. Asserted Obviousness Over Bouevitch and Sparks

Petitioner contends claims 1–4, 17, and 22 would have been obvious over Bouevitch and Sparks. Pet. 47–57. Petitioner provides a claim chart describing how Bouevitch and Sparks discloses each of the limitations of the claims. *Id.* at 51–57. Petitioner's contentions are supported by Dr. Ford. Ex. 1037 ¶ 155–164. In summary, Petitioner relies on Bouevitch as disclosing the same features Petitioner contends Bouevitch discloses in the combination with Carr, as discussed above. Petitioner further relies on Sparks as disclosing a MEMS array with elements individually and continuously controllable in two dimensions to reflect channels and control power, as claimed. *See* Pet. at 47, 53; *see also* Ex. 1006, 4:43–45 (describing an optical switch comprising arrays of MEMS capable of two axis movement). Specifically, Sparks discloses using movable micromirrors capable of two axes movement so that "each of the channels passing through the switch may be attenuated to whatever degree necessary to achieve the desired effect." Ex. 1006, 2:30–35, 4:39–47.

Petitioner has shown, as discussed above and as supported by Dr. Ford, that Bouevitch discloses the input, output, and one or more other ports, as recited by claim 1. Patent Owner does not dispute Petitioner's contention that Sparks and Bouevitch together disclose the remaining limitations of claims 1–4, 17, and 22. Petitioner also has demonstrated that the rationale for the asserted combination of

Bouevitch and Carr similarly applies to the combination of Bouevitch and Sparks. For example, Petitioner contends that a person of ordinary skill "would have been motivated to combine the two axis movable MEMS mirrors of Sparks in the COADM of Bouevitch based on the teachings of the references, common sense and knowledge generally available to a [person of ordinary skill], as the proposed combination would merely be substituting known elements to yield predictable results," and that "using the known two-axis mirrors of Sparks in the Bouevitch COADM entails nothing more than the use of known techniques to improve similar devices." Pet. 48–49.

Patent Owner disputes the sufficiency of the rationale provided in the Petition for the combination of Bouevitch and Sparks on the same bases Patent Owner argued with respect to the combination with Carr discussed above. PO Resp. 23–36 (arguing that Petitioner's "proposed combinations (1) conflict with Bouevitch's principle of operation and (2) are based on nothing but impermissible hindsight," and "[a]s such, a [person of ordinary skill] would have had no reason to combine Bouevitch with either Carr or Sparks."). For the reasons explained above, we are not persuaded by Patent Owner's assertion that the "*intentional* misalignment techniques taught by Carr and Sparks conflict with Bouevitch's optical design." *Id.* at 28. Nor are we persuaded that the motivation to combine Bouevitch and Sparks comes from the '368 patent and amounts to impermissible hindsight. *See*

PO Resp. 31–36. As noted above, Bouevitch discusses “alignment problems” and concerns with “small temperature fluctuations.” Ex. 1002, 10:9–10, 64–65. Petitioner notes that Sparks also explains that the disclosed two-axis MEMS mirrors are fabricated to “*carefully align the beams* so as to ensure that the maximum possible input optical signal is received at the output of the switch” if desired. Pet. Reply 16 (quoting Ex. 1006, 4:42–47 (emphasis added)).

Petitioner has articulated sufficient reasoning with some rational underpinning to support the legal conclusion of obviousness based on the asserted combination of Bouevitch and Sparks. With regard to incorporating the teaching of a two-axis mirror in Sparks with Bouevitch, we are persuaded that it is a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter. Further, the asserted combination of Bouevitch and Sparks yields a predictable result. *See KSR*, 550 U.S. at 416 (“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”). For the foregoing reasons, Petitioner has established by a preponderance of the evidence that claims 2, 5, 6, 9–12, and 15–21 would have been obvious over Bouevitch and Sparks.

E. Conclusion

Petitioner has shown by a preponderance of the evidence that claims 1, 2, 5, 6, 9–12, and 15–21 would have been obvious over Bouevitch and Carr, and that claims 1–4, 17, and 22 would have been obvious over Bouevitch and Sparks.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, based on a preponderance of the evidence, claims 1–6, 9–12, and 15–22 of U.S. Patent No. RE42,368 are unpatentable; and,

FURTHER ORDERED that, because this is a Final Written Decision, the parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

For PETITIONER:

Nathaniel T. Browand
Mark Scarsi
Christopher Gaspar
Christopher E. Chalsen
Lawrence T. Kass
Suraj K. Balusa
MILBANK, TWEED, HADLEY & MCCLOY LLP
nbrowand@milbank.com
mscarsi@milbank.com
cgaspar@milbank.com
cchalsen@milbank.com
lkass@milbank.com
sbalusu@milbank.com

Matthew J. Moore
Robert Steinberg
LATHAM & WATKINS LLP
matthew.moore@lw.com
bob.steinberg@lw.com

J. Pieter van Es
Thomas K. Pratt
Jordan N. Bodner
Michael S. Cuviello
BANNER & WITCOFF, LTD.
PvanEs@bannerwitcoff.com
TPratt@bannerwitcoff.com
JBodner@bannerwitcoff.com
MCuviello@bannerwitcoff.com

For PATENT OWNER:

Jason D. Eisenberg
Robert Greene Sterne
Jon E. Wright
Jonathan Tuminaro
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
jasone-PTAB@skgf.com
rsterne-PTAB@skgf.com
jwright-PTAB@skgf.com
jtuminar-PTAB@skgf.com

APPENDIX H

Trials@uspto.gov
571-272-7822

Paper 36
Entered: September 28, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FUJITSU NETWORK COMMUNICATIONS, INC., CORIANT OPERATIONS, INC., CORIANT (USA) INC., and CIENA CORPORATION
Petitioner,

v.

CAPELLA PHOTONICS, INC.,
Patent Owner.

Cases IPR2015-00727[1]
Patent RE42,678 E

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[1] IPR2015-01961 was joined with IPR2015-00727 on March 21, 2016, by Order in IPR2015-01961, Paper 14 (IPR2015-00726, Paper 26).

Before JOSIAH C. COCKS, KALYAN K. DESHPANDE, and JAMES A. TARTAL, Administrative Patent Judges.

TARTAL, Administrative Patent Judge.

FINAL WRITTEN DECISION

35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

Petitioner, Fujitsu Network Communications, Inc., Coriant Operations, Inc., Coriant (USA) Inc., and Ciena Corporation filed petitions requesting an inter partes review of claims 1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53 and 61–65 of U.S. Patent No. RE42,678 E ("the '678 patent"). Paper 1 ("Pet."). Paper 1 ("Petition" or "Pet."); see also IPR2015-01961, Paper 7.

Claims 1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53 and 61–65 of the '678 patent were previously held to be unpatentable in Cisco Systems, Inc., Ciena Corporation, Coriant Operations, Inc., Coriant (USA) Inc., and Fujitsu Network Communications, Inc., v. Capella Photonics, Inc., IPR2014-01276, (PTAB Feb. 17, 2016) (Paper 40) (the '1276 case). The grounds of unpatentability asserted by Petitioner in this case rely on prior art, evidence, and arguments not asserted in the '1276 case. Likewise, Patent Owner, Capella Photonics, Inc., advances arguments and evidence in response in this case that were not asserted by Patent Owner in the ’1276 case.

Based on the information provided in the Petition, and in consideration of the Preliminary Response (Paper 7) of Patent Owner, we instituted a trial pursuant to 35 U.S.C. § 314(a) of: (1) claims 1, 9, 10, 13,17, 19, 44, 53, 61, 64, and 65 as obvious over Bouevitch[2] and Carr[3] under 35 U.S.C. § 103(a), and (2) claims 1–4, 19–23, 27, 29, 44–46, and 61–63 as obvious over Bouevitch and Sparks[4] under 35 U.S.C. § 103(a). Paper 8 (“Institution Decision”); see also IPR2015-01961, Paper 14.

After institution of trial, Patent Owner filed a Response (Paper 20, “Response” or “PO Resp.”) and Petitioner filed a Reply (Paper 25, “Pet. Reply”). The Petition is supported by the Declaration of Joseph E. Ford, Ph.D. (Ex. 1037)[5]. The Response is supported

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[2] U.S. Patent No. 6,498,872 B2, issued Dec. 24, 2002 (Ex. 1002, “Bouevitch”)

[3] U.S. Patent No. 6,442,307 B1, issued Aug. 27, 2002 (Ex. 1005, “Carr”).

[4] U.S. Patent No. 6,625,340 B1, issued Sep. 23, 2003 (Ex. 1006, “Sparks”)

[5] At the time of filing, the Petition was supported by the Declaration of Timothy J. Drabik, Ph.D. Ex. 1016. After institution of trial, and prior to his deposition, Dr. Drabik passed away. See Paper 14. Over the opposition of Patent Owner, Petitioner’s motion to file as supplemental information the Declaration of Joseph E. Ford in support of the petition was granted (Paper 17), and Patent Owner’s Request for Reconsideration of that decision was denied (Paper 21). Patent

by the Declaration of Dr. Alexander V. Sergienko (Ex. 2033).

A transcript of the Oral Hearing conducted on May 24, 2016, is entered as Paper 35 ("Tr.").

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, Petitioner has shown by a preponderance of the evidence that claims 1–4, 9, 10, 13, 17, 19–23, 27,29, 44–46, 53 and 61–65 of the '678 patent are unpatentable.

Owner's further attempts to obtain additional discovery of Dr. Drabik's "notes, comments, and edits" after his death were denied as not relevant to this proceeding as Petitioner no longer relies on Dr. Drabik's declaration as support for the Petition. Paper 24. Patent Owner was informed that "the panel will not consider the content of [Dr. Drabik's] Declaration as a part of any Final Written Decision." Paper 17, 4–5. Patent Owner further argues that Dr. Ford's testimony is based on hindsight reasoning and bias, and should be given little if any weight because Patent Owner was unable to depose Dr. Drabik before his death and a paper published by Dr. Ford purportedly conflicts with Dr. Ford's declaration as it "does not cite to a single reference about wavelength-selective switches that pre-date [Patent Owner's] 2001 priority date." PO Resp. 45–49. We have considered each of Patent Owner's arguments and reiterate that Patent Owner had the opportunity to cross-examine Dr. Ford prior to filing its Patent Owner Response. We are not persuaded that Dr. Ford's testimony should be afforded little or no weight based on the arguments asserted by Patent Owner.

II. BACKGROUND

A. The ’678 patent (Ex. 1001)

The ’678 patent, titled “Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities,” reissued September 6, 2011, from U.S. Patent No. RE 39,397 (“the ’397 patent”). Ex. 1001. The ’397 patent reissued November 14, 2006, from U.S. Patent No. 6,625,346 (“the ’346 patent”). Id. The ’346 patent issued September 23, 2003, from U.S. Patent Application No. 09/938,426, filed August 23, 2001.

According to the ’678 patent, “fiber-optic communications networks commonly employ wavelength division multiplexing (WDM), for it allows multiple information (or data) channels to be simultaneously transmitted on a single optical fiber by using different wavelengths and thereby significantly enhances the information–bandwidth of the fiber.” Id. at 1:37– 42. An optical add-drop multiplexer (OADM) is used both to remove wavelengths selectively from a multiplicity of wavelengths on an optical fiber (taking away one or more data channels from the traffic stream on the fiber) and to add wavelengths back onto the fiber (inserting new data channels in the same stream of traffic). Id. at 1:45–51.

The ’678 patent describes a “wavelength-separating-routing (WSR) apparatus that uses a diffraction grating to separate a multi-wavelength optical signal by wavelength into multiple spectral channels, which are then focused onto an array of corresponding channel micromirrors." Id. at Abstract. "The channel micromirrors are individually controllable and continuously pivotable to reflect the spectral channels into selected output ports." Id. According to Petitioner, the small, tilting mirrors are sometimes called Micro Electro Mechanical Systems or "MEMS." Pet. 6. The WSR described in the '678 patent may be used to construct dynamically reconfigurable OADMs for WDM optical networking applications. Ex. 1001 at Abstract.

Figure 1A of the '678 patent is reproduced below.

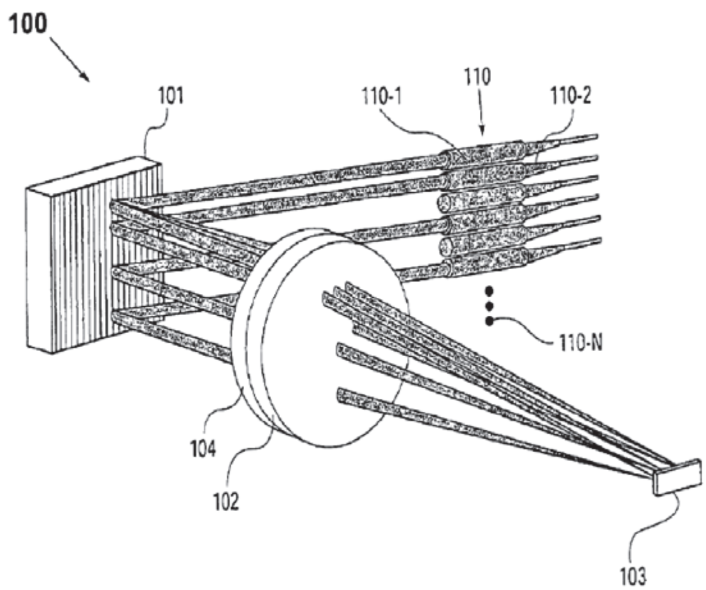

Fig. 1A

Figure 1A depicts wavelength-separating-routing (WSR) apparatus 100, in accordance with the ’678 patent. WSR apparatus 100 is composed of an array of fiber collimators 110 (multiple input/output ports, including input port 110-1 and output ports 110-2 through 110-N), diffraction grating 101 (a wavelength separator), quarter wave plate 104, focusing lens 102 (a beam-focuser), and array of channel micromirrors 103. Ex. 1001, 6:57–63, 7:55–56.

A multi-wavelength optical signal emerges from input port 110-1 and is separated into multiple spectral channels by diffraction grating 101, which are then focused by focusing lens 102 into a spatial array of distinct spectral spots (not shown). Id. at 6:64–7:2. Channel micromirrors 103 are positioned such that each channel micromirror receives one of the spectral channels. Id. at 7:2–5.

Figure 1B of the ’678 patent is reproduced below.

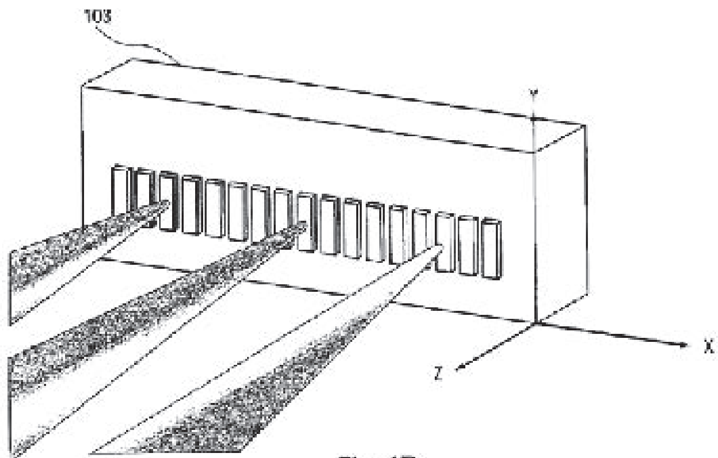

Fig. 1B

Figure 1B depicts a close-up view of the array of channel micromirrors 103 shown above in Figure 1A. Id. at 8:6–7. The channel micromirrors "are individually controllable and movable, e.g. pivotable (or rotatable) under analog (or continuous) control, such that, upon reflection, the spectral channels are directed" into selected output ports by way of focusing lens 102 and diffraction grating 101. Id. at 7:6–11.

According to the '678 patent:

> [e]ach micromirror may be pivoted about one or two axes. What is important is that the pivoting (or rotational) motion of each channel micromirror be individually controllable in an analog manner, whereby the pivoting angle can be continuously adjusted so as to enable the channel micromirror to scan a spectral channel across all possible output ports.

Id. at 9:8–14.

Figure 3 of the ’678 patent is reproduced below.

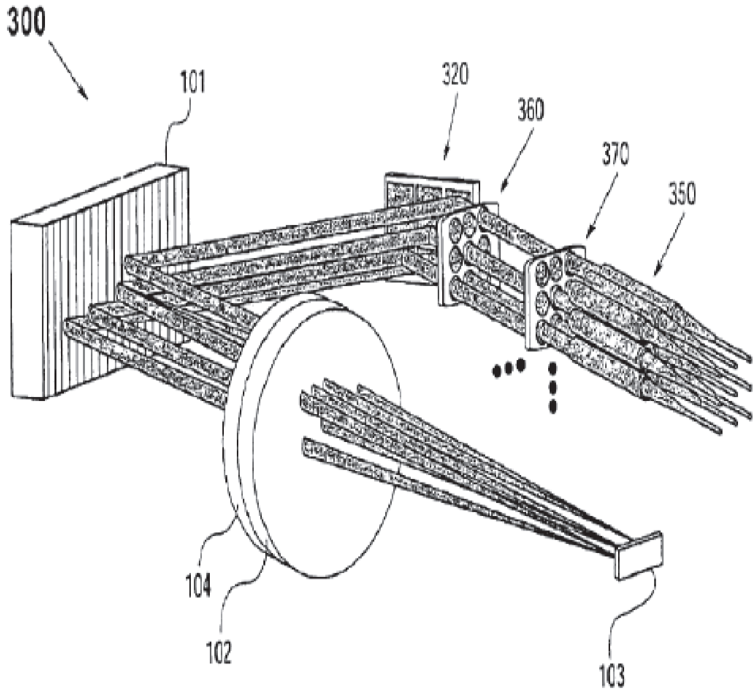

Fig. 3

Similar to Figure 1A, above, Figure 3 also shows a WSR apparatus as described by the ’678 patent. Id. at 10:25–26. In this embodiment, two- dimensional array of fiber collimators 350 provides an input port and plurality of output ports. Id. at 10:31–32. First and second two-dimensional arrays of imaging lenses 360, 370 are placed in a telecentric arrangement between two-dimensional collimator-alignment mirror array 320 and two- dimensional fiber collimator array 350. Id. at 10:37–43. "The channel micromirror 103 must be pivotable biaxially in this case (in order to direct its corresponding spectral channel to any one of the output ports)." Id. at 10:43–46.

The WSR also may incorporate a servo-control assembly (together termed a "WSR-S apparatus"). Id. at 4:65–67. According to the '678 patent:

> The servo-control assembly serves to monitor the power levels of the spectral channels coupled into the output ports and further provide control of the channel micromirrors on an individual basis, so as to maintain a predetermined coupling efficiency of each spectral channel in one of the output ports. As such, the servo-control assembly provides dynamic control of the coupling of the spectral channels into the respective output ports and actively manages the power levels of the spectral channels coupled into the output ports.

Id. at 4:47–56.

Figure 5 of the '678 patent is reproduced below.

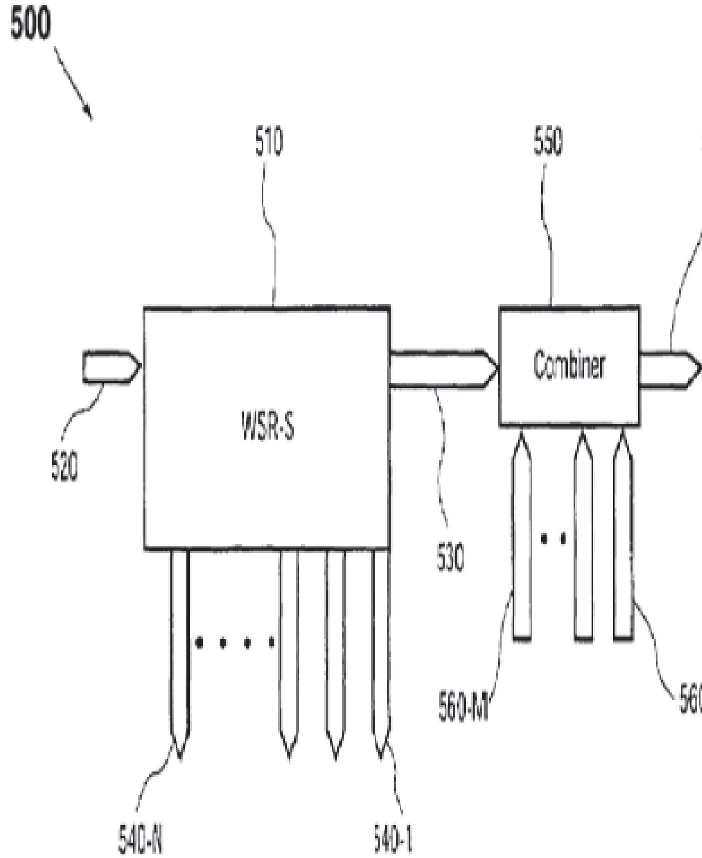

Fig. 5

Figure 5 depicts OADM 500 in accordance with the ’678 patent composed of WSR-S (or WSR) apparatus 510 and optical combiner 550. Id. at 12:40–44. Input port 520 transmits a multi-wavelength optical signal, which is separated and routed into a plurality of output ports, including pass-through port 530 and one or more drop ports 540-1 through 540-N. Id. at 12:44–48. Pass-through port 530 is optically coupled to optical combiner 550, which combines the pass-through spectral channels with one or more add spectral channels provided by one or more add ports 560-1 through 560-M. Id. at 12:52–56. The combined optical signal is then routed into an existing port 570, providing an output multi-wavelength optical signal. Id. at 12:56–58.

B. Illustrative Claims

Challenged claims 1, 21, 44, and 61 of the '678 patent are independent. Challenged claims 2–4, 9, 10, 13, 17, 19, and 20 ultimately depend from claim 1; claims 22, 23, 27, and 29 ultimately depend from claim 21; claims 45, 46, and 53 ultimately depend from claim 44; and, claims 62–65 ultimately depend from claim 61. Claims 1, 21, and 61 of the '678 patent are illustrative of the claims at issue:

> 1. A wavelength-separating-routing apparatus, comprising:
>
> a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;
>
> b) a wavelength-separator, for separating said multi- wavelength optical signal from said input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being pivotal about two axes and being individually and continuously controllable to reflect [[said]] corresponding received spectral channels into any selected ones of said output ports and to control the power of said received spectral channels coupled into said output ports.

Ex. 1001, 14:6–23 (emphases in original, "[[ ]]" indicating matter in the first reissue that forms no part of the second reissue, and matter in italics indicating additions made by second reissue).

21. A servo-based optical apparatus comprising:

a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;

b) a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels;

c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and

d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said output ports; and

e) a servo-control assembly, in communication with said channel micromirrors and said output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.

Ex. 1001, 15:29–48.

61. A method of performing dynamic wavelength separating and routing, comprising:

a) receiving a multi-wavelength optical signal from an input port;

b) separating said multi -wavelength optical signal into multiple spectral channels;

c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and

d) dynamically and continuously controlling said beam-deflecting elements [[, thereby directing]] in two dimensions to direct said spectral channels into [[a plurality]] any

> selected ones of said output ports and to control the power of the spectral channels coupled into said selected output ports.

Ex. 1001, 18:55–19:3 (emphases in original, with "[[ ]]" indicating matter in the first reissue that forms no part of the second reissue, and matter in italics indicating additions made by second reissue).

III. ANALYSIS

A. Claim Construction

The Board interprets claims using the "broadest reasonable construction in light of the specification of the patent in which [they] appear[]." 37 C.F.R. § 42.100(b). We presume a claim term carries its "ordinary and customary meaning," which is "the meaning that the term would have to a person of ordinary skill in the art in question" at the time of the invention. In re Translogic Tech., Inc., 504 F.3d 1249, 1257 (Fed. Cir. 2007). A patentee may, however, act as their own lexicographer and give a term a particular meaning in the Specification, but must do so with "reasonable clarity, deliberateness, and precision." In re Paulsen, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Only terms which are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc., 200 F.3d 795, 803 (Fed. Cir. 1999).

1. “continuously controllable”

Claims 1 and 44 require “a spatial array of channel micromirrors . . . being individually and continuously controllable.” Ex. 1001, 14:16–20; 17:43–47. Similarly, claim 61 requires “dynamically and continuously controlling said beam-deflecting elements.” Id. at 18:65–66. Petitioner asserts that the broadest reasonable interpretation of “continuously [controllable/controlling/pivotable],” in light of the specification, is “under analog control.” Pet. 9–10. According to Petitioner, the ’678 patent identifies “under analog control” as an example of continuous control. Id. Petitioner identifies the following disclosures of the ’678 patent as supporting its proposed construction:

> The patent explains that “[a] distinct feature of the channel micromirrors in the present invention, in contrast to those used in the prior art, is that the motion . . . of each channel micromirror is under analog control such that its pivoting angle can be continuously adjusted.” ([Ex. 1001], 4:7–11). Another passage in the specification states that “[w]hat is important is that the pivoting (or rotational) motion of each channel micromirror be individually controllable in an analog manner, whereby the pivoting angle can be continuously adjusted so as to enable the channel micromirror to scan a spectral channel across all possible output ports.” ([Ex. 1001], 9:9–14). Yet another passage states that “channel micromirrors 103 are

> individually controllable and movable, e.g., pivotable (or rotatable) under analog (or continuous) control." (Id., 7:6–8).

Pet. 9–10.

Dr. Ford also explains that "[e]lectrostatically driven MEMS mirrors may be driven with an analog voltage for continuous positioning control," and states that a person of ordinary skill in the art "would have known that MEMS mirrors based on analog voltage control can be tilted to any desired angle in their operating range." Ex. 1037 ¶¶ 57, 157.

Patent Owner contends that no express construction should be given to any claim term. PO Resp. 19. Additionally, according to Dr. Sergienko, "[a]nalog controlled mirrors can operate under continuous control." Ex. 2033 ¶ 48. However, there is no evidence that analog controlled mirrors always operate under continuous control or that only analog mirrors operate under continuous control.

Accordingly, based on all of the evidence presented, we are not persuaded that "continuously controllable" is limited to "analog control" or that "analog control" necessarily corresponds to "continuous" control under all circumstances. We determine that "continuously controllable," in light of the specification of the '678 patent, encompasses "under analog control such that it can be continuously adjusted."

2. “servo-control assembly” and “servo-based”

Challenged claims 2–4, 21–23, and 45 recite a “servo-control assembly.” Petitioner asserts that the broadest reasonable interpretation of “servo-control assembly” in light of the specification is “assembly that uses automatic feedback to control a device in response to a control signal.” Pet. 10–11. Challenged claims 21–25, 27, and 29 recite a “servo-based optical apparatus.” Petitioner asserts that “servo-based” means “using automatic feedback to control a device in response to a control signal.” Id. at 11. Patent Owner offers no construction of the terms. We are not persuaded that “servo” necessarily means “feedback” or “feedback-based” merely because the ’678 patent describes a processing unit within a servo- control assembly as using power measurements from the spectral monitor to provide feedback control of the channel mirrors. See Pet. 13–14.

The ’678 patent does not use the term “servo-based” outside of the preamble of challenged claims 21–25, 27, and 29. “If . . . the body of the claim fully and intrinsically sets forth the complete invention, including all of its limitations, and the preamble offers no distinct definition of any of the claimed invention’s limitations, . . . then the preamble is of no significance to claim construction because it cannot be said to constitute or explain a claim limitation.” Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1305 (Fed. Cir. 1999) (citations omitted). The bodies of claims 21–25, 27, and 29 fully and intrinsically set forth the complete invention;

therefore, the use of “servo-based” in the preamble does not serve as a limitation and need not be construed for purposes of this decision.

With respect to “servo-control assembly,” the ’678 patent states that it “serves to monitor the power levels of the spectral channels coupled into the output ports and further provide control of the channel micro-mirrors on an individual basis.” Ex. 1001, 4:47–50. Further, “[i]f the WSR apparatus includes an array of collimator-alignment mirrors . . . the servo-control assembly may additionally provide dynamic control of the collimator- alignment mirrors.” Id. at 4:56–60. According to the ’678 patent, “[a] skilled artisan will know how to implement a suitable spectral monitor along with an appropriate processing unit to provide a servo-control assembly in a WSP-S apparatus according to the present invention, for a given application.” Ex. 1001, 12:11–15.

Based on the specification, a “servo-control assembly” encompasses a spectral monitor and processing unit to monitor spectral channel power levels and control channel micro mirrors on an individual basis. See id. At 11:10–36.

3. “port”

Claim 1 recites “multiple fiber collimators, providing an input port . . . and a plurality of output ports.” Ex. 1001, 14:8–10. By comparison, claim 61 does not recite a collimator, but instead requires “receiving a multi- wavelength optical signal from an input port," and "controlling said beam deflecting elements . . . to direct said spectral channels into . . . output ports." Id. at 18:57–19:1. Neither Petitioner nor Patent Owner offer an express definition of "port." Instead Patent Owner argues that "[n]owhere in the '678 patent or the prosecution history is there an indication that the ports are to be construed to encompass circulator ports." PO Resp. at 39. We disagree.

There is no dispute that the ordinary and customary meaning of "port" encompasses circulator ports and, indeed, any "point of entry or exit of light." See Dr. Sergienko Deposition Transcript (Ex. 1041), 43:16–23, 45:12–13 ("The circulator ports are ports with constraints."). Nor does the '678 patent equate the term "port" to "collimator," as both "port" and "collimator" appear separately in the claims of the '678 patent. Ex. 1001, 14:8–10. We have considered the testimony of Dr. Sergienko as well (Ex. 2033 ¶¶ 102–123) and find that even if certain fiber collimators serve as ports in the '678 patent, that does not redefine the term "port" to mean "collimator." See id. at ¶ 102.

Although the broad scope of a claim term may be intentionally disavowed, "this intention must be clear," see Teleflex, Inc. v. Ficosa N. Am. Corp., 299 F.3d 1313, 1325 (Fed. Cir. 2002) ("The patentee may demonstrate an intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."). "However, this intention must be clear, and cannot draw limitations into the claim from a preferred embodiment." *Conoco, Inc. v. Energy & Envtl. Int'l.*, 460 F.3d 1349, 1357–58 (Fed. Cir. 2006).

Patent Owner fails to show any "expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope" with respect to the use of "port" in the '678 patent. Patent Owner argues that "[t]he inventors of the '678 patent realized that including optical circulators in an OADM was a significant drawback" and that "the claimed ROADMs do not require circulators." PO Resp. 13–14. Patent Owner further argues that by looking at the specification "as a whole," the '678 patent employs fiber collimators as ports and that the prosecution history does not indicate "that the ports are to be construed to encompass circulator ports." Id. at 39. To the contrary, Petitioner demonstrates that a provisional application to the '678 patent in fact uses circulator ports as "ports." Pet. Reply 19–20 (citing Ex. 2012, 4, Fig. 9). We have considered all of the arguments advanced by Patent Owner in its effort to redefine "port" as excluding "circulator ports" (PO Resp. 38–43) and find insufficient support for Patent Owner's contention that the '678 patent disavows or otherwise precludes circulator ports from the scope of the term "port." We determine that "port," in light of the specification of the '678 patent, encompasses "circulator port."

3. Additional Claim Terms

Petitioner addresses the additional claim terms "in two dimensions," "beam-deflecting elements," and "channel micromirror." Pet. 8–9, 12–14. Patent Owner contends that no term requires express construction. PO Resp. 19. For purposes of this decision, no express construction of any additional claim terms is necessary.

B. References Asserted as Prior Art

Petitioner relies on Bouevitch, Carr, and Sparks with respect to its assertion that the challenged claims would have been obvious.

1. Bouevitch

Bouevitch describes an optical device for rerouting and modifying an optical signal, including modifying means such as a MEMS array and a liquid crystal array which function as an attenuator when the device operates as a dynamic gain equalizer (DGE) and as a switching array when the device operates as a configurable optical add/drop multiplexer (COADM). Ex. 1002, Abstract. According to Petitioner, the COADM described in Bouevitch "uses MEMS mirrors with one axis of rotation." Pet. 31.

2. Carr

Carr describes a MEMS mirror device comprised of a mirror movably coupled to a frame and an actuator for moving the mirror. Ex. 1005, Abstract. Petitioner contends "Carr discloses a two-dimensional array of double-gimbaled mirrors that can be tilted about two perpendicular torsion bars to any desired orientation," as well as power control or attenuation by tilting the MEMS mirrors such that only a portion of input signals enter the output fibers. Pet. 31–32 (citing Ex. 1005, 3:44–47, 3:66–4:2, 11:13–20).

3. Sparks

Sparks describes an optical switch arranged to misalign the optical beam path to provide a predetermined optical output power. Ex. 1006, Abstract. According to Sparks, "[t]he system operates by controlling the movable micromirrors (16, 26), which are fabricated using MEMS technology and are capable of two axis movement, to carefully align the beams so as to ensure that the maximum possible input optical signal is received at the output of the switch." Id. at 4:43–46.

C. Asserted Obviousness Over Bouevitch and Carr

Petitioner asserts that claims 1, 9, 10, 13, 17, 19, 44, 53, 61, 64, and 65 would have been obvious over Bouevitch and Carr. Pet. 31–44.

1. Claim 1

Claim 1, directed to a wavelength-separating-routing apparatus, requires "multiple fiber collimators, providing an input port . . . and a plurality of output ports." Ex. 1001, 14:6–10. Petitioner contends that Bouevitch describes microlenses 12a and 12b, corresponding to the recited "multiple fiber collimators." Pet. 36. Petitioner's declarant, Dr. Ford, equates microlenses 12a and 12b to fiber collimators. Ex. 1037, ¶¶ 146–151, 162. Petitioner further asserts that the microlenses of Bouevitch, in conjunction with fiber waveguides and circulators, provide an input port (labeled "IN") and a plurality of output ports (labeled "OUT EXPRESS" and "OUT DROP"). Pet. 36–37; Pet. Reply 18; see also Ex. 1037 ¶ 162[1pre] and [1a] (citing, inter alia, Ex. 1002, 14:14–21, Fig. 11).

Patent Owner argues that, under its proposed claim construction of "port," Bouevitch discloses at most two ports because the '678 patent equates "port" to "collimator." PO Resp. 38–42. For the reasons explained above in our claim construction analysis for "port," we reject Patent Owner's claim construction for "port." Failing to provide any express meaning to a term, "port," and then arguing that the term nevertheless fails to encompass a certain structure in the prior art (a structure Patent Owner's own experts identifies as a "port") is not persuasive. See Ex. 1041, 45:12–13. Accordingly, we do not agree with Patent Owner's contention that the only ports disclosed by Bouevitch are collimator lenses 12a and 12b. See PO Resp. at 40–42. Petitioner has shown, as discussed above and as supported by Dr. Ford, that Bouevitch discloses the recited "multiple fiber collimators, providing an input port . . . and a plurality of output ports," as recited by claim 1.

Patent Owner does not dispute Petitioner's contention that Carr and Bouevitch together disclose the remaining limitations of claim 1. In particular, claim 1 requires "a wavelength-separator" for separating the multi-wavelength optical signal input into multiple spectral channels. Petitioner identifies diffraction grating 20 of Bouevitch as corresponding to the recited "wavelength-separator." Pet. 37–38. Petitioner also identifies Bouevitch's diffraction grating 620, spherical reflector 610, and modifying means 150 as corresponding to the recited "beam-focuser" of claim 1 of the '678 patent. Id. at 38.

Petitioner further identifies MEMS mirror array 50 of Bouevitch as corresponding to the recited "a spatial array of channel micromirrors." Id. (citing Ex. 1002, 14:48–55). Petitioner also identifies the two-dimensional array of movable gimballed mirrors shown in Carr Figures 1a and 2b as corresponding to the claimed "spatial array of channel micromirrors." Id. At 38–39. For each of the channel micromirrors, claim 1 further requires that they be "pivotal about two axes" and be "individually and continuously controllable to reflect corresponding received spectral channels into any selected ones of said output ports and to control the power of said received spectral channels coupled into said output ports." Petitioner identifies the double gimballed mirror 21 which "can be tilted to any desired orientation." Id. (quoting Ex. 1005, 3:47–48). Carr further discloses intentional misalignment for power control. See id. at 35–36 (quoting Ex. 1005, 11:11–23, see also Fig. 9). As Explained by Dr. Ford, "Carr discloses effecting closed-loop power control or attenuation by tilting MEMS mirrors to introduce misalignment of channel wavelength beams," and "Carr specifically teaches that its analog, continuous micromirrors would be useful for power control applications in WDM systems." Ex. 1037 ¶¶ 116, 156. In summary, for the reasons discussed above, we agree with Petitioner that Bouevitch and Carr disclose all of the recited limitations of claim 1. See Pet. 31–36. Thus, the remaining issue is whether Petitioner has provided "some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." KSR Int'l Co. v. Teleflex Inc., 550 U.S. 398, 418 (2007).[6]

With respect to a rationale for combining Bouevitch and Carr, Petitioner contends that the use of the two-axis mirror of Carr in Bouevitch: (1) is the use of a known technique to improve similar devices, (2) is a simple substitution of one known element for

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[6] The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) secondary considerations, i.e. objective evidence of unobviousness. See Graham v. John Deere Co., 383 U.S. 1, 17–18 (1966). We have considered each of the Graham factors and incorporate our discussion of those considerations, to the extent there is a dispute, in our evaluation of the reasoning that supports the asserted combination. We further observe that, in this proceeding, evidence of secondary considerations has not been offered for evaluation.

another yielding predictable results, and (3) would be obvious to try as there are only two options for tilting MEMS mirrors: one-axis and two-axis mirrors. Pet. 32–35. Petitioner's rationale for combining Bouevitch and Carr is supported by Dr. Ford. Ex. 1037 ¶¶ 152–161. In particular, Dr. Ford explains that "providing the MEMS mirrors of Bouevitch with two-axis tilt capability enables the spatial positioning of returning beams in both transverse directions at the face of microlens array 12," thereby reducing errors in system alignment. Id. at ¶ 153; see also id. at ¶ 155 (stating that "[t]here are only two options for tilting MEMS mirrors: one-axis and two-axis mirrors" and that "[b]ecause Carr already disclosed the use of two-axis mirrors (which were available by the '678 Patent's priority date), a [person having ordinary skill in the art] would have a high expectation of success upon trying two-axis mirror control in Bouevitch.")

Patent Owner disputes the sufficiency of the rationale provided in the Petition. PO Resp. 23–36. Petitioner demonstrates that the thrust of Patent Owner's arguments do not refute Petitioner's contentions, but instead argue that the asserted combination would not have been obvious for other reasons. See Pet. Reply 12–13 (citing Ex. 1040 (noting that Dr. Sergienko agreed that two-axis mirrors were known in the art and provided certain benefits over single axis mirrors)).

First, Patent Owner argues that a person of ordinary skill "would have never used two-axis mirrors in Bouevitch's system to control power through intentional misalignment, because doing so would destroy Bouevitch's principle of operation." PO Resp. 24. Patent Owner contends that Bouevitch discloses "a folded 4-f system that autocorrects for any unintentional misalignments" and that this advantage would be lost if combined with Carr because Carr controls power through "intentional misalignment." Id. at 26–27. Patent Owner further argues that Bouevitch "uses a different method to control power . . . by attenuation at the MEMS devices, not intentional misalignment." Id. at 28.

There is no dispute that Bouevitch discloses methods other than misalignment for power control. We agree with Petitioner, however, that Bouevitch discloses that the "degree of attenuation is based on the degree of deflection provided by the reflector (i.e., the angle of reflection)." Pet. 40 (quoting Ex. 1002, 7:35–37). Patent Owner argues in response that Bouevitch is referring to "constructive or destructive interference," not misalignment. PO Resp. 29. In reply, Petitioner notes that Dr. Sergienko was unable to identify any portion of Bouevitch to support Patent Owner's theory of attenuation based on interference. Pet. Reply 8 (citing Ex. 1040, 90:8–22). Indeed, the paragraph cited by Patent Owner from Dr. Sergienko's declaration in support of the assertion that Bouevitch "refers" to power control through interference, in fact, says no such thing. PO Resp. 29 (citing Ex. 2033 ¶ 99 (stating that Bouevitch refers to modifying means for power control and that another reference (Ex. 2031) illustrates power control through interference)). We find persuasive Petitioner's explanation that had Bouevitch intended to refer to interference- based attenuation instead of angular misalignment, then Bouevitch would have addressed altering distances, not angles of tilt. See Pet. Reply 8–10 (citing Ex. 1040, 126:9–127:7) (explaining that Mechanical Anti-Reflection Switch (MARS) modulator device operates in a "'surface-normal manner' by vertically moving the partially reflective membrane," and noting that Dr. Sergienko agreed the MARS device does not vary the angle of reflection). We further see no inconsistency between Bouevitch's disclosure of methods to prevent unintentional misalignment with other methods that incorporate intentional misalignment for power control. "The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the . . . application." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). For the same reasons, we are not persuaded that applying intentional misalignment for power control as disclosed by Carr would destroy Bouevitch's principle of operation.

Second, Patent Owner argues that Petitioner's combination of Bouevitch and Carr is improper hindsight because it relies on knowledge beyond the level of ordinary skill at the time of the claimed invention and includes knowledge gleaned only from the applicant's disclosure. PO Resp. 31–36. Patent Owner argues that Dr. Ford assumed "wavelength-selective switches were known at the time of the invention, when, in fact, they were not." *Id.* at 31. Patent Owner's argument is premised on its contention that Dr. Ford published a paper in 2006 which did not contain any citations "to confirm that wavelength-selective switches were known when the '678 patent was filed." Id. at 32. Patent Owner's argument is not persuasive evidence that wavelength switches were unknown at the relevant time. To the contrary, Dr. Ford's declaration in this proceeding identifies references supporting the contention that wavelength-selective switches were known and described prior to Patent Owner's priority date. See Ex. 1037 ¶ 52 (citing Ex. 1002, 5:15–38; Ex. 1027, 1:56–67). That those same references were not cited in an article by Dr. Ford in 2006 is of little relevance to our determination of obviousness in this proceeding.

Next, Patent Owner argues that one of Petitioner's motivations for combining Bouevitch with Carr comes from the '678 patent because: (1) Petitioner contends dual axis mirrors compensate for system alignment errors from well-known problems like imperfect assembly or temperature changes; (2) Petitioner and Dr. Ford provide no citation that such problems were "well-known"; and (3) the '678 patent states certain prior art provided "no mechanisms implemented for overcoming degradation in the alignment owing to environmental effects such as thermal and mechanical disturbances over the course of operation." PO Resp. 34–35. We find persuasive Petitioner's reply that Bouevitch and

Carr, rather than the ’678 patent, sufficiently provide the motivation for the asserted combination. See Pet. Reply 16 (describing a “two-axis MEMS device with ‘highly accurate lateral alignment’ that ‘permits precise control of the mirrors, a more robust structure, greater packing density, larger mirror sizes, and larger mirror rotation angles than are conventionally obtained and easier electrical connection to the mirrors’” (quoting Ex. 1005, 4:9–17 (emphasis added)) and discussing “alignment problems” and concerns with “small temperature fluctuations” (quoting Ex. 1002, 10:9–10, 65–65)).

Finally, Patent Owner argues that Petitioner’s motivations to combine “drastically over simplify the subject matter of the claimed inventions,” and no ordinary skilled person would combine Bouevitch and Carr because it “would have injected complexity into Bouevitch’s system without any added functionality.” PO Resp. 36. We find Patent Owner’s argument conclusory and not persuasive because it fails to address the benefits of a two-axis mirror disclosed by Carr which would be apparent to one of skill in the art without hindsight. We also find persuasive Petitioner’s contention that it would have been obvious to try, because, as Dr. Ford testified, (1) there were only two solutions to the known need to deflect light beams with MEMS: 1- axis or 2-axis, (2) a person of ordinary skill would have had a high expectation of success to try two-axis mirror control in Bouevitch, and (3) the result of the combination would be predictable. See Pet. 33; Pet. Reply 12; Ex. 1037 ¶ 155. While Dr. Sergienko states that a person of ordinary skill "would have considered many factors" before substituting a two-axis mirror for a one-axis mirror, the references of record reflect that there are routinely complex design considerations in the fiber optic communications field. Ex. 2033 ¶ 142. Patent Owner does not explain persuasively why combining the teachings of Bouevitch and Carr would be beyond the skill of a skilled artisan, even if feats of engineering are contemplated.

Petitioner has articulated sufficiently reasoning with some rational underpinning to support the legal conclusion of obviousness based on the asserted combination of Bouevitch and Carr. With regard to incorporating the teaching of a two-axis mirror in Carr with Bouevitch, we are persuaded that it is a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter. Further, the asserted combination of Bouevitch and Carr yields a predictable result. *See KSR,* 550 U.S. at 416 ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."). For the foregoing reasons, Petitioner has established by a preponderance of the evidence that claim 1 would have been obvious over Bouevitch and Carr.[7]

[7] Patent Owner provides no persuasive evidence of secondary considerations to support the patentability of claims of the '678 patent.

2. Claims 9, 10, 13, 17, 19, 44, 53, 61, 64, and 65

In addition to addressing the elements of claim 1, we agree with Petitioner's identification of how claims 9, 10, 13, 17, 19, 44, 53, 61, 64, and 65 would have been obvious over Bouevitch and Carr, as supported by the declaration of Dr. Ford. Pet. 40–44; Ex. 1037 ¶162. Patent Owner has not raised additional arguments with respect to claims 9, 10, 13, 17, 19, 44, 53, 61, 64 beyond those asserted with respect to claim 1, addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 9, 10, 13, 17, 19, 44, 53, 61, 64 would have been obvious over Bouevitch and Carr.

D. Asserted Obviousness Over Bouevitch and Sparks

Petitioner asserts that claims 1–4, 19–23, 27, 29, 44–46, and 61–63 would have been obvious over Bouevitch and Sparks. Pet. 44–57. Petitioner provides a claim chart identifying how the references disclose the elements of each claim. Id. at 48–57. Petitioner's contentions are supported by Dr. Ford. Ex. 1037 ¶ 163–175. In summary, Petitioner relies on Bouevitch as disclosing the same features Petitioner contends Bouevitch discloses in the combination with Carr, as discussed above. Petitioner further relies on Sparks as disclosing a MEMS array with elements individually and continuously controllable in two dimensions to reflect channels and control power, as claimed. See Pet. 45, 49–50; see also Ex. 1006, 4:43–45 (describing an optical switch comprising arrays of MEMS capable of two axis movement). Specifically, Sparks discloses using movable micromirrors capable of two axes movement so that "each of the channels passing through the switch may be attenuated to whatever degree necessary to achieve the desired effect." Ex. 1006, 2:30–35; 4:39–47.

Petitioner has shown, as discussed above and as supported by Dr. Ford, that Bouevitch discloses the "multiple fiber collimators, providing an input port . . . and a plurality of output ports," as recited by claim 1. Patent Owner does not dispute Petitioner's contention that Sparks and Bouevitch together disclose the remaining limitations of claims 1–4, 19–23, 27, 29, 44–46, and 61–63. Petitioner also has demonstrated that the rationale for the asserted combination of Bouevitch and Carr similarly applies to the combination of Bouevitch and Sparks. For example, Petitioner contends that a person of ordinary skill "would have been motivated to combine the two axis movable MEMS mirrors of Sparks in the COADM of Bouevitch based on the teachings of the references, common sense and knowledge generally available to a [person of ordinary skill], as the proposed combination would merely be substituting known elements to yield predictable results," and that "using the known two-axis mirrors of Sparks in the Bouevitch COADM entails nothing more than the use of known techniques to improve similar devices." Pet. 45–46.

Patent Owner disputes the sufficiency of the rationale provided in the Petition for the combination of Bouevitch and Sparks on the same bases Patent Owner argued with respect to the combination with Carr discussed above. PO Resp. 23–36 (arguing that Petitioner's "proposed combinations (1) conflict with Bouevitch's principle of operation and (2) are based on nothing but impermissible hindsight," and "[a]s such, a [person of ordinary skill] would have had no reason to combine Bouevitch with either Carr or Sparks."). For the reasons explained above, we are not persuaded by Patent Owner's assertion that the "intentional misalignment techniques taught by Carr and Sparks conflict with Bouevitch's optical design." Id. at 28. Nor are we persuaded that the motivation to combine Bouevitch and Sparks comes from the '678 patent and amounts to impermissible hindsight. See PO Resp. 31–36. As noted above, Bouevitch discusses "alignment problems" and concerns with "small temperature fluctuations." Ex. 1002, 10:9–10, 64–65. Petitioner notes that Sparks also explains that the disclosed two-axis MEMS mirrors are fabricated to "carefully align the beams so as to ensure that the maximum possible input optical signal is received at the output of the switch" if desired. Pet. Reply 16 (quoting Ex. 1006 at 4:42–47 (emphasis added)).

Petitioner has articulated sufficient reasoning with some rational underpinning to support the legal conclusion of obviousness based on the asserted combination of Bouevitch and Sparks. With regard to incorporating the teaching of a two-axis mirror in

Sparks with Bouevitch, we are persuaded that it is a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter. Further, the asserted combination of Bouevitch and Sparks yields a predictable result. See *KSR*, 550 U.S. at 416 ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results."). For the foregoing reasons, Petitioner has established by a preponderance of the evidence that claims 1–4, 19–23, 27, 29, 44–46, and 61–63 would have been obvious over Bouevitch and Sparks.

E. Conclusion

Petitioner has shown by a preponderance of the evidence that claims 1, 9, 10, 13, 17, 19, 44, 53, 61, 64, and 65 would have been obvious over Bouevitch and Carr, and that claims 1–4, 19–23, 27, 29, 44–46, and 61–63 would have been obvious over Bouevitch and Sparks.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, based on a preponderance of the evidence, claims 1– 4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53 and 61–65 of U.S. Patent No. RE42,678 are unpatentable; and,

FURTHER ORDERED that, because this is a Final Written Decision, the parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

For PETITIONER:

Nathaniel T. Browand
Mark Scarsi
Christopher Gaspar
Christopher E. Chalsen
Lawrence T. Kass
Suraj K. Balusa
MILBANK, TWEED, HADLEY & MCCLOY LLP
nbrowand@milbank.com
mscarsi@milbank.com
cgaspar@milbank.com
cchalsen@milbank.com
lkass@milbank.com
sbalusu@milbank.com

Matthew J. Moore
Robert Steinberg
LATHAM & WATKINS LLP
matthew.moore@lw.com
bob.steinberg@lw.com

J. Pieter van Es
Thomas K. Pratt
Jordan N. Bodner
Michael S. Cuviello
BANNER & WITCOFF, LTD.
PvanEs@bannerwitcoff.com
TPratt@bannerwitcoff.com
JBodner@bannerwitcoff.com
MCuviello@bannerwitcoff.com

For PATENT OWNER:

Jason D. Eisenberg
Robert Greene Sterne
Jon E. Wright
Jonathan Tuminaro
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
jasone-PTAB@skgf.com
rsterne-PTAB@skgf.com
jwright-PTAB@skgf.com
jtuminar-PTAB@skgf.com

APPENDIX I

Trials@uspto.gov Paper 51
571-272-7822 Entered: September 29, 2016

UNITED STATES PATENT AND
TRADEMARK OFFICE

BEFORE THE PATENT TRIAL
AND APPEAL BOARD

LUMENTUM HOLDINGS, INC., LUMENTUM, INC., LUMENTUM OPERATIONS, LLC, CORIANT OPERATIONS, INC., CORIANT (USA) INC., CIENA CORPORATION, CISCO SYSTEMS, INC., and FUJITSU NETWORK COMMUNICATIONS, INC.,
Petitioner,

v.

CAPELLA PHOTONICS, INC.,
Patent Owner.

Case IPR2015-00731[1]

[1] IPR2015-01969 was joined with IPR2015-00731 on March 10, 2016, by Order in IPR2015-01969, Paper 11 (IPR2015-00731, Paper 42).

Patent RE42,368

Before JOSIAH C. COCKS, KALYAN K. DESHPANDE, and JAMES A. TARTAL, *Administrative Patent Judges*.

TARTAL, *Administrative Patent Judge.*

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and *37 C.F.R. § 42.73*

I. INTRODUCTION

Petitioner, Lumentum Holdings, Inc., Lumentum Inc., Lumentum Operations, LLC, Coriant Operations, Inc., Coriant (USA) Inc., Ciena Corporation, Cisco Systems, Inc., and Fujitsu Network Communications, Inc., filed petitions requesting an *inter partes* review of claims 1–6, 9–13, and 15–22 of U.S. Patent No. RE42,368 ("the '368 patent"). Paper 1 ("Petition" or "Pet."); *see also* IPR2015-01969, Paper 6.

Claims 1–6, 9–13, and 15–22 of the '368 patent were previously held to be unpatentable in *Cisco Systems, Inc., Ciena Corporation, Coriant Operations, Inc., Coriant (USA) Inc., and Fujitsu Network* Communications*, Inc., v. Capella Photonics, Inc*., IPR2014-01166, (PTAB Jan. 28, 2016) (Paper

44) (the '1166 case). Claims 1–6, 9–12, and 15–22 of the '368 patent also were previously held to be unpatentable in *Fujitsu Network Communications, Inc., Coriant Operations, Inc., Coriant (USA) Inc., and Ciena Corporation v. Capella Photonics, Inc.*, IPR2015-00726, (PTAB Sep. 28, 2016) (Paper 38) (the '726 case). The grounds of unpatentability asserted by Petitioner in this case rely on combinations of prior art, evidence, and arguments not asserted in either the '1166 case or the '726 case. Likewise, Patent Owner, Capella Photonics, Inc., advances arguments and evidence in response in this case that were not asserted by Patent Owner in either the '1166 case or the '726 case.

Based on the information provided in the Petition, and in consideration of the Preliminary Response (Paper 7) of Patent Owner, we instituted a trial pursuant to 35 U.S.C. § 314(a) of: (1) claims 1–6, 9–11, 13,and 15–22 as obvious over Bouevitch[2], Sparks[3], and Lin[4] under 35 U.S.C. §103(a); and, (2) claim 12 as obvious over Bouevitch, Sparks, Lin, and Dueck[5] under 35 U.S.C. § 103(a). Paper 8

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[2] U.S. Patent No. 6,498,872 B2, issued December 24, 2002 (Ex. 1003, "Bouevitch")

[3] U.S. Patent No. 6,625,340 B1, issued September 23, 2003 (Ex. 1004, "Sparks").

[4] U.S. Patent No. 5,661,591, issued August 26, 1997 (Ex. 1010, "Lin")

[5] U.S. Patent No. 6,011,884, issued January 4, 2000 (Ex. 1021, "Dueck")

(“Institution Decision”); *see also* IPR2015-01969, Paper 11.

After institution of trial, Patent Owner filed a Response (Paper 17, “Response” or “PO Resp.”) and Petitioner filed a Reply (Paper 37, “Pet. Reply”). The Petition is supported by the Declaration of Sheldon McLaughlin (Ex. 1028). The Response is supported by the Declaration of Dr. Alexander V. Sergienko (Ex. 2022).

A transcript of the Oral Hearing conducted on May 24, 2016, is entered as Paper 50 (“Tr.”).

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, Petitioner has shown by a preponderance of the evidence that claims 1–6, 9–13, and 15–22 of the ’368 patent are unpatentable.

II. BACKGROUND

A. The ’368 patent (Ex. 1001)

The ’368 patent, titled “Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities,” reissued May 17, 2011, from U.S. Patent No. 6,879,750 (“the ’750 patent”). Ex. 1001. The ’750 patent issued April 12, 2005, from application number 10/745,364, filed December 22, 2003.

According to the ’368 patent, “fiber-optic communications networks commonly employ wavelength division multiplexing (WDM), for it allows multiple information (or data) channels to be simultaneously transmitted on a single optical fiber by using different wavelengths and thereby significantly enhances the information bandwidth of the fiber." *Id.* at 1:37–42. An optical add-drop multiplexer (OADM) is used both to remove wavelengths selectively from a multiplicity of wavelengths on an optical fiber (taking away one or more data channels from the traffic stream on the fiber), and to add wavelengths back onto the fiber (inserting new data channels in the same stream of traffic). *Id.* at 1:45–51.

The '368 patent describes a "wavelength-separating-routing (WSR) apparatus that uses a diffraction grating to separate a multi-wavelength optical signal by wavelength into multiple spectral channels, which are then focused onto an array of corresponding channel micromirrors." *Id.* at Abstract. "The channel micromirrors are individually controllable and continuously pivotable to reflect the spectral channels into selected output ports." *Id.* According to Petitioner, the small, tilting mirrors are sometimes called Micro ElectroMechanical Systems or "MEMS." Pet. 8.

The WSR described in the '368 patent may be used to construct dynamically reconfigurable OADMs for WDM optical networking applications. Ex. 1001, Abstract.

Figure 1A of the '368 patent is reproduced below.

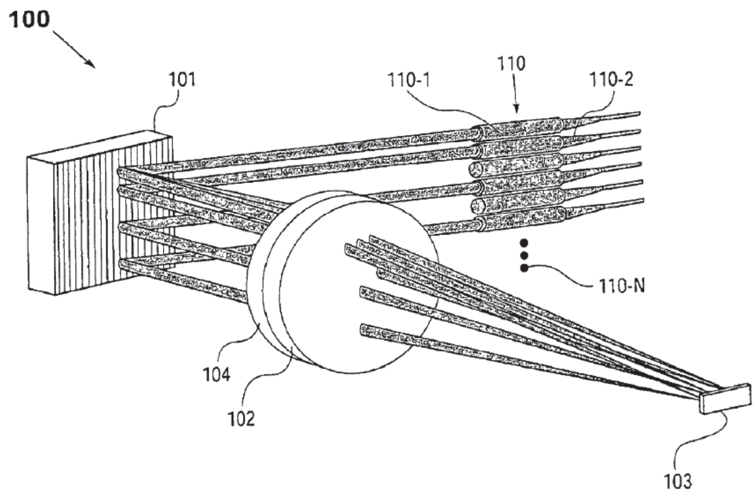

Fig. 1A

Figure 1A depicts wavelength-separating-routing (WSR) apparatus 100, in accordance with the ’368 patent. WSR apparatus 100 is comprised of an array of fiber collimators 110 (multiple input/output ports, including input port 110-1 and output ports 110-2 through 110-N), diffraction grating 101 (a wavelength separator), quarter wave plate 104, focusing lens 102 (a beam- focuser), and array of channel micromirrors 103. Ex. 1001, 6:57–63, 7:55–56.

A multi-wavelength optical signal emerges from input port 110-1 and is separated into multiple spectral channels by diffraction grating 101, which are then focused by focusing lens 102 into a spatial array of distinct spectral spots (not shown). *Id.* at 6:64–7:2. Channel micromirrors 103 are positioned such that each channel micromirror receives one of the spectral channels.

Figure 1B of the ’368 patent is reproduced below.

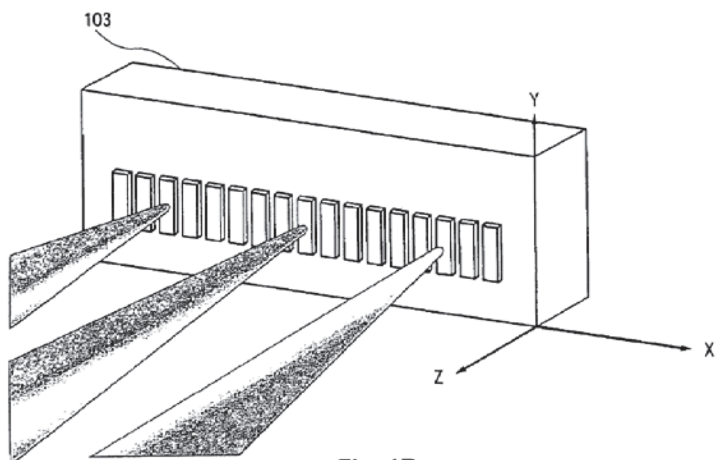

Fig. 1B

Figure 1B depicts a close-up view of the array of channel micromirrors 103 shown above in Figure 1A. *Id.* at 8:6–7. The channel micromirrors “are individually controllable and movable, e.g. pivotable (or rotatable) under analog (or continuous) control, such that, upon reflection, the spectral channels are directed” into selected output ports by way of focusing lens 102 and diffraction grating 101. *Id.* at 7:6–11.

According to the ’368 patent:

> each micromirror may be pivoted about one or two axes. What is important is that the pivoting (or rotational) motion of each channel micromirror be individually controllable in an analog manner, whereby the pivoting angle

> can be continuously adjusted so as to enable the channel micromirror to scan a spectral channel across all possible output ports.

Id. at 9:8–14.

Figure 3 of the '368 patent is reproduced below.

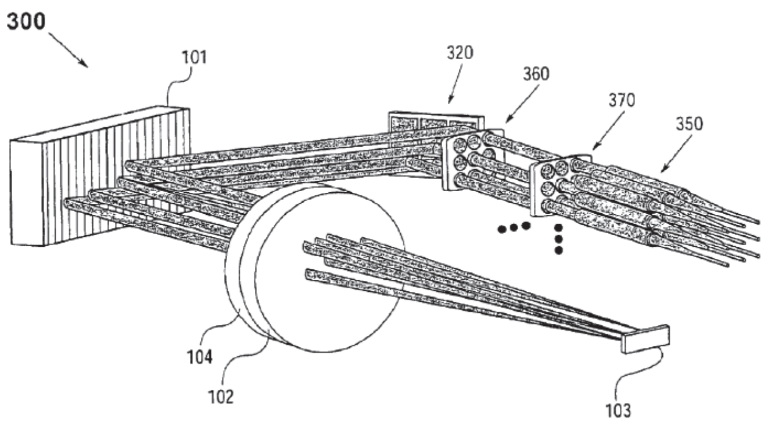

Fig. 3

Similar to Figure 1A, above, Figure 3 also shows a WSR apparatus as described by the '368 patent. Ex. 1001, 10:25–26. In this embodiment, two- dimensional array of fiber collimators 350 provides an input port and plurality of output ports. *Id.* at 10:31–32. First and second two-dimensional arrays of imaging lenses 360, 370 are placed in a telecentric arrangement between two-dimensional collimator-alignment mirror array 320 and two-dimensional fiber collimator array 350. *Id.* at 10:37–

43. "The channel micromirrors 103 must be pivotable biaxially in this case (in order to direct its corresponding spectral channel to anyone of the output ports)." *Id.* At 10:43–46.

The WSR also may incorporate a servo-control assembly (together termed a "WSR-S apparatus"). *Id*. at 4:65–67. According to the '368 patent:

> The servo-control assembly serves to monitor the power levels of the spectral channels coupled into the output ports and further provide control of the channel micromirrors on an individual basis, so as to maintain a predetermined coupling efficiency of each spectral channel in one of the output ports. As such, the servo-control assembly provides dynamic control of the coupling of the spectral channels into the respective output ports and actively manages the power levels of the spectral channels coupled into the output ports.

Id. at 4:47–56.

Figure 5 of the '368 patent is reproduced below.

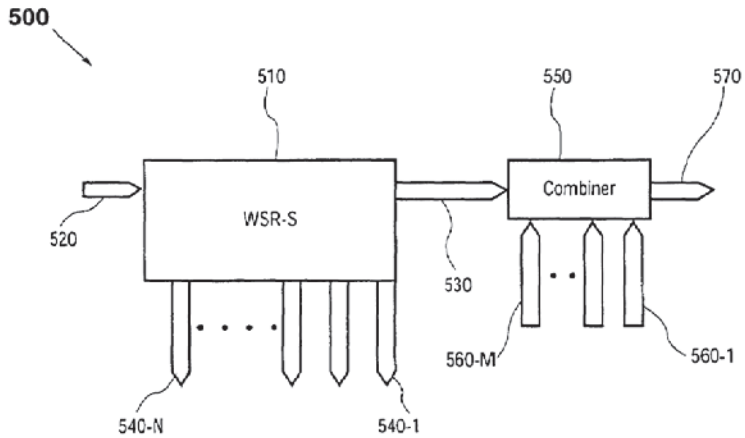

Fig. 5

Figure 5 depicts OADM 500 in accordance with the '368 patent composed of WSR-S (or WSR) apparatus 510 and optical combiner 550. *Id.* at 12:40–44. Input port 520 transmits a multi-wavelength optical signal, which is separated and routed into a plurality of output ports, including pass-through port 530 and one or more drop ports 540-1 through 540-N. *Id.* at 12:44–48. Pass-through port 530 is optically coupled to optical combiner 550, which combines the pass-through spectral channels with one or more add spectral channels provided by one or more add ports 560-1 through 560-M. *Id.* at 12:52–56. The combined optical signal is then routed into an existing port 570, providing an output multi-wavelength optical signal. *Id.* at 12:56–58.

B. Illustrative Claims

Challenged claims 1, 15, 16, and 17 of the '368 patent are independent. Claims 2–6 and 9–13 ultimately depend from claim 1 and claims 18–22 ultimately depend from claim 17. Claims 1 and 17 of the '368 patent are illustrative of the claims at issue:

> 1. An optical add-drop apparatus comprising an input port for an input multi-wavelength optical signal having first spectral channels; one or more other ports for second spectral channels; an output port for an output multi-wavelength optical signal; a wavelength-selective device for spatially separating said spectral channels; [and] a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels, each of said elements being individually and continuously controllable *in two dimensions* to reflect its corresponding spectral channel to a selected one of said ports *and to control the power of the spectral channel reflected to said selected port*.

Ex. 1001, 14:6–20.

> 17. A method of performing dynamic add and drop in a WDM optical network, comprising separating an input multi-wavelength optical signal into spectral channels; imaging each of said spectral channels onto a corresponding beam-

> deflecting element; and controlling dynamically and continuously said beam-deflecting elements *in two dimensions* so as to combine selected ones of said spectral channels into an output multi-wavelength optical signal *and to control the power of the spectral channels combined into said output multi- wavelength optical signal*.

Ex. 1001, 16:3–14.

III. ANALYSIS

A. Claim Construction

The Board interprets claims using the "broadest reasonable construction in light of the specification of the patent in which [they] appear[]." 37 C.F.R. § 42.100(b). We presume a claim term carries its "ordinary and customary meaning," which is "the meaning that the term would have to a person of ordinary skill in the art in question" at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). A patentee may, however, act as their own lexicographer and give a term a particular meaning in the Specification, but must do so with "reasonable clarity, deliberateness, and precision." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Only terms which are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

1. *"to control"*

Independent claims 1, 15, and 16 each recite outside of the preamble:

> a spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels, each of said elements being individually and continuously controllable in two dimensions to reflect its corresponding spectral channel to a selected one of said ports and <u>to control the power of the spectral channel reflected</u> to said selected port.

Ex. 1001, 14:14– 20, 15:14–20, 15:31–37 (emphases added). Independent claim 17 contains a similar limitation.[6] Petitioner contends that the "to control" clause "refers merely to intended use" and is limited "only to structure that may be capable of redirecting a spectral channel to a particular port." Pet. 13. Petitioner further asserts that the "to control" clause means "to change the power in the spectral channel that is received by a particular port." *Id.* Petitioner identifies no sufficient evidence in support of construing "to control" as meaning "to change." Patent Owner does not address the meaning of the

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[6] Claim 17 recites: "controlling dynamically and continuously said beam- deflecting elements in two dimensions so as to combine selected ones of said spectral channels into an output multi-wavelength optical signal and to control the power of the spectral channels combined into said output multi-wavelength optical signal." Ex. 1001, 16:9–14.

term. Although "apparatus claims cover what a device is, not what a device does," the language at issue here describes the function that the apparatus must be capable of performing. *Hewlett-Packard Co. v. Bausch & Lomb, Inc.*, 909 F.2d 1464, 1468 (Fed.Cir.1990); *see also K-2 Corp. v. Salomon S.A.*, 191 F.3d 1356, 1363 (Fed. Cir. 1999) (explaining that functional language is an additional limitation in the claim). In that regard, the "to control" clause is, thus, functional rather than non- functional. Accordingly, the claimed "spatial array of beam-deflecting elements" is further limited to a spatial array that satisfies the "to control" functional limitations. We determine no further express construction of the "to control" clause is necessary for purposes of this decision.

2. "*continuously controllable*"

Claim 1 requires "a spatial array of beam-deflecting elements . . . each of said elements being individually and continuously controllable." Similarly, claim 17 requires "controlling dynamically and continuously said beam-deflecting elements." Petitioner asserts that "continuously controllable" should be construed to mean "able to effect changes with fine precision." Pet. at 11. Petitioner also notes, however, that the '368 patent identifies "under analog control" as an example of continuous control, and contends that "the example of analog control does not alone define the [broadest reasonable interpretation] of continuously controllable." *Id.* at 12; *see also* Ex. 1028 (stating "a mirror that is disclosed to be under analog control would fit within the scope of "continuously controllable"). Petitioner identifies the following disclosures of the '368 patent as supporting its proposed construction:

The '368 Patent explains that "[a] distinct feature of the channel micromirrors in the present invention, in contrast to those used in the prior art, is that the motion…of each channel micromirror is under ***analog control*** such that its pivoting angle can be ***continuously adjusted***." ([Ex. 1001], 4:7–11; emphasis added). Another passage in the specification states that "[w]hat is important is that the pivoting (or rotational) motion of each channel micromirror be individually ***controllable in an analog manner***, whereby the pivoting angle can be continuously adjusted so as to enable the channel micromirror to scan a spectral channel across all possible output ports." (*Id*., 9:9–14; emphasis added). Yet another passage states that "channel micromirrors 103 are individually controllable and movable, e.g., pivotable (or rotatable) under analog (or continuous) control." (*Id*., 7:6–8). Pet. 12. Patent Owner disputes Petitioner's proposed construction, but offers no express alternative. PO Response 46–47. We find that Petitioner: (1) offers no sufficient explanation for how its proposed definition accounts for the term "continuously" in "continuously controllable"; (2) directs us to no portion of the specification of the '368 patent that uses "fine precision"; and (3) fails to explain what "fine precision" is intended to encompass or exclude. *See id.* at 11–12. Additionally, based on all of the evidence presented, we are not persuaded that "continuously controllable" is limited to "analog control," or that "analog control" necessarily corresponds to "continuous" control under all circumstances. We determine that "continuously controllable," in light of the specification of the '368 patent, encompasses "under analog control such that it can be continuously adjusted."

3. "port"

Claim 1 requires "an input port . . . one or more other ports. . . [and] an output port." Patent Owner contends that in the '368 patent "the structure or elements making up the ports are collimators." PO Resp. 33. Patent Owner offers no definition of "port," and does not suggest that the '368 patent provides an express definition of the term, but instead argues that a "port," as claimed, is not a "circulator port" because the '368 patent "disavows circulator-based optical systems." *Id.* at 34. We disagree.

There is no dispute that the ordinary and customary meaning of "port" encompasses circulator ports, and, indeed, any "point of entry or exit of light." *See* Dr. Sergienko Deposition Transcript (Ex. 1040), 43:16–23, 45:12–13 ("The circulator ports are ports with constraints."). Nor does the '368 patent equate the term "port" to "collimator," as both "port" and "collimator" appear separately in the claims of the '368 patent. Ex. 1001, 14:7, 14:48–51. We have considered the testimony of Dr. Sergienko as well (Ex. 2022 ¶¶ 168–172), and find that even if certain fiber collimators serve as ports in the '368 patent, that does not redefine the term "port" to mean "collimator." *See id*. at ¶ 171. Thus, the primary issue is whether the '368 patent disavows circulator ports from the scope of the term "port."

Although the broad scope of a claim term may be intentionally disavowed, "this intention must be clear," *see Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002) ("The patentee may demonstrate an intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."), and cannot draw limitations into the claim from a preferred embodiment." *Conoco, Inc. v. Energy & Envtl. Int'l.*, 460 F.3d 1349, 1357 (Fed. Cir. 2006).

Patent Owner fails to show any expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope with respect to the use of "port" in the '368 patent. Patent Owner argues: (1) that the '368 patent provides a scalable system without circulator ports, that a provisional application to the '368 patent "describes existing add/drop architectures that had a number of problems" (PO Resp. 35); (2) that U.S. Patent No. 6,984,917 shows how experts use the term "input port" and "output port" because it uses elements "similar to how the '368 patent describes fiber collimators serving as ports" (PO Resp. 42–43); and (3) that because the inventors of the '368 patent "consistently emphasized the limitations of circulator-based switches and provided an alternative configuration," a person of ordinary skill in the art would have understood that the inventors were disavowing the use of optical circulators (PO Resp. 35). S*ee also* PO Resp. 34–39 (citing Ex 2022 ¶ 182).

We do not discern any "clear disavowal of claim scope" from the arguments advanced by Patent Owner. Dr. Sergienko merely states that based on market differentiation, construing "ports" to include circulator ports "goes beyond the intent of the '368 patent." Ex. 2022, ¶ 182. Even if the '368 patent were viewed as Dr. Sergienko suggests, a speculative purported intent of market differentiation is not disavowal. Moreover, Petitioner further demonstrates that a provisional application to the '368 patent in fact uses circulator ports as "ports." Pet. Reply 12–13 (citing Ex. 1008, 3, Fig. 9). Such usage undermines Patent Owner's disavowal contention. Patent Owner's argument that the provisional application is "entirely consistent with the '368 patent's use of collimators" fails to negate the fact that the provisional application uses circulator ports as "ports." *See* PO Resp. 39–42. Similarly, we find insufficient support for Patent Owner's argument based on the preamble that "circulators can only be coupled to, but not part of, the [optical add drop] apparatus. *See id.* at 39. We are not persuaded that the preamble's recitation of a "[a]n optical add-drop apparatus comprising" of claim 1 is limiting because "the body of the claim fully and intrinsically sets forth the complete invention, including all of its limitations." *See Pitney*

Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1305 (Fed. Cir. 1999). Because "the preamble offers no distinct definition of any of the claimed invention's limitations, but rather merely states . . . the purpose or intended use of the invention, . . . the preamble is of no significance to claim construction." *Id.* (citing *Rowe v. Dror*, 112 F.3d 473, 478 (Fed. Cir. 1997); *Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257 (Fed. Cir. 1989); *Kropa v. Robie*, 187 F.2d 150, 152 (CCPA 1951)). We also are persuaded that Bouevitch's "Configurable Optical Add/Drop Multiplexer" is recognized as an optical add-drop apparatus and includes circulators. *See* Pet. Reply 13. We have considered all of the arguments advanced by Patent Owner in its effort to redefine "port" as excluding "circulator ports" (PO Resp. 31–43), and find insufficient support for Patent Owner's contention that the '368 patent disavows or otherwise excludes circulator ports from the scope of the term "port." We determine that "port," in light of the specification of the '368 patent, encompasses "circulator port."

4. "beam *focuser*"

Claim 11 requires a "beam-focuser for focusing said separated spectral channels onto said beam deflecting elements." The '368 patent states that "[t]he beam-focuser may be a single lens, an assembly of lenses, or other beam focusing means known in the art." Ex. 1001, 4:20–22.

Petitioner contends that "beam focuser" is "a device that directs a beam of light to a spot." Pet. 16. According to Petitioner:

> The Summary of the '368 patent states that the "beam-focuser focuses the spectral channels into corresponding spectral spots." ([Ex. 1001], 3:63-64.) The specification also explains that the beams of light are "focused by the focusing lens 102 into a spatial array of distinct spectral spots (not shown in FIG. lA) in a one- to-one correspondence." (*Id.*, 6:65-7:5.) The MEMS mirrors are in turn "positioned in accordance with the spatial array formed by the spectral spots, such that each channel micromirror receives one of the spectral channels." (*Id.*)

Id. Patent Owner does not dispute expressly Petitioner's proposed construction, and provides no alternative construction of "beam focuser." Consistent with Petitioner's proposed construction, Dr. Sergienko testified that "focusing means bringing of the energy in the original image limited to the focal spot." Ex. 1040, 245:17–19. We agree that, based on the specification of the '368 patent, "beam focuser" means "a device that directs a beam of light to a spot."

5. "*dynamically*"

Claim 17 recites "[a] method of performing dynamic add and drop in a WDM optical network, comprising: . . . controlling dynamically and continuously said beam-deflecting elements in two dimensions." Ex. 1001, 16:3–10. Petitioner contends that "'dynamically' imports an aspect of control during operation," and equates the term to "able to effect changes . . . during operation." Pet. 17. It is unclear how Petitioner equates "dynamically" to "during operation" and no supporting citation is provided.

The '368 patent uses "dynamic" and "dynamically" throughout the specification, stating, for example, that "[t]he power levels of the spectral channels in the output ports may be dynamically managed according to demand." Ex. 1001, 11:30–32. We determine from the specification that the '368 patent uses "dynamically" in contrast to "static," in accordance with its ordinary and customary meaning.

6. Additional Claim Terms

Petitioner addresses several additional claim terms, including "in two dimensions," "spectral monitor," and "servo-control assembly." Pet. 12–16. For purposes of this decision, no express construction of any additional claim terms is necessary.

B. References Asserted as Prior Art

Petitioner relies on Bouevitch, Sparks, Lin, and Dueck with respect to its assertion that the challenged claims would have been obvious.

1. Bouevitch

Bouevitch describes an optical device for rerouting and modifying an optical signal, including modifying means such as a MEMS array and a liquid crystal array which function as an attenuator when the device operates as a dynamic gain equalizer (DGE), and as a switching array when the device operates as a configurable optical add/drop multiplexer (COADM). Ex. 1003, Abstract. According to Petitioner, the COADM described in Bouevitch "uses MEMS mirrors with 1 axis of rotation." Pet. 20. Petitioner also contends that the Bouevitch COADM controls the power of its output channels by tilting beam-deflecting mirrors at varying angles. *Id.* at 19.

2. Sparks

Sparks describes an optical switch arranged to misalign the optical beam path to provide a predetermined optical output power. Ex. 1004, Abstract. According to Sparks, "[t]he system operates by controlling the movable micromirrors (16, 26), which are fabricated using MEMS technology and are capable of two axis movement, to carefully align the beams so as to ensure that the maximum possible input optical signal is received at the output of the switch." *Id.* at 4:43–46.

3. Lin

Lin describes a "spatial light modulator… operable in the analog mode for light beam steering or scanning applications." Ex. 1010, Abstract. Lin explains that the angular deflection of a mirror about the torsional axis is a function of the voltage potential applied to an address electrode. *Id.* At 6:29–32. Petitioner contends that Figure 3B of Lin depicts a continuous and linear relationship between the deflection angle of the MEMS mirrors and the applied voltage. Pet. 31.

4. Dueck

Dueck describes a wavelength division multiplexer that integrates an axial gradient refractive index element with a diffraction grating to provide efficient coupling from a plurality of input sources. Ex. 1021, Abstract. Petitioner contends that Dueck describes various diffraction gratings for use in WDM devices. Pet. 19.

C. Asserted Obviousness Over Bouevitch, Sparks, and Lin

Petitioner asserts that claims 1–6, 9–11, 13, and 15–22 would have been obvious over Bouevitch, Sparks, and Lin.[7] Pet. 5.

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[7] Petitioner initially argues that Patent Owner admitted in a Replacement Reissue Application Declaration by Assignee that all elements of claim 1, except for two-axis mirrors, were disclosed by Bouevitch. Pet. 9–11 (quoting Ex. 1002, 81–82). Petitioner identifies no persuasive authority for the proposition that such a statement should be treated as an admission in this proceeding. Moreover, rather than admit that all original elements of claim 1 are disclosed by Bouevitch, the statement makes clear that three additional references not

1. Claim 1

Claim 1, directed to an optical add-drop apparatus, requires "an input port . . . one or more other ports . . . [and] an output port." Petitioner asserts that Bouevitch discloses an optical add-drop apparatus, including an input port (labeled "IN"), one or more other ports (labeled 80b "IN ADD" and "OUT DROP"), and an output port (labeled "OUT EXPRESS"), as recited by claim 1 of the '368 patent. Pet. 25–26 (citing Ex. 1003, Fig. 11).m Petitioner's contentions are supported by Sheldon McLaughlin, an employee of Petitioner. Ex. 1028 (Declaration of Sheldon McLaughlin) ¶¶ 2, 38–41.

Patent Owner argues that, under its proposed claim construction of "port," Bouevitch discloses at most two ports because the '368 patent equates "port" to "collimator" and disavows circulator ports. PO Resp. 31–44. For the reasons explained above in our claim construction analysis for "port," we reject Patent Owner's claim construction for "port." Accordingly, we do not agree with Patent Owner's contention that the only ports disclosed by Bouevitch are collimator lenses 12a and 12b. *See* PO Resp. 44. Petitioner has shown, as discussed above and as supported by Mr. McLaughlin, that Bouevitch

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relied upon by Petitioner in this proceeding were considered in combination with Bouevitch. As a result, we are not persuaded that Patent Owner has admitted all elements of claim 1, except for two-axis mirrors, were disclosed by Bouevitch.

discloses the recited input, output, and one or more other ports, as recited by claim 1.

Claim 1 requires "a wavelength-selective device" for spatially separating spectral channels. Petitioner identifies diffraction grating 20 of Bouevitch as corresponding to the recited "wavelength-selective device." Pet. 27. Claim 1 also requires "a spatial array of beam-deflecting elements." Petitioner identifies MEMS mirror array 50 of Bouevitch as corresponding to the recited "spatial array of beam-deflecting elements positioned such that each element receives a corresponding one of said spectral channels." Pet. 27–28. Patent Owner does not dispute Petitioner's contentions, with which we agree. Patent Owner does, however, argue that "Petitioner does not meet its burden of showing in the Petition how 'deflecting' to acirculator and then 'propagating' to the output or the drop meets the claim element "reflecting" to an output port," and that "propagating" is not "reflecting." PO Resp. 44–45. Patent Owner's argument is not persuasive because it is beyond the scope of the claims, which do not require reflection directly to an output port. To the contrary, we agree with Petitioner that "Fig. 1A of the '368 patent, for example, discloses a light beam that reflects off micromirror 103, and then propagates back though both focusing lens 102 and quarter-wave plate 104 before being directed to an output port." Pet. Reply 14.

For each of the beam-deflecting elements, claim 1 further requires that they be "individually and continuously controllable *in two dimensions* to reflect its corresponding spectral channel to a selected one of said ports *and to control the power of the spectral channel reflected to said selected port*."

The '368 patent provides analog control as an example of "continuously controllable," and Petitioner shows that Bouevitch discloses continuously controllable power attenuation as an analog function of the angle of the deflector, which is also described as "variable." *Id.* at 28–30. As Mr. McLaughlin explains, a person of ordinary skill would understand from Bouevitch that "the level of control, required to balance the optical power differentials among the wavelength channels, is achieved via analog voltage control." Ex. 1028 ¶ 48. *See also* Declaration of Dr. Dan Marom, Ex. 1029 ¶ 58 (explaining that Bouevitch discloses the use of variable attenuation for power control, and a person of ordinary skill in the art would understand that the necessary level of control required to balance the optical power differentials among the wavelength channels is achieved in Bouevitch with continuous control over the mirror tilt via analog voltage control); Ex. 1003, 7:35–37 (stating that "[t]he degree of attenuation is based on the degree of deflection provided by the reflector (i.e., the angle of reflection)"). Patent Owner does not otherwise dispute Petitioner's contention that Bouevitch discloses continuous control of beam-deflecting elements via analog voltage control with respect to a single axis. *See* PO Resp. 47.

Petitioner also contends that Lin discloses "continuous control." Pet. 31–32, Ex. 1028 ¶ 51. Lin describes a spatial light modulator (SLM) operable in the analog mode for light beam steering or scanning applications. Ex. 1010, Abstract. Figures 3A and 3B of Lin are reproduced below.

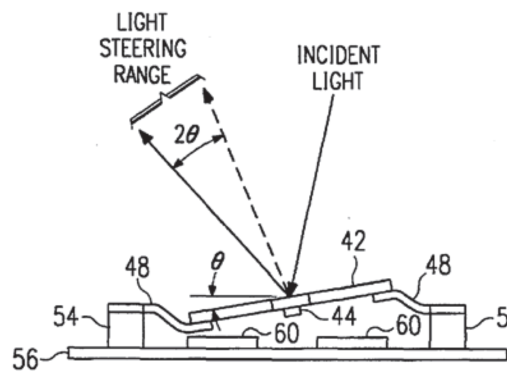

FIG. 3A

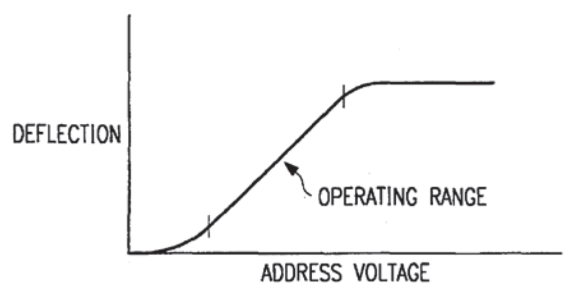

FIG. 3B

Figure 3A is a spatial light modulator, "illustrating the pixel being deflected about the torsion hinge to steer incident light in a selected direction, the deflection of the pixel being a function of the voltage applied to the underlying address electrode." Ex. 1010, 5:20–25. As Petitioner explains, Figure 3B shows a graph disclosing the continuous deflection angle of MEMS mirrors as a function of the voltage applied to affect that deflection. Pet. 31; *see also* Ex. 1028 ¶ 61 (testimony of Dr. Marom stating that Lin "confirms that continuous and analog control of MEMS mirrors was known prior to the '368 patent's priority date"). Lin explains that "the angular deflection of mirror 42 about the torsional axis defined by hinges 44 is seen to be a function of the voltage potential applied to one of the address electrodes 60." Ex. 1010, 6:29–32. Lin further explains that:

> With an address voltage being applied to one address electrode 60 being from 0 to 20 volts, mirror 42 is deflected proportional to the address voltage. When SLM 40 is operated as an optical switch or light steerer, incident light can be precisely steered to a receiver such as an optical sensor or scanner. The mirror tilt angle can be achieved with a excellent accuracy for pixel steering.

Id. at 7:13–19.

Patent Owner argues that Petitioner has not shown that Lin discloses continuous control because such control cannot be shown by the input signal alone, and Petitioner did not "look at the structure of the mirror, how the voltage affects movement of the mirror, and what control loop algorithm has been utilized." PO Resp. 51 (citing Ex. 2022 ¶ 204–05 (stating that Lin Figure 3B "may represent a mirror that is controlled in a step-wise manner"). We find the speculative testimony of Dr. Sergienko not persuasive over the express disclosure of Lin of analog control whereby "mirror 42 is deflected proportional to the address voltage," thereby demonstrating "continuous control," as claimed.

With regard to beam-deflecting elements controllable in two dimensions, as required by claim 1, Petitioner also shows that "Sparks describes 'movable micromirrors (16,26), which are fabricated using MEMS technology and are capable of two axis movement, to carefully align the beams so as to ensure that the maximum possible input optical signal is received at the output of the switch.'" Pet. 33–34 (quoting Ex. 1004, 4:43–47); *see also* Ex. 1028 ¶ 56). Patent Owner does not dispute that Sparks discloses MEMS controllable in two dimensions. *See* PO Resp. 48.

In summary, for the reasons discussed above, Petitioner has established that Bouevitch discloses all of the recited limitations of claim l for an array of mirrors individually and continuously controllable on a single axis, but not on a two axis (i.e., two dimension) array "to reflect its corresponding spectral channel to a selected one of said ports and to control the power of the spectral channel reflected to said selected port." Patent Owner did not dispute that Bouevitch discloses continuous control of beam-deflecting elements via analog voltage control with respect to a single axis, and Petitioner has demonstrated that Lin also discloses such "continuous control." Finally, Petitioner has established that Sparks discloses an array of mirrors controllable in two dimensions "to reflect" and "to control," as recited by claim 1. Thus, the remaining issue is whether Petitioner has provided "some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007).[8]

With respect to a rationale for combining Bouevitch and Sparks, Petitioner contends the use of the two-axis mirror of Sparks in Bouevitch: (1) is a simple substitution of one known element for another yielding predictable results, (2) is the use of a known technique to improve similar devices, (3) would be obvious to try as there are only two options for tilting MEMS mirrors: one-axis and two-axis mirrors, and (4) would be motivated to help ensure that all channels have nearly equivalent power and to overcome manufacturing deviations by being actuatable to adjust for any unintentional misalignment in two axes. Pet. 22–24. Petitioner also contends that several reasons support the

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[8] The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) secondary considerations, i.e. objective evidence of unobviousness. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We have considered each of the Graham factors and incorporate our discussion of those considerations, to the extent there is a dispute, in our evaluation of the reasoning that supports the asserted combination.

addition of Lin's continuous, analog control to the asserted combination:

> (1) continuously controlled mirrors were known to be interchangeable with discrete step mirrors; (2) continuously controlled mirrors allow arbitrary positioning of mirrors and can more precisely match the optimal coupling value; and (3) Lin specifically teaches that its analog, continuous MEMS mirrors would be useful in optical switching applications like Bouevitch's and Sparks' optical switch devices. (Lin, Ex. 1010 at 2:6–9; McLaughlin Decl., Ex. 1028 at ¶ 52.)

Pet. 32.

Patent Owner disputes the sufficiency of the rationale provided in the Petition. PO Resp. 14–29. First, Patent Owner argues that Petitioner combines disparate embodiments of Bouevitch, noting that the Petition cites portions of Bouevitch describing not only figure 11, but also figures 1, 5, 6a, and 9 which correspond to other embodiments. *Id.* at 16–18. Noting that various portions of a reference are cited does not show that the asserted combination is dependent upon a disclosure appearing only with respect to one embodiment and not another. Petitioner persuasively explains that it relies "only on the Fig. 11 embodiment of Bouevitch." Pet. Reply 1–2. Although Petitioner includes a discussion of Bouevitch's disclosure of power control in the Petition, it is clear that the asserted combination does not stand or fall on that disclosure. The

Petition states that a person of ordinary skill in the art "would be motivated to use the 2-axis system of Sparks within the system of Bouevitch for power control." Pet. 35. Petitioner's discussion of the power control embodiment of Bouevitch in support of the rationale for the asserted combination with Sparks (i.e., both Sparks and Bouevitch address power control) does not impose an obligation on Petitioner to articulate a rationale for including the power control embodiment of Bouevitch in the asserted combination.

Patent Owner also argues that a person of ordinary skill in the art would not have combined Bouevitch and Sparks for various reasons. PO Resp. 18–31. Patent Owner argues that if Bouevitch accomplishes both switching and power control using a one-axis mirror, absent hindsight a person of ordinary skill "would have had *no* reason" to use a two-axis mirror to control power, particularly because it would make it "vastly more complex." *Id.* at 18. We find Patent Owner's argument conclusory and not persuasive because it fails to address the benefits of a two-axis mirror disclosed by Sparks which would be apparent to one of skill in the art without hindsight. *See* Pet. Reply 3 (stating "Sparks expressly states that an advantage of the optical switches with two-axis mirrors is that attenuation (i.e., power control) can be achieved without incorporating separate attenuators within the system. (*See, e.g.*, Sparks, Ex. 1004, col. 2, ll. 28-30, col. 4, ll. 55-58.)"). Petitioners' expert Mr. McLaughlin testified that a person of ordinary skill would have been capable of overcoming any problems presented by technical issues. Ex. 2032, 125:18–126:10, 134:11–19, 137:16–23.) Patent Owner concedes that two-axis mirrors were known and cited during prosecution. PO Resp. 19. Patent Owner argues that Petitioner "fails to address the technical challenges" that would prevent it from being a simple substitution. PO Resp. 20–23. Dr. Sergienko was asked whether similar technical considerations presented problems that could not be overcome by one of skill in the art, and indicated "no." Ex. 1040, 266:16–267:25. Moreover, "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . . Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Here, the test for obviousness reflects what the combined teachings of Bouevitch, Sparks, and Lin would have suggested to one of ordinary skill in the art, and does not require that any one particular component of a reference must be bodily incorporated, or physically inserted, into another reference.

Next, Patent Owner argues that a person of ordinary skill in the art would not have been motivated to combine Spark's tiltable mirrors with Bouevitch because it would disrupt Bouevitch's explicit teaching of parallel alignment, and "Bouevitch teaches away from misalignment for power control." PO Resp. 23–27. "The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the … application." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). While Bouevitch discusses how angular displacement is disadvantageous in certain respects (*see* Ex. 1028, 2:1–7), we are not persuaded such discussion is sufficient to constitute a teaching away. To the contrary, Petitioner has shown persuasively that Bouevitch uses angular misalignment to control power in at least some embodiments of Bouevitch. Pet. Reply 4–6.

Similarly, Patent Owner's contention that Bouevitch and Sparks are "incompatible technologies" is not persuasive. *See* PO Resp. 27–29. According to Patent Owner, Bouevitch would be rendered unsatisfactory for its intended purpose "to provide *both* power optimization control *and* optimally efficient optical coupling of the beam to the output port" because Bouevitch and Sparks perform attenuation "at opposite ends of the optical system." *Id.* at 29. As Petitioner notes, Bouevitch discloses embodiments that perform power attenuation by angular misalignment of the beam using MEMS mirrors. Pet. Reply 6. Patent Owner's articulation of the intended purpose of Bouevitch focuses on only one objective, and fails to address what Bouevitch discloses as a whole to one of skill in the art. There is no over a one-axis mirror. "The fact that the motivating benefit comes at the expense of another benefit, … should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another." *Winner Int'l.,* 202 F.3d at 1349, n. 8. We are not persuaded that the costs identified by Patent Owner overcome the rationale of the asserted combination provided by Petitioner. Importantly, Patent Owner does not persuasively counter Petitioner's rationale that it would have been obvious to try, because, as Mr. McLaughlin testified: (1) there were only two solutions to the known need to deflect light beams with MEMS: 1-axis or 2- axis; (2) a person of ordinary skill would have had a high expectation of success to try two-axis mirror control in Bouevitch; and (3) the result of the combination would be predictable. *See* Pet. 22–23; Reply 4; Ex. 1028 ¶¶41–42; Ex. 1029 ¶ 45.

With respect to Lin, Patent Owner argues that "Petitioner provides no KSR rationale." PO Resp. 7. Patent Owner's argument neglects the rationale provided by Petitioner. See Pet. 32. Patent Owner also implicates "impermissible hindsight" in the combination with Lin (*id.* at 14) and argues that Petitioner fails to explain how to modify Lin's structural elements to incorporate a two-dimensional rotation (*id.* at 52–53). As explained above, however, the test for obviousness is not whether the features of one reference may be bodily incorporated into the structure of another reference. Moreover, the references of record reflect that there routinely are complex design considerations in the fiber optic communications field. Patent Owner does not explain persuasively why combining the teachings of Sparks and Lin would be beyond the skill of a skilled artisan. We find more persuasive Petitioner's contention that Lin specifically teaches that its analog, continuous MEMS mirrors would be useful in optical switching applications like Bouevitch's and Sparks' optical switch devices. *See* Ex. 1010, 2:6–9; Ex. 1028 ¶ 52.

Petitioner has articulated sufficient reasoning with some rational underpinning to support the legal conclusion of obviousness based on the asserted combination of Bouevitch, Sparks, and Lin. With regard to incorporating the teaching of a two-axis mirror in Sparks with Bouevitch, we are persuaded that it is a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter. The asserted combination of Sparks and Bouevitch and Lin yields a predictable result. *See KSR*, 550 U.S. at 416 ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.").

We are further persuaded that Petitioner has identified additional "rational underpinning" in support of the asserted combination. Mr. Laughlin explains that the references all address optical signal switches, that "the principles of operation of the MEMS-based actuating mirrors are essentially the same except that the mirrors of Sparks are actuatable in one more axis than those of Bouevitch," and that a two-axis mirror in place of a one-axis mirror "would yield a predictable result of the same functionality (e.g., movement of a reflective surface in a first axis) yet with more control (e.g., the reflective surface moving in a second axis in similar manner as the movement in the first axis). Ex. 1028 ¶ 30. While Lin is not necessary in light of our determination that Bouevitch also discloses continuous control, Mr. Laughlin persuasively explains that continuously controlled analog mirrors were recognized as interchangeable with discrete step mirrors. *Id*. At 53–55; *see also* Ex. 1010, 2:7–9, 3:41–57 (discussing analog control as an alternative to binary (discrete) control of mirrors to increase the precision of the mirror placement).

Finally, Patent Owner argues that "[i]ndustry adoption is additional evidence of non-obviousness and the fact that Petitioner relies on impermissible hindsight when making the combination." PO Resp. 54–59. In particular, Patent Owner argues that "[t]he industry recognized the advantages presented in [Patent Owner's] optical configuration. *Id*. at 55. Patent Owner quotes, for example, a statement that describes Patent Owner as offering "a 10-fiber port solution." *Id.* Patent Owner offers no explanation as to how such a statement is within the scope of the claims at issue. Similarly, Patent Owner refers to a "WavePath product line" without demonstrating any of those products practice the challenged claims. *See id*. Patent Owner further argues that "experts" adopted its ROADM configuration. *Id*. at 56–59. According to Patent Owner, if certain other patents held by Mr. Laughlin and Dr. Marom "are not evidence of nonobviousness themselves, they at the least show that Mr. McLaughlin and Dr. Marom are susceptible to hindsight bias because both worked on [Patent Owner's] optical configuration, and both were aware of the [Patent Owner's] optical configuration after [Patent Owner] disclosed it to the public.

We agree with Petitioner that Patent Owner does not offer adequate support that such alleged "industry adoption" suggests non-obviousness, and that Patent Owner does not demonstrate any nexus to the merits of the claimed invention. *See* Pet. Reply 20. Pet. Reply 20. We likewise agree with Petitioner that, to the extent that Patent Owner is suggesting that it is providing evidence of copying, it is insufficient because Patent Owner does not present any evidence of actual copying or a nexus to any of Patent Owner's products. *See, e.g., Iron Grip Barbell Co. Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) ("[C]opying requires the replication of a specific product."); *see also Tokai Corp. v. Easton Enters.*, 632 F.3d 1358, 1370 (Fed. Cir. 2011). We have considered all of the evidence of non- obviousness identified by Patent Owner. For the foregoing reasons, we conclude Petitioner has established by a preponderance of the evidence that claim 1 would have been obvious over Bouevitch, Sparks, and Lin.

2. Claims 2, 5, 6, 9, 10, 13, 15, and 16

Claims 2, 5, 6, 9, 10, 13, 15, and 16 ultimately depend from claim 1. In addition to addressing the elements of claim 1, we agree with Petitioner's identification of how claims 2, 5, 6, 9, 10, 13, 15, and 16 would have been obvious over Bouevitch, Sparks, and Lin, as supported by the declaration of Mr. Laughlin. Pet. 36–38, 43–46, 49–54. For example, claim 2 requires "a control unit for controlling each of said beam-deflecting elements," and Petitioner has shown that it would have been obvious to apply the control unit disclosed by Sparks to Bouevitch as it is the addition of a known element which yields the predictable result of electronic control. *See* Pet. 36–38. As another example, claim 13 requires that "beam-deflecting elements comprise micromachined mirrors." Petitioner has shown that mirrors disclosed in Bouevitch and Sparks are micromachined mirrors." Pet. 49–50. Patent Owner has not raised additional arguments with respect to claims 2, 5, 6, 9, 10, 13, 15, and 16 beyond those asserted with respect to claim 1, addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 2, 5, 6, 9, 10, 13, 15, and 16 would have been obvious over Bouevitch, Sparks, and Lin.

3. Claims 3 and 4

Claim 3, which depends from claim 1, further requires that the control unit "comprises a servo-control assembly, including a spectral monitor for monitoring power levels of selected ones of said spectral channels, and a processing unit responsive to said power levels for controlling said beam deflecting elements." Claim 4, which depends from claim 3, further requires that the "servo-control assembly maintains said power levels at predetermined values." The '368 patent states that:

> The electronic circuitry and the associated signal processing algorithm/software for such processing unit in a servo-control system are known in the art. A skilled artisan will know how to implement a suitable spectral monitor along with an appropriate processing unit to provide a servo-control assembly in a WSP-S apparatus according to the present invention, for a given application.

Ex. 1001, 12:9–15. Accordingly, the '368 patent expressly recognizes that the additional features of claims 3 and 4 were "known in the art" to a skilled artisan and would have been obvious to implement.

We agree with Petitioner's contention that the disclosure in Sparks of a "closed-loop servo control system" and "power measuring means" correspond to the claimed servo-control assembly and spectral monitor, and serve the same purpose. Pet. 38–42 (citing, *inter alia*, Ex. 1004, 2:59–65, 4:39–45, 4:61–67; Ex. 1028 ¶¶ 75–78). With regard to claim 4, Petitioner directs us to Sparks, which teaches that the closed-loop power control feature carries out "controlled misalignment of the optical beam path so as to achieve a predetermined optical output power" (Ex. 1004 at 2:24-25; *see also id.* at Abstract.) Petitioner also provides sufficient articulated reasoning with some rational underpinning to support the combination of the Sparks controller and optical power monitor with Bouevitch, including that "the feedback-driven control of Sparks would improve the precision of the mirror-based switching system of Bouevitch." Pet. 41–42 (citing Ex. 1028 ¶¶ 81–82). Petitioner also reasons that it would have been obvious to try the predetermined power settings of Sparks within Bouevitch, "because there are only a limited set of types of power settings to use: predetermined and not-predetermined." *Id.* at 42 (citing Ex. 1028 ¶ 86).

Patent Owner argues that Petitioner fails to explain how or why a person of ordinary skill would have been able to add Sparks's control features to Bouevitch. *Id*. Patent Owner does not address the disclosure of the '368 patent, which states that a "skilled artisan will know how to implement a suitable spectral monitor," or the reasoning provided by Petitioner. We have considered Patent Owner's arguments and find them to be insufficiently supported and conclusory. On the other hand, we conclude that Petitioner's reasoning is sound and supported adequately by the record. Petitioner has established by a preponderance of the evidence that claims 3 and 4 would have been obvious over Bouevitch, Sparks, and Lin.

4. Claim 11

Claim 11 depends from claim 1 and further requires "a beam-focuser for focusing said separated spectral channels onto said beam deflecting elements." Petitioner contends, and we agree, that Bouevitch discloses a "beam-focuser element at reflector 10 in Figure 11." Pet. 46–47; *see also* Ex.

1028 ¶ 96. Petitioner further explains that in Bouevitch "reflector 10 directs the separated beams of light λ_1 and λ_2 from the points on the reflector annotated as R onto the corresponding beam deflecting mirrors 51 and 52 in MEMS array 50." *Id.* at 47. Patent Owner does not dispute Petitioner's contentions with regard to claim 11 beyond the arguments asserted with respect to claim 1, addressed above. Petitioner has established by a preponderance of the evidence that Bouevitch discloses a "beam focuser," as recited in claim 11, and that claim 11 would have been obvious over Bouevitch, Sparks, and Lin.

5. Claims 17–22

Claim 17 is directed to "a method of performing dynamic add and drop in a WDM optical network" which includes elements substantially similar to features of apparatus claim 1. Claims 18–22 ultimately depend from claim 17. We agree with Petitioner's identification of how claims 17–22 would have been obvious over Bouevitch, Sparks, and Lin, as supported by the declaration of Mr. Laughlin. Pet. 54–60. Petitioner asserts that other than for "dynamically," the method step for "controlling dynamically and continuously said beam-deflecting elements *in two dimensions* so as to combine selected ones of said spectral channels into an output multi-wavelength optical signal *and to control the power of the spectral channels combined into said output multi-wavelength optical signal*" would have been obvious for the same reasons articulated with regard to claim 1. Pet. 56. Petitioner also contends that:

> Both Bouevitch and Sparks teach dynamic control during operation. Bouevitch's device can be used as a "dynamic gain equalizer and/or configurable add/drop multiplexer," which includes dynamic control of the mirrors that perform those actions. (Ex. 1003 at 2:24-25.) Sparks teaches closed-loop 2-axis control (Ex. 1004 at 4:39-47) which the PHOSITA would have understood to mean making adjustments to the deflection of the beam in response to real-time monitoring of the channel power level. (McLaughlin Decl., Ex. 1028 at ¶ 117.)

Id. at 56–57. We find Petitioner's contentions persuasive.

Patent Owner does not dispute Petitioner's contentions with regard to claims 17–22 beyond the arguments asserted with respect to claim 1 and 3 (with respect to claim 22), addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 17–22 would have been obvious over Bouevitch, Sparks, and Lin.

D. Asserted Obviousness Over Bouevitch, Sparks, Lin, and Dueck

Petitioner contends claim 12 would have been obvious over Bouevitch, Sparks, Lin, and Dueck. Pet. 47–49. Claim 12 recites the apparatus of claim 1, wherein the wavelength-selective device comprises a device selected from the group consisting of ruled diffraction gratings, holographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing prisms. Ex. 1001, 14:63–67. Petitioner contends that any of the types of wavelength-selective devices recited in claim 12 would have been obvious because "[e]ach type was known in the prior art, each was interchangeable as a wavelength-selective device, and each was one of a small set of possible choices." Pet. 48 (citing Ex. 1028 ¶¶ 98–99). Petitioner contends that Bouevitch discloses the claimed wavelength selective device in the form of a prism. *Id.* Patent Owner does not dispute that Bouevitch discloses the additional elements of claim 12. Petitioner also asserts that Dueck discloses "ruled diffraction gratings," as claimed. *Id.*; Ex. 1021, 6:26–30. Petitioner further asserts that it would have been obvious to try Dueck's ruled diffraction gratings in the devices of Bouevitch and Sparks because it represents the "best mode" of separating wavelengths in WDM devices. *Id.* at 49.

Patent Owner argues that a person of ordinary skill would not have been motivated to use Dueck's diffraction grating. PO Resp. 29–31. According to Patent Owner, Dueck discloses a diffraction grating that reflects an input light beam to an output port at very nearly the same angle as the incident angle. *Id.* at 31. Patent Owner reasons that because no configuration shown in Bouevitch is designed to reflect a light beam at the same angle as Dueck, there is no motivation to use Dueck's diffraction grating in Bouevitch. *Id.* In reply, Petitioner asserts that Dueck was relied on "to show that ruled diffraction gratings were one of a small set of known and interchangeable choices." Pet. Reply 8. As noted above, the obviousness test has no bodily incorporation requirement, and is instead focused on "what the combined teachings of those references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d at 425. While the particular configuration of the ruled diffraction grating in Dueck may not be incorporated readily into Bouevitch, Dueck nonetheless discloses the broader concept of a ruled diffraction grating. Indeed, Dr. Sergienko testified that a ruled diffraction grating could have been used in Bouevitch, as well as holographic diffraction grating, or an echelle grating, as they are all reasonable substitutes for one another and would be expected to work. *See* Ex. 1040, 256:13–259:7.

We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claim 12 would have been obvious over Bouevitch, Sparks, Lin, and Dueck.

E. Conclusion

Petitioner has shown by a preponderance of the evidence that claims 1–6, 9–11, 13, and 15–22 would have been obvious over Bouevitch, Sparks, and Lin, and that claim 12 would have been obvious over Bouevitch, Sparks, Lin, and Dueck.

IV. MOTIONS TO SEAL

Petitioner and Patent Owner filed a joint motion to seal Exhibit 2032, along with a proposed protective order. Paper 18. Patent Owner also filed a motion to seal Exhibit 2035. Paper 29. Redacted copies of Exhibits 2032 and 2035 were also filed. We hereby grant entry of the parties' Stipulated Protective Order.

There is an expectation that information will be made public where the information is identified in a final written decision, and that confidential information that is subject to a protective order ordinarily becomes public 45 days after final judgment in a trial, unless a motion to expunge is granted. 37 C.F.R. § 42.56; Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,761 (Aug. 14, 2012). In rendering this Final Written Decision, it was not necessary to identify, nor discuss in detail, any confidential information. However, a party who is dissatisfied with this Final Written Decision may appeal the Decision pursuant to 35 U.S.C. § 141(c), and has 63 days after the date of this Decision to file a notice of appeal. 37 C.F.R. § 90.3(a). Thus, it remains necessary to maintain the record, as is, until resolution of an appeal, if any.

In view of the foregoing, the confidential documents filed in the instant proceeding will remain under seal, at least until the time period for filing a notice of appeal has expired or, if an appeal is taken, the appeal has concluded. The record for the instant proceeding will be preserved in its entirety, and the confidential documents will not be expunged or made public, pending appeal. Notwithstanding 37 C.F.R. § 42.56 and the Office Patent Trial Practice Guide, neither a motion to expunge confidential documents nor a motion to maintain these documents under seal is necessary or authorized at this time. *See* 37 C.F.R. § 42.5(b).

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, based on a preponderance of the evidence, claims 1–6, 9–13, and 15–22 of U.S. Patent No. RE42,368 are unpatentable;

FURTHER ORDERED that the Stipulated Protective Order of the parties is entered;

FURTHER ORDERED that the Joint Motion to Seal Exhibit 2032 is granted;

FURTHER ORDERED that Patent Owner's Motion to Seal Exhibit 2035 is granted; and

FURTHER ORDERED that, because this is a Final Written Decision, the parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

For PETITIONER:

Walter Linder
FAEGRE BAKER DANIELS LLP
patentdocketing@faegrebd.com

Pieter van Es
Thomas Pratt
Jordan Bodner
Michael Cuviello
BANNER & WITCOFF, LTD.
pvanes@bannerwitcoff.com
TPratt@bannerwitcoff.com
jbodner@bannerwitcoff.com
mcuviello@bannerwitcoff.com

Matthew Moore
Robert Steinberg
LATHAM & WATKINS LLP
matthew.moore@lw.com
Bob.Steinberg@lw.com

Wayne Stacy
COOLEY LLP
wstacy@cooley.com

Lawrence Kass
Christopher Chalsen
Nathaniel Browand

Suraj Balusu
MILBANK, TWEED, HADLEY & MCCLOY LLP
lkass@milbank.com
cchalsen@milbank.com
nbrowand@milbank.com
sbalusu@milbank.com

For PATENT OWNER:

Jason Eisenberg
Robert Sterne
Jon Wright
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
Jasone-ptab@skgf.com
rsterne-PTAB@skgf.com
jwright-PTAB@skgf.com

APPENDIX J

Trials@uspto.gov
571-272-7822

Paper 50
Entered: October 14, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LUMENTUM HOLDINGS, INC., LUMENTUM, INC., LUMENTUM OPERATIONS, LLC, CORIANT OPERATIONS, INC., CORIANT (USA) INC., CIENA CORPORATION, CISCO SYSTEMS, INC., and FUJITSU NETWORK COMMUNICATIONS, INC.,
Petitioner,

v.

CAPELLA PHOTONICS, INC.,
Patent Owner.

Case IPR2015-00739[1]

[1] IPR2015-01971 was joined with IPR2015-00739 on March 11, 2016, by Order in IPR2015-01971, Paper 12 (IPR2015-00739, Paper 41).

Patent RE42,678 E

Before JOSIAH C. COCKS, KALYAN K. DESHPANDE, and JAMES A. TARTAL, *Administrative Patent Judges*.

TARTAL, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
U.S.C. § 318(a) and *37 C.F.R. § 42.73*

I. INTRODUCTION

Petitioner, Lumentum Holdings, Inc., Lumentum Inc., Lumentum Operations, LLC, Coriant Operations, Inc., Coriant (USA) Inc., Ciena Corporation, Cisco Systems, Inc., and Fujitsu Network Communications, Inc., filed petitions requesting an *inter partes* review of claims 1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53, and 61–65 of U.S. Patent No. RE42,678 E (Ex. 1001, "the '678 patent"). Paper 1 ("Petition" or "Pet."); *see also* IPR2015-01971, Paper 6.

Claims 1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53, and 61–65 of the '678 patent were previously held to be unpatentable in *Cisco Systems, Inc., Ciena Corporation, Coriant Operations, Inc., Coriant (USA) Inc., and Fujitsu Network Communications, Inc., v. Capella Photonics, Inc.*, IPR2014-01276, (PTAB Feb. 17, 2016) (Paper 40) (the '1276 case). Claims 1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53, and 61–65 of the ’678 patent also were previously held to be unpatentable in *Fujitsu Network Communications, Inc., Coriant Operations, Inc., Coriant (USA) Inc., and Ciena Corporation v. Capella Photonics, Inc.*, IPR2015-00727, (PTAB Sep. 28, 2016) (Paper 36) (the ’727 case). The grounds of unpatentability asserted by Petitioner in this case rely on combinations of prior art, evidence, and arguments not asserted in either the ’1276 case or the ’727 case. Likewise, Patent Owner, Capella Photonics, Inc., advances arguments and evidence in response in this case that were not asserted by Patent Owner in either the ’1276 case or the ’727 case.

Based on the information provided in the Petition, and in consideration of the Preliminary Response (Paper 6) of Patent Owner, we instituted a trial pursuant to 35 U.S.C. § 314(a) of: (1) claims 1–4, 9, 10, 13, 19–23, 27, 44–46, and 61–65 as obvious over Bouevitch[2], Sparks[3], and Lin[4] under 35 U.S.C. § 103(a); and, (2) claims 17, 29, and 53 as obvious over Bouevitch, Sparks, Lin, and Dueck[5] under 35

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[2] U.S. Patent No. 6,498,872 B2, issued December 24, 2002 (Ex. 1003, “Bouevitch”)

[3] U.S. Patent No. 6,625,340 B1, issued September 23, 2003 (Ex. 1004, “Sparks”).

[4] U.S. Patent No. 5,661,591, issued August 26, 1997 (Ex. 1010, “Lin”)

[5] U.S. Patent No. 6,011,884, issued January 4, 2000 (Ex. 1021, “Dueck”)

U.S.C. § 103(a). Paper 7 ("Institution Decision"); *see also* IPR2015-01971, Paper 12.

After institution of trial, Patent Owner filed a Response (Paper 16, "Response" or "PO Resp.") and Petitioner filed a Reply (Paper 36, "Pet. Reply"). The Petition is supported by the Declaration of Sheldon McLaughlin (Ex. 1028). The Response is supported by the Declaration of Dr. Alexander V. Sergienko (Ex. 2022).

A transcript of the Oral Hearing conducted on May 24, 2016, is entered as Paper 49 ("Tr.").

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, Petitioner has shown by a preponderance of the evidence that claims 1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53, and 61–65 of the '678 patent are unpatentable.

II. BACKGROUND

A. The '678 patent (Ex. 1001)

The '678 patent, titled "Reconfigurable Optical Add-Drop Multiplexers with Servo Control and Dynamic Spectral Power Management Capabilities," reissued September 6, 2011, from U.S. Patent No. RE 39,397 ("the '397 patent"). Ex. 1001. The '397 patent reissued November 14, 2006, from U.S. Patent No. 6,625,346 ("the '346 patent"). *Id.* The '346 patent issued September 23, 2003, from U.S.

Patent Application No. 09/938,426, filed August 23, 2001.

According to the ’678 patent, “fiber-optic communications networks commonly employ wavelength division multiplexing (WDM), for it allows multiple information (or data) channels to be simultaneously transmitted on a single optical fiber by using different wavelengths and thereby significantly enhances the information–bandwidth of the fiber.” *Id.* at 1:37–42. An optical add-drop multiplexer (OADM) is used both to remove wavelengths selectively from a multiplicity of wavelengths on an optical fiber (taking away one or more data channels from the traffic stream on the fiber) and to add wavelengths back onto the fiber (inserting new data channels in the same stream of traffic). *Id.* at 1:45–51.

The ’678 patent describes a “wavelength-separating-routing (WSR) apparatus that uses a diffraction grating to separate a multi-wavelength optical signal by wavelength into multiple spectral channels, which are then focused onto an array of corresponding channel micromirrors.” *Id.* at Abstract. “The channel micromirrors are individually controllable and continuously pivotable to reflect the spectral channels into selected output ports.” *Id.* According to Petitioner, the small, tilting mirrors are sometimes called Micro Electro Mechanical Systems or “MEMS.” Pet. 8. The WSR described in the ’678 patent may be used to construct dynamically reconfigurable OADMs for WDM optical networking applications. Ex. 1001 at Abstract.

Figure 1A of the ’678 patent is reproduced below.

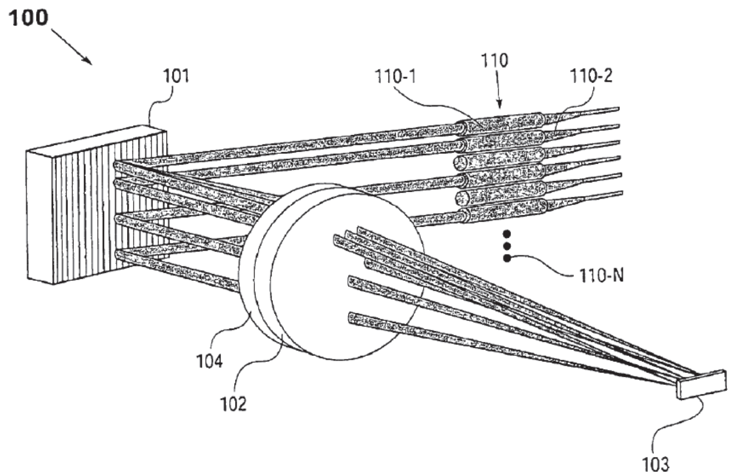

Fig. 1A

Figure 1A depicts wavelength-separating-routing (WSR) apparatus 100, in accordance with the ’678 patent. WSR apparatus 100 is composed of an array of fiber collimators 110 (multiple input/output ports, including input port 110-1 and output ports 110-2 through 110-N), diffraction grating 101 (a wavelength separator), quarter wave plate 104, focusing lens 102 (a beam-focuser), and array of channel micromirrors 103. Ex. 1001, 6:57–63, 7:55–56.

A multi-wavelength optical signal emerges from input port 110-1 and is separated into multiple spectral channels by diffraction grating 101, which are then focused by focusing lens 102 into a spatial array of distinct spectral spots (not shown). *Id.* at

6:64–7:2. Channel micromirrors 103 are positioned such that each channel micromirror receives one of the spectral channels. *Id.* at 7:2–5.

Figure 1B of the ’678 patent is reproduced below.

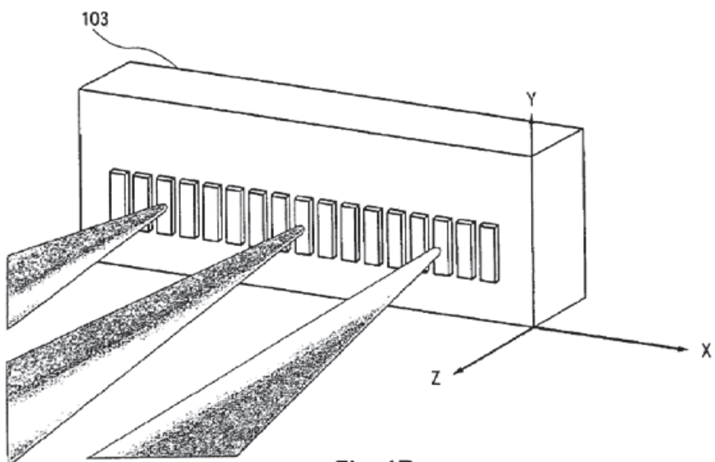

Fig. 1B

Figure 1B depicts a close-up view of the array of channel micromirrors 103 shown above in Figure 1A. *Id.* at 8:6–7. The channel micromirrors “are individually controllable and movable, e.g., pivotable (or rotatable) under analog (or continuous) control, such that, upon reflection, the spectral channels are directed” into selected output ports by way of focusing lens 102 and diffraction grating 101. *Id.* at 7:6–11.

According to the ’678 patent:

> [e]ach micromirror may be pivoted about one or two axes. What is important is that the pivoting (or rotational) motion of each channel micromirror be individually controllable in an analog manner, whereby the pivoting angle can be continuously adjusted so as to enable the channel micromirror to scan a spectral channel across all possible output ports.

Id. at 9:8–14.

Figure 3 of the ’678 patent is reproduced below

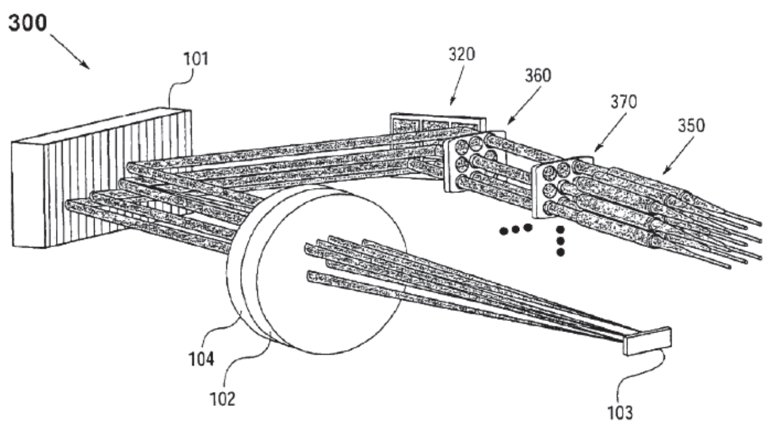

Fig. 3

Similar to Figure 1A, above, Figure 3 also shows a WSR apparatus as described by the ’678 patent. *Id.* at 10:25–26. In this embodiment, two-dimensional array of fiber collimators 350 provides an input port and plurality of output ports. *Id.* at 10:31–32. First and second two-dimensional arrays of imaging lenses 360, 370 are placed in a telecentric arrangement between two-dimensional collimator-alignment mirror array 320 and two- dimensional fiber collimator array 350. *Id.* at 10:37–43. "The channel micromirror 103 must be pivotable biaxially in this case (in order to direct its corresponding spectral channel to any one of the output ports)." *Id.* At 10:43–46.

The WSR also may incorporate a servo-control assembly (together termed a "WSR-S apparatus"). *Id.* at 4:65–67. According to the '678 patent:

> The servo-control assembly serves to monitor the power levels of the spectral channels coupled into the output ports and further provide control of the channel micromirrors on an individual basis, so as to maintain a predetermined coupling efficiency of each spectral channel in one of the output ports. As such, the servo-control assembly provides dynamic control of the coupling of the spectral channels into the respective output ports and actively manages the power levels of the spectral channels coupled into the output ports.

Id. at 4:47–56.

Figure 5 of the '678 patent is reproduced below.

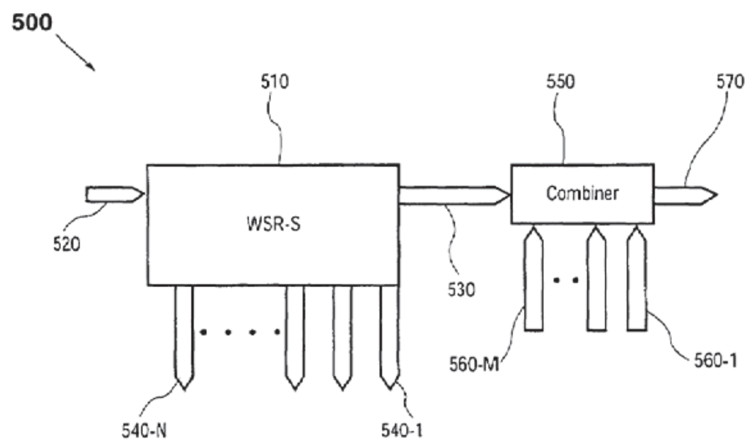

Fig. 5

Figure 5 depicts OADM 500 in accordance with the ’678 patent composed of WSR-S (or WSR) apparatus 510 and optical combiner 550. *Id.* at 12:40–44. Input port 520 transmits a multi-wavelength optical signal, which is separated and routed into a plurality of output ports, including pass-through port 530 and one or more drop ports 540-1 through 540-N. *Id.* at 12:44–48. Pass-through port 530 is optically coupled to optical combiner 550, which combines the pass-through spectral channels with one or more add spectral channels provided by one or more add ports 560-1 through 560-M. *Id.* At 12:52–56. The combined optical signal is then routed into an existing port 570, providing an output multi-wavelength optical signal. *Id.* at 12:56–58.

B. Illustrative Claims

Challenged claims 1, 21, 44, and 61 of the '678 patent are independent. Challenged claims 2–4, 9, 10, 13, 17, 19, and 20 ultimately depend from claim 1; claims 22, 23, 27, and 29 ultimately depend from claim 21; claims 45, 46, and 53 ultimately depend from claim 44; and, claims 62–65 ultimately depend from claim 61. Claims 1, 21, and 61 of the

'678 patent are illustrative of the claims at issue:

> 1. A wavelength-separating-routing apparatus, comprising:
>
> a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;
>
> b) a wavelength-separator, for separating said multi- wavelength optical signal from said input port into multiple spectral channels;
>
> c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and
>
> d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being *pivotal about two axes and being* individually and continuously controllable to reflect [[said]] *corresponding*

> *received* spectral channels into *any* selected ones of said output ports *and to control the power of said received spectral channels coupled into said output ports.*

Ex. 1001, 14:6–23 (emphases in original, "[[ ]]" indicating matter in the first reissue that forms no part of the second reissue, and matter in italics indicating additions made by second reissue).

> 21. A servo-based optical apparatus comprising:
>
> a) multiple fiber collimators, providing an input port for a multi-wavelength optical signal and a plurality of output ports;
>
> b) a wavelength-separator, for separating said multi- wavelength optical signal from said input port into multiple spectral channels;
>
> c) a beam-focuser, for focusing said spectral channels into corresponding spectral spots; and
>
> d) a spatial array of channel micromirrors positioned such that each channel micromirror receives one of said spectral channels, said channel micromirrors being individually controllable to reflect said spectral channels into selected ones of said output ports; and

e) a servo-control assembly, in communication with said channel micromirrors and said output ports, for maintaining a predetermined coupling of each reflected spectral channel into one of said output ports.

Ex. 1001, 15:29–48.

61. A method of performing dynamic wavelength separating and routing, comprising:

a) receiving a multi-wavelength optical signal from an input port;

b) separating said multi -wavelength optical signal into multiple spectral channels;

c) focusing said spectral channels onto a spatial array of corresponding beam-deflecting elements, whereby each beam-deflecting element receives one of said spectral channels; and

d) dynamically and continuously controlling said beam-deflecting elements [[, thereby directing]] *in two dimensions to direct* said spectral channels into [[a plurality]] *any selected ones of said* output ports *and to control the power of the spectral channels coupled into said selected output ports*.

Ex. 1001, 18:55–19:3 (emphases in original, with "[[ ]]" indicating matter in the first reissue that forms no part of the second reissue, and matter in italics indicating additions made by second reissue).

III. ANALYSIS

A. Claim Construction

The Board interprets a claim using the "broadest reasonable construction in light of the specification of the patent in which it appears." 37 C.F.R. § 42.100(b). We presume a claim term carries its "ordinary and customary meaning," which is "the meaning that the term would have to a person of ordinary skill in the art in question" at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). A patentee may, however, act as their own lexicographer and give a term a particular meaning in the specification, but must do so with "reasonable clarity, deliberateness, and precision." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Only terms which are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

1. "*continuously controllable*"

Claims 1 and 44 require "a spatial array of channel micromirrors . . . being individually and continuously controllable." Ex. 1001, 14:16–20; 17:43–47. Similarly, claim 61 requires "dynamically and continuously controlling said beam-deflecting elements." *Id.* at 18:65–66. Petitioner asserts that "continuously controllable" should be construed to mean "able to effect changes with fine precision." Pet. at 11. Petitioner also notes, however, that the '678 patent identifies "under analog control" as an example of continuous control, and contends that "the example of analog control does not alone define" the broadest reasonable interpretation of "continuously controllable." *Id.* at 12; *see also* Ex. 1028 ¶¶ 59–60 (explaining that a mirror that is disclosed to be under analog control would fit within the scope of "continuously controllable"). Petitioner identifies the following disclosures of the '678 patent as supporting its proposed construction:

The '678 Patent explains that "[a] distinct feature of the channel micromirrors in the present invention, in contrast to those used in the prior art, is that the motion…of each channel micromirror is under *analog control* such that its pivoting angle can be *continuously adjusted*." ([Ex. 1001], 4:7–11; emphasis added).) Another passage in the specification states that "[w]hat is important is that the pivoting (or rotational) motion of each channel micromirror be individually *controllable in an analog manner*, *whereby the pivoting angle can be continuously adjusted* so as to enable the channel micromirror to scan a spectral channel across all possible output ports." (*Id.* at 9:9–14; emphasis added). '678 Patent states "channel micromirrors 103 are individually controllable and movable, e.g., pivotable (or rotatable) under analog (or continuous) control." (*Id. at 7:6–8*). Pet. 11–12.

Patent Owner disputes Petitioner's proposed construction, but offers no express alternative. PO Response 47–48. We find that Petitioner: (1) offers no sufficient explanation for how its proposed definition accounts for the term "continuously" in "continuously controllable"; (2) directs us to no portion of the specification of the '678 patent that uses "fine precision"; and (3) fails to explain what "fine precision" is intended to encompass or exclude. *See* Pet. 11–12. Additionally, based on all of the evidence presented, we are not persuaded that "continuously controllable" is limited to "analog control," or that "analog control" necessarily corresponds to "continuous" control under all circumstances. We determine that "continuously controllable," in light of the specification of the '678 patent, encompasses "under analog control such that it can be continuously adjusted."

2. "*servo-control assembly*" and "*servo-based*"

Challenged claims 2–4, 21–23, and 45 recite a "servo-control assembly." Petitioner asserts "servo-control assembly" means "feedback- based control assembly," thereby suggesting "servo" means "feedback- based." Pet. 12. Challenged claims 21–25, 27, and 29 recite a "servo-based optical apparatus." Petitioner asserts that "servo-based" means "feedback- based control." *Id*. Patent Owner offers no construction of the terms. We are not persuaded that "servo" necessarily means "feedback" or "feedback- based" merely because the '678 patent describes a processing unit within a servo-control assembly as using power measurements from the spectral monitor to provide feedback control of the channel mirrors. *See* Pet. 13–14.

The '678 patent does not use the term "servo-based" outside of the preamble of challenged claims 21–25, 27, and 29. "If . . . the body of the claim fully and intrinsically sets forth the complete invention, including all of its limitations, and the preamble offers no distinct definition of any of the claimed invention's limitations, . . . then the preamble is of no significance to claim construction because it cannot be said to constitute or explain a claim limitation." *Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999) (citations omitted). The bodies of claims 21–25, 27, and 29 fully and intrinsically set forth the complete invention; therefore, the use of "servo-based" in the preamble does not serve as a limitation and need not be construed for purposes of this decision.

With respect to "servo-control assembly," the '678 patent states that it "serves to monitor the power levels of the spectral channels coupled into the output ports and further provide control of the channel micromirrors on an individual basis." Ex. 1001, 4:47–50. Further, "[i]f the WSR apparatus includes an array of collimator-alignment mirrors . . . the servo-control assembly may additionally provide dynamic control of the collimator- alignment mirrors." *Id.* at 4:56–60. According to the '678 patent, "[a] skilled artisan will know how to implement a suitable spectral monitor along with an appropriate processing unit to provide a servo-control assembly in a WSP-S apparatus according to the present invention, for a given application." Ex. 1001, 12:11–15.

Based on the specification, a "servo-control assembly" encompasses a spectral monitor and processing unit to monitor spectral channel power levels and control channel micro mirrors on an individual basis. *See id*. At 11:10–36.

3. "*port*"

Claim 1 recites "multiple fiber collimators, providing an input port . . . and a plurality of output ports." Ex. 1001, 14:8–10. By comparison, claim 61 does not recite a collimator, but instead requires "receiving a multi- wavelength optical signal from an input port," and "controlling said beam deflecting elements . . . to direct said spectral channels into . . . output ports." *Id.* at 18:57–19:1. Patent Owner offers no definition of "port," and does not suggest that the '678 patent provides an express definition of the term, but instead argues that a "port," as claimed, is not a "circulator port" because the '678 patent "disavows circulator-based optical systems." PO Resp. at 35–36. We disagree.

There is no dispute that the ordinary and customary meaning of "port" encompasses circulator ports, and, indeed, any "point of entry or exit of light." *See* Dr. Sergienko Deposition Transcript (Ex. 1051), 43:16–23, 45:12–13 ("The circulator ports are ports with constraints."). Nor does the'678 patent equate the term "port" to "collimator," as both "port" and "collimator" appear separately in the claims of the ’678 patent. Ex. 1001, 14:8–10. We have considered the testimony of Dr. Sergienko as well (Ex. 2022 ¶¶ 168–172), and find that even if certain fiber collimators serve as ports in the ’678 patent, that does not redefine the term “port” to mean “collimator.” *See id.* at ¶ 171. Thus, the primary issue is whether the ’678 patent disavows circulator ports from the scope of the term “port.”

Although the broad scope of a claim term may be intentionally disavowed, this intention must be clear, *see Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002) (“[t]he patentee may demonstrate an intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope”), and cannot draw limitations into the claim from a preferred embodiment. *Conoco, Inc. v. Energy & Envtl. Int’l.*, 460 F.3d 1349, 1357-58 (Fed. Cir. 2006).

Patent Owner fails to show any expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope with respect to the use of “port” in the ’678 patent. Patent Owner argues: (1) that the ’678 patent provides a scalable system without circulator ports (PO Resp. 1), (2) that a provisional application to the ’678 patent “describes existing add/drop architectures that had a number of problems” (PO Resp. 37); (3) that U.S. Patent No. 6,984,917 shows how experts use the term “input port” and “output port” because it uses elements “similar to how the ’678 patent describes fiber collimators serving as ports" (PO Resp. 43–44); and (4) that because the inventors of the '678 patent "consistently emphasized the limitations of circulator-based switches and provided an alternative configuration," a person of ordinary skill in the art would have understood that the inventors were disavowing the use of optical circulators (PO Resp. 36–37). S*ee also* PO Resp. 34–40 (citing Ex 2022 ¶ 182).

We do not discern any "clear disavowal of claim scope" from the arguments advanced by Patent Owner. Dr. Sergienko merely states that based on market differentiation, construing "ports" to include circulator ports "goes beyond the intent of the '678 patent." Ex. 2022, ¶ 182. Even if the '678 patent were viewed as Dr. Sergienko suggests, a speculative purported intent of market differentiation is not disavowal. Moreover, Petitioner further demonstrates that a provisional application to the '678 patent in fact uses circulator ports as "ports." Pet. Reply 15–16 (citing Ex. 1008, 3, Fig. 9). Such usage undermines Patent Owner's disavowal contention. Patent Owner's argument that the provisional application is "entirely consistent with the '678 patent's use of collimators" fails to negate the fact that the provisional application uses circulator ports as "ports." *See* PO Resp. 42–43. Similarly, we find insufficient support for Patent Owner's argument based on the preamble that "circulators can only be coupled to, but not part of, the [optical add drop] apparatus. *See id.* at 40–41. We are not persuaded that the preamble's recitation of a "[a]n optical add-drop apparatus comprising" of claim 1 is limiting because "the body of the claim fully and intrinsically sets forth the complete invention, including all of its limitations." *See Pitney Bowes, Inc. v. Hewlett-Packard Co.*, 182 F.3d 1298, 1305 (Fed. Cir. 1999). Because "the preamble offers no distinct definition of any of the claimed invention's limitations, but rather merely states . . . the purpose or intended use of the invention, . . . the preamble is of no significance to claim construction." *Id.* (citing *Rowe v. Dror*, 112 F.3d 473, 478 (Fed. Cir. 1997); *Corning Glass Works v. Sumitomo Elec. U.S.A., Inc.*, 868 F.2d 1251, 1257 (Fed. Cir. 1989); *Kropa v. Robie*, 187 F.2d 150, 152 (CCPA 1951)). We also are persuaded that Bouevitch's "Configurable Optical Add/Drop Multiplexer" is recognized as an optical add-drop apparatus and includes circulators. *See* Pet. Reply 16. We have considered all of the arguments advanced by Patent Owner in its effort to redefine "port" as excluding "circulator ports" (PO Resp. 32–44), and find insufficient support for Patent Owner's contention that the '678 patent disavows or otherwise excludes circulator ports from the scope of the term "port." We determine that "port," in light of the specification of the '678 patent, encompasses "circulator port."

4. "*beam-focuser*"

Claims 1, 21, and 44 each require a "beam-focuser, for focusing said spectral channels into corresponding spectral spots." The '678 patent states that "[t]he beam-focuser may be a single lens, an assembly of lenses, or other beam focusing means known in the art." Ex. 1001, 4:20–22.

Petitioner contends that "beam focuser" is "a device that directs a beam of light to a spot." Pet. 14. According to Petitioner:

> The Summary of the '678 patent states that the "beam-focuser focuses the spectral channels into corresponding spectral spots." ([Ex. 1001], 3:63–64.) The specification also explains that the beams of light are "focused by the focusing lens 102 into a spatial array of distinct spectral spots (not shown in FIG. lA) in a one- to-one correspondence." (*Id*. at 6:65–7:5.) The MEMS mirrors are in turn "positioned in accordance with the spatial array formed by the spectral spots, such that each channel micromirror receives one of the spectral channels." (*Id*.)

Id. Patent Owner does not dispute expressly Petitioner's proposed construction, and provides no alternative construction of "beam focuser." Consistent with Petitioner's proposed construction, Dr. Sergienko testified that "focusing means bringing of the energy in the original image limited to the focal spot." Ex. 1051, 245:17–19. We agree that, based on the specification of the '678 patent, "beam focuser" means "a device that directs a beam of light to a spot."

5. Additional Claim Terms

Petitioner addresses several additional claim terms, including "spectral monitor," "in two dimensions," "control the power," and "optical sensor." Pet. 13–16. For purposes of this decision, no express construction of any additional claim terms is necessary.

B. References Asserted as Prior Art

Petitioner relies on Bouevitch, Sparks, Lin, and Dueck with respect to its assertion that the challenged claims would have been obvious.

1. Bouevitch

Bouevitch describes an optical device for rerouting and modifying an optical signal, including modifying means such as a MEMS array and a liquid crystal array which function as an attenuator when the device operates as a dynamic gain equalizer (DGE), and as a switching array when the device operates as a configurable optical add/drop multiplexer (COADM). Ex. 1003, Abstract. According to Petitioner, the COADM described in Bouevitch "uses MEMS mirrors with 1 axis of rotation." Pet. 19. Petitioner also contends that the Bouevitch COADM controls the power of its output channels by tilting beam-deflecting mirrors at varying angles. *Id.* at 18.

2. Sparks

Sparks describes an optical switch arranged to misalign the optical beam path to provide a predetermined optical output power. Ex. 1004, Abstract. According to Sparks, "[t]he system operates by controlling the movable micromirrors (16, 26), which are fabricated using MEMS technology and are capable of two axis movement, to carefully align the beams so as to ensure that the maximum possible input optical signal is received at the output of the switch." *Id.* at 4:43–46.

3. Lin

Lin describes a "spatial light modulator… operable in the analog mode for light beam steering or scanning applications." Ex. 1010, Abstract. Lin explains that the angular deflection of a mirror about the torsional axis is a function of the voltage potential applied to an address electrode. *Id.* at 6:29–32. Petitioner contends that Figure 3B of Lin depicts a continuous and linear relationship between the deflection angle of the MEMS mirrors and the applied voltage. Pet. 31–32.

4. Dueck

Dueck describes a wavelength division multiplexer that integrates an axial gradient refractive index element with a diffraction grating to provide efficient coupling from a plurality of input sources. Ex. 1021, Abstract. Petitioner contends that Dueck describes various diffraction gratings for use in WDM devices. Pet. 18.

C. Asserted Obviousness Over Bouevitch, Sparks, and Lin

Petitioner asserts that claims 1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53, and 61–65 would have been obvious over Bouevitch, Sparks, and Lin[6]. Pet. 5.

1. Claim 1

Claim 1, directed to a wavelength-separating-routing apparatus, requires "multiple fiber collimators, providing an input port . . . and a plurality of output ports." Ex. 1001, 14:6–10. Petitioner shows that Bouevitch describes microlenses 12a and 12b, corresponding to the recited "multiple fiber collimators." Pet. 24–25. Petitioner's declarant, Sheldon McLaughlin, an employee of Petitioner, equates microlenses 12a and

[6] Petitioner initially argues that Patent Owner admitted in a Replacement Reissue Application Declaration by Assignee that all elements of claim 1, except for two-axis mirrors, were disclosed by Bouevitch. Pet. 9–11 (quoting Ex. 1002, 104). Petitioner identifies no persuasive authority for the proposition that such a statement should be treated as an admission in this proceeding. Moreover, rather than admit that all original elements of claim1 are disclosed by Bouevitch, the statement makes clear that three additional references not relied upon by Petitioner in this proceeding were considered in combination with Bouevitch. As a result, we are not persuaded that Patent Owner has admitted all elements of claim 1, except for two-axis mirrors, were disclosed by Bouevitch

12b to fiber collimators. Ex. 1028 ¶ 43. Petitioner further asserts that the microlenses of Bouevitch, in conjunction with fiber waveguides and circulators, provide an input port (labeled "IN"), and a plurality of output ports (labeled "OUT EXPRESS" and "OUT DROP"). Pet. 25–26 (citing Ex. 1003, Fig. 11). Petitioner's contentions are supported by Mr. McLaughlin. Ex. 1028 ¶¶ 44–45.

Patent Owner argues that, under its proposed claim construction of "port," Bouevitch discloses at most two ports because the '678 patent equates "port" to "collimator" and disavows circulator ports. PO Resp. 32–45. For the reasons explained above in our claim construction analysis, we reject Patent Owner's claim construction for "port." Accordingly, we do not agree with Patent Owner's contention that the only ports disclosed by Bouevitch are collimator lenses 12a and 12b. *See* PO Resp. 45. Petitioner has shown, as discussed above and as supported by Mr. McLaughlin, that Bouevitch discloses the recited "multiple fiber collimators, providing an input port . . . and a plurality of output ports," as recited by claim 1.

Claim 1 further requires "a wavelength-separator" for separating the multi-wavelength optical signal input into multiple spectral channels. Petitioner identifies diffraction grating 20 of Bouevitch as corresponding to the recited "wavelength-separator." Pet. 26. Petitioner also identifies Bouevitch's reflector 10 as a "beam-focuser," as also recited in claim 1. *Id*. at 27.

For each of the channel micromirrors, claim 1 further requires that they be "*pivotal about two axes*," and be "individually and continuously controllable to reflect *corresponding received* spectral channels into *any* selected ones of said output ports *and to control the power of said received spectral channels coupled into said output ports*." Petitioner shows that reflectors 51 and 52 in MEMS array 50 of Bouevitch are micromirrors and that "Bouevitch teaches positioning its micromirrors such that each receives a corresponding spectral channel dispersed by the diffraction grating." Pet. 28 (citing Ex. 1003, 14:53–65, 7:33–38, 10:43-51, Fig. 3). Petitioner also shows that Bouevitch discloses "individual" control for each mirror in MEMS array 50 and explains that "[e]ach reflector is individually controlled in to deflect the respective beam to either the output or the drop port." *Id.* At 29 (citing Ex. 1028 ¶ 55).

Patent Owner argues that the beam in Bouevitch is "propagate[d]" to an output port, and that Petitioner has *not* shown that "deflecting" or "propagating" to an output port is "reflecting," as claimed. PO Resp. 45–46. We find Patent Owner's argument not persuasive. Patent Owner provides no construction of "to reflect" to explain why a beam that is reflected and then propagated or deflected is excluded. Patent Owner's argument is not persuasive because it is beyond the scope of the claims. *Petitioner* has shown that Patent Owner's argument implies a requirement that the beam be directly reflected to an output port which is contrary to an embodiment of the '678 patent. *See* Pet. Reply

16–17. In this regard, we agree with Petitioner that the ’678 patent does not require reflection *directly* to an output port and, contrary to Patent Owner’s argument, “Fig. 1A of the ’678 patent, for example, discloses a light beam that reflects off micromirror 103, and then propagates back though both focusing lens 102 and quarter-wave plate 104 before being directed to an output port.” Pet. Reply 17.

The ’678 patent provides analog control as an example of “continuously controllable,” and Petitioner shows that Bouevitch discloses continuously controllable power attenuation as an analog function of the angle of the deflector, which is also described as “variable.” Pet. at 28–30. As Mr. McLaughlin explains, a person of ordinary skill would understand from Bouevitch that “the level of control, required to balance the optical power differentials among the wavelength channels[,] is achieved via analog voltage control.” Ex. 1028 ¶ 56; s*ee also* Declaration of Dr. Dan Marom, Ex. 1029 ¶ 58 (explaining that Bouevitch discloses the use of variable attenuation for power control, and a person of ordinary skill in the art would understand that the necessary level of control required to balance the optical power differentials among the wavelength channels is achieved in Bouevitch with continuous control over the mirror tilt via analog voltage control); Ex. 1003, 7:35–37 (stating that “[t]he degree of attenuation is based on the degree of deflection provided by the reflector (i.e., the angle of reflection)”). Patent Owner does not otherwise dispute Petitioner’s contention that Bouevitch discloses continuous control of beam-deflecting elements via analog voltage control with respect to a single axis. *See* PO Resp. 47–49.

Petitioner also shows that Lin discloses "continuous control." Pet. 31–32. Lin describes a spatial light modulator (SLM) operable in the analog mode for light beam steering or scanning applications. Ex. 1010, Abstract. Figures 3A and 3B of Lin are reproduced below.

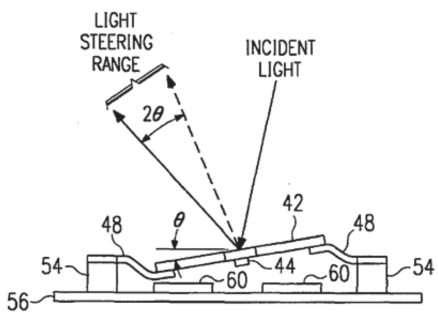

FIG. 3A

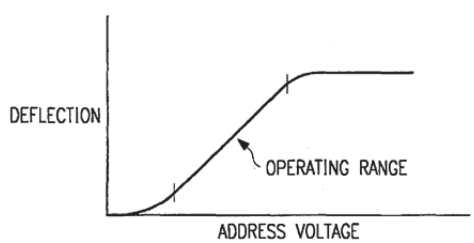

FIG. 3B

Figure 3A is a spatial light modulator, "illustrating the pixel being deflected about the torsion hinge to steer incident light in a selected direction, the deflection of the pixel being a function of the voltage applied to the underlying address electrode." Ex. 1010, 5:20–25. As Petitioner explains, Figure 3B shows a graph disclosing the continuous deflection angle of MEMS mirrors as a function of the voltage applied to affect that deflection. Pet. 31. Mr. McLaughlin testifies that Lin "confirms that continuous and analog control of MEMS mirrors was known prior to the '678 patent's priority date." Ex. 1028 ¶ 59. Lin explains that "the angular deflection of mirror 42 about the torsional axis defined by hinges 44 is seen to be a function of the voltage potential applied to one of the address electrodes 60." Ex. 1010, 6:29–32. Lin further explains that:

> With an address voltage being applied to one address electrode 60 being from 0 to 20 volts, mirror 42 is deflected proportional to the address voltage. When SLM 40 is operated as an optical switch or light steerer, incident light can be precisely steered to a receiver such as an optical sensor or scanner. The mirror tilt angle can be achieved with a excellent accuracy for pixel steering.

Id. at 7:13–19.

Patent Owner argues that Petitioner hasn't shown that Lin discloses continuous control because such control cannot be shown by the input signal alone, and Petitioner did not "look at the structure of the mirror, how the voltage affects movement of the mirror, and what control loop algorithm has been utilized." PO Resp. 52 (citing Ex. 2022 ¶¶ 204–05 (stating that Lin Figure 3B "may represent a mirror that is controlled in a step-wise manner")). We find the speculative testimony of Dr. Sergienko not persuasive over the express disclosure of Lin of analog control whereby "mirror 42 is deflected proportional to the address voltage," thereby demonstrating "continuous control," as claimed. *See* Ex. 1010, at 7:13–19; *see also* Ex. 1028 ¶ 59.

With regard to beam-deflecting elements controllable in two dimensions, as required by claim 1, Petitioner also shows that "Sparks describes 'movable micromirrors (16,26), which are fabricated using MEMS technology and are capable of two axis movement, to carefully align the beams so as to ensure that the maximum possible input optical signal is received at the output of the switch.'" Pet. 33–34 (quoting Ex. 1004, 4:43–47); *see also* Ex. 1028 ¶ 64). Patent Owner does not dispute that Sparks discloses MEMS controllable in two dimensions, including "to control the power," as claimed. *See* PO Resp. 49–50; *see also* Ex. 1004 Abstract (describing "switching means arranged to switch an optical signal by redirection of the optical beam path of said signal, wherein said optical switch is arranged to misalign the optical beam path so as to provide a predetermined optical output power")).

In summary, for the reasons discussed above, Petitioner has established that Bouevitch discloses all of the recited limitations of claim 1 for multiple fiber collimators, a wavelength-separator, a beam-focuser, and a spatial array of channel micromirrors individually and continuously controllable on a single axis, but not on a two axis (i.e., "pivotal about two axes") array "to reflect said corresponding received spectral channels into any selected ones of said output ports and to control the power of said received spectral channels coupled into said output ports." Patent Owner did not dispute that Bouevitch discloses continuous control of beam-deflecting elements via analog voltage control with respect to a single axis, and Petitioner has demonstrated that Lin also discloses such "continuous control." Finally, Petitioner has established that Sparks discloses an array of mirrors controllable in two dimensions "to reflect" and "to control," as recited by claim 1. Thus, the remaining issue is whether Petitioner has provided "some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007).[7]

With respect to a rationale for combining Bouevitch and Sparks, Petitioner shows the use of the two-axis mirror of Sparks in Bouevitch: (1) is a simple substitution of one known element for

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[7] The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art; and (4) secondary considerations, i.e. objective evidence of unobviousness. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We have considered each of the Graham factors and incorporate our discussion of those considerations, to the extent there is a dispute, in our evaluation of the reasoning that supports the asserted combination. We further observe that, in this proceeding, evidence of secondary considerations has not been offered for evaluation.

another yielding predictable results, (2) is the use of a known technique to improve similar devices, (3) would be obvious to try as there are only two options for tilting MEMS mirrors: one-axis and two-axis mirrors, and (4) would be motivated to help ensure that all channels have nearly equivalent power and to overcome manufacturing deviations by being actuatable to adjust for any unintentional misalignment in two axes. Pet. 20–23. Petitioner also shows that several reasons support the addition of Lin's continuous, analog control to the asserted combination: (1) continuously controlled mirrors were known to be interchangeable with discrete step mirrors; (2) continuously controlled mirrors allow arbitrary positioning of mirrors and can more precisely match the optimal coupling value; and (3) Lin specifically teaches that its analog, continuous MEMS mirrors would be useful in optical switching applications like Bouevitch's and Sparks' optical switch devices. (Lin, Ex. 1010 at 2:6–9; McLaughlin Decl., Ex. 1028 at ¶ 52.)

Pet. 32.

Patent Owner disputes the sufficiency of the rationale provided in the Petition. PO Resp. 14–30. First, Patent Owner argues that Petitioner combines disparate embodiments of Bouevitch, noting that the Petition cites portions of Bouevitch describing not only figure 11, but also figures 1, 5, 6a, and 9 which correspond to other embodiments. *Id.* at 15–17. Noting that various portions of a reference are cited does not show that the asserted combination is dependent upon a disclosure appearing only with respect to one embodiment and not another. Petitioner persuasively explains that it relies "only on the Fig. 11 embodiment of Bouevitch." Pet. Reply 1–2. Although Petitioner includes a discussion of Bouevitch's disclosure of power control in the Petition, it is clear that the asserted combination does not stand or fall on that disclosure. The Petition states that a person of ordinary skill in the art "would be motivated to use the 2-axis system of Sparks within the system of Bouevitch for power control." Pet. 36. Petitioner's discussion of the power control embodiment of Bouevitch in support of the rationale for the asserted combination with Sparks (i.e., both Sparks and Bouevitch address power control) does not impose an obligation on Petitioner to articulate a rationale for including the power control embodiment of Bouevitch in the asserted combination.

Patent Owner also argues that a person of ordinary skill in the art would not have combined Bouevitch and Sparks for various reasons. PO Resp. 18–31. Patent Owner argues that if Bouevitch accomplishes both switching and power control using a one-axis mirror, absent hindsight a person of ordinary skill "would have had *no* reason" to use a two-axis mirror to control power, particularly because it would make it "vastly more complex." *Id.* at 18. We find Patent Owner's argument conclusory and not persuasive because it fails to address the benefits of a two-axis mirror disclosed by Sparks which would be apparent to one of skill in the art without hindsight. *See* Pet. Reply 3 ("Sparks expressly states that an advantage of the optical switches with two-axis mirrors is that attenuation (*i.e.*, power control) can be achieved without incorporating separate attenuators within the system. (*See, e.g.*, Sparks, Ex. 1004, col. 2, ll. 28–30, col. 4, ll. 55–58.)"). Petitioners' expert Mr. McLaughlin testified that a person of ordinary skill would have been capable of overcoming any problems presented by technical issues. Ex. 2032, 125:18–126:10, 134:11–19, 137:16–23.) Patent Owner concedes that two-axis mirrors were known and cited during prosecution. PO Resp. 20. Patent Owner argues that Petitioner "fails to address the technical challenges" that would prevent it from being a simple substitution. PO Resp. 20–23. Dr. Sergienko was asked whether similar technical considerations presented problems that could not be overcome by one of skill in the art, and indicated "no." Ex. 1051, 266:16–267:25.

Moreover, "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . . Rather, the test is what the combined teachings of those references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Here, the test for obviousness reflects what the combined teachings of Bouevitch, Sparks, and Lin would have suggested to one of ordinary skill in the art, and does not require that any one particular component of a reference must be bodily incorporated, or physically inserted, into another reference.

Next, Patent Owner argues that a person of ordinary skill in the art would not have been motivated to combine Spark's tiltable mirrors with Bouevitch because it would disrupt Bouevitch's explicit teaching of parallel alignment, and "Bouevitch teaches away from misalignment for power control." PO Resp. 24–28. "The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the … application." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). While Bouevitch discusses how angular displacement is disadvantageous in certain respects (*see* Ex. 1003, 2:1–7), we are not persuaded such discussion is sufficient to constitute a teaching away. To the contrary, Petitioner has shown persuasively that Bouevitch uses angular misalignment to control power in at least some embodiments of Bouevitch. Pet. Reply 4–6.

Similarly, Patent Owner's contention that Bouevitch and Sparks are "incompatible technologies" is not persuasive. *See* PO Resp. 28–30. According to Patent Owner, Bouevitch would be rendered unsatisfactory for its intended purpose "to provide *both* power optimization control *and* optimally efficient optical coupling of the beam to the output port" because Bouevitch and Sparks perform attenuation "at opposite ends of the optical system." *Id.* at 29. As Petitioner notes, Bouevitch discloses embodiments that perform power attenuation by angular misalignment of the beam using MEMS mirrors. Pet. Reply 6. Patent Owner's articulation of the intended purpose of Bouevitch focuses on only one objective, and fails to address what Bouevitch discloses as a whole to one of skill in the art. There is no dispute that the use of a two-axis mirror includes benefits as well as costs over a one-axis mirror. "The fact that the motivating benefit comes at the expense of another benefit, . . . should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another." *Winner Int'l.*, 202 F.3d at 1349 n.8. We are not persuaded that the costs identified by Patent Owner overcome the rationale of the asserted combination provided by Petitioner. Importantly, Patent Owner does not persuasively counter Petitioner's rationale that it would have been obvious to try, because, as Mr. McLaughlin testified: (1) there were only two solutions to the known need to deflect light beams with MEMS: 1-axis or 2- axis; (2) a person of ordinary skill would have had a high expectation of success to try two-axis mirror control in Bouevitch; and (3) the result of the combination would be predictable. *See* Pet. 20–23; Reply 3–4; Ex. 1028 ¶¶ 30–34; Ex. 1029 ¶ 45.

With respect to Lin, Patent Owner argues that "Petitioner provides no *KSR* rationale." PO Resp. 7. Patent Owner's argument neglects the rationale provided by Petitioner. *See* Pet. 32–33. Patent Owner also implicates "impermissible hindsight" in the combination with Lin (*id.* at 14, 54) and argues that Petitioner fails to explain how to modify Lin's structural elements to incorporate a two-dimensional rotation (*id.* at 52–53). As explained above, however, the test for obviousness is not whether the features of one reference may be bodily incorporated into the structure of another reference. Moreover, the references of record reflect that there routinely are complex design considerations in the fiber optic communications field. Patent Owner does not explain persuasively why combining the teachings of Sparks and Lin would be beyond the skill of a skilled artisan. We find more persuasive Petitioner's contention that Lin specifically teaches that its analog, continuous MEMS mirrors would be useful in optical switching applications like Bouevitch's and Sparks' optical switch devices. *See* Pet. Reply 21; Ex. 1010, 2:6–9; Ex. 1028 ¶ 60.

Petitioner has articulated sufficient reasoning with some rational underpinning to support the legal conclusion of obviousness based on the asserted combination of Bouevitch, Sparks, and Lin. With regard to incorporating the teaching of a two-axis mirror in Sparks with Bouevitch, we are persuaded that it is a simple substitution, notwithstanding the fact that it may require substantial engineering as a practical matter. The asserted combination of Sparks and Bouevitch and Lin yields a predictable result. *See KSR*, 550 U.S. at 416 ("The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.").

We are further persuaded that Petitioner has identified additional "rational underpinning" in support of the asserted combination. Mr. McLaughlin explains that the references all address optical signal switches, that "the principles of operation of the MEMS-based actuating mirrors are essentially the same except that the mirrors of Sparks are actuatable in one more axis than those of Bouevitch," and that a two-axis mirror in place of a one-axis mirror "would yield a predictable result of the same functionality (e.g., movement of a reflective surface in a first axis) yet with more control (e.g., the reflective surface moving in a second axis in similar manner as the movement in the first axis). Ex. 1028 ¶ 31. While Lin is not necessary in light of our determination that Bouevitch also discloses continuous control, Mr. McLaughlin persuasively explains that continuously controlled analog mirrors were recognized as interchangeable with discrete step mirrors. *Id*. at 32–34; *see also* Ex. 1010, 2:7–9, 3:41–57 (discussing analog control as an alternative to binary (discrete) control of mirrors to increase the precision of the mirror placement).

Finally, Patent Owner argues that "[i]ndustry adoption is additional evidence of non-obviousness and the fact that Petitioner relies on impermissible hindsight when making the combination." PO Resp. 56–57. In particular, Patent Owner argues that "[t]he industry recognized the advantages presented in [Patent Owner's] optical configuration. *Id*. at 56. Patent Owner quotes, for example, a statement that describes Patent Owner as offering "a 10-fiber port solution." *Id.* Patent Owner offers no explanation as to how such a statement is within the scope of the claims at issue. Similarly, Patent Owner refers to a "WavePath product line" without demonstrating any of those products practice the challenged claims. *See id*. Patent Owner further argues that "experts" adopted its ROADM configuration. *Id.* at 57–59. According to Patent Owner, if certain other patents held by Mr. Laughlin and Dr. Marom "are not evidence of nonobviousness themselves, they at the least show that Mr. McLaughlin and Dr. Marom are susceptible to hindsight bias because both worked on [Patent Owner's] optical configuration, and both were aware of the [Patent Owner's] optical configuration after [Patent Owner] disclosed it to the public." *Id.* At 60.

We agree with Petitioner that Patent Owner does not offer adequate support that such alleged "industry adoption" suggests non-obviousness, and that Patent Owner does not demonstrate any nexus to the merits of the claimed invention. *See* Pet. Reply 23–24. We likewise agree with Petitioner that, to the extent that Patent Owner is suggesting that it is providing evidence of copying, it is insufficient because Patent Owner does not present any evidence of actual copying or a nexus to any of Patent Owner's products. *See, e.g.*, *Iron Grip Barbell Co. Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) ("[C]opying requires the replication of a specific product."); *see also Tokai Corp. v. Easton Enters. Inc.*, 632 F.3d 1358, 1370 (Fed. Cir. 2011). We have considered all of the evidence of non-obviousness identified by Patent Owner. For the foregoing reasons, we conclude Petitioner has established by a preponderance of the evidence that claim 1 would have been obvious over Bouevitch, Sparks, and Lin.

2. Claims 2–4

Claim 2 depends from claim 1, and further requires "a servo-control assembly, in communication with said channel micromirrors and said output ports, for providing control of said channel micromirrors and thereby maintaining a predetermined coupling of each reflected spectral channel into one of said output ports." Claim 3 depends from claim 2, and further requires "said servo-control assembly comprises a spectral monitor for monitoring power levels of said spectral channels coupled into said output ports, and a processing unit responsive to said power levels for providing control of said channel micromirrors." Claim 4 depends from claim 3, and further requires that "said servo-control assembly maintains said power levels at a predetermined value."

The '678 patent states that:

> The electronic circuitry and the associated signal processing algorithm/software for such processing unit in a servo-control system are known in the art. A skilled artisan will know how to implement a suitable spectral monitor along with an appropriate processing unit to provide a servo-control assembly in a WSP-S

> apparatus according to the present invention, for a given application.

Ex. 1001, 12:9–15. Accordingly, the ’678 patent expressly recognizes that the additional features of claims 2–4 were “known in the art” to a skilled artisan and would have been obvious to implement.

We agree with Petitioner’s contention that the disclosure in Sparks of a “closed-loop servo control system” and “power measuring means” correspond to the claimed servo-control assembly and spectral monitor, and serve the same purpose. Pet. 37–43 (citing, *inter alia*, Ex. 1004, 2:59–65, 4:39–45, 4:61–67; Ex. 1028 ¶¶ 75–78).

Concerning “coupling,” as claimed, we find persuasive Petitioner’s explanation that:

> Sparks discusses its use of servo-control to achieve a particular degree of coupling of a channel to an output port. Sparks states “FIG. 2a illustrates how the optical beam 30 would normally be coupled into the optical fiber core 4a, which is surrounded by optical fibre cladding 4b, by the focusing lens 22. If . . . the optical beam path is misaligned, e.g. either to misalignment of one of the mirrors 16, 26 or movement of the lens 22, then FIG. 2b illustrates how only a portion of the beam30 will be coupled into the optical fibre core 4a. Consequently, only the fraction of the beam profile 30 coupled into the output forms the output signal, and hence the optical signal is

> attenuated." (Ex. 1004 at 5:1-11.) Sparks teaches that "the optical switch is calibrated such that a predetermined misalignment produces a predetermined attenuation". (*Id.* at 2:52-53; *see also id.* at 3:15-22.) Thus, a predetermined coupling of each reflected spectral channel into an output port is maintained. (McLaughlin Decl., Ex. 1028 at ¶ 81.)

Pet. 39.

With regard to claim 4, Petitioner directs us to Sparks, which teaches "[a]n optical switch comprising switching means arranged to switch an optical signal by redirection of the optical beam path of said signal, wherein said optical switch is arranged to misalign the optical beam path so as to provide a predetermined optical output power." Pet. 43 (quoting Ex. 1004, Abstract). Petitioner also provides sufficient articulated reasoning with some rational underpinning to support the combination of the feedback loop in Sparks controller as a known alternative to "external feedback." *Id.* at 38. Petitioner further explains that the using the spectral monitor and processing unit of Sparks within the Bouevitch ROADM "would have been the mere combining of known prior art elements according to their known methods to yield predictable results." *Id.* at 42 (citing Ex. 1028 ¶¶ 85–93).

Patent Owner argues that Petitioner fails to explain how or why a person of ordinary skill would have been able to add Sparks's control features to Bouevitch. PO Resp. 54–55. As noted above, the obviousness test has no bodily incorporation requirement, and is instead focused on "what the combined teachings of the references would have suggested to those of ordinary skill in the art." *See Keller*, 642 F.2d at 425. Patent Owner does not address the disclosure of the '678 patent, which states that a "skilled artisan will know how to implement a suitable spectral monitor," or the reasoning provided by Petitioner. We have considered Patent Owner's arguments and find them to be insufficiently supported and conclusory. On the other hand, we conclude that Petitioner's reasoning (Pet. 35–43) is sound and supported adequately by the record. Petitioner has established by a preponderance of the evidence that claims 2–4 would have been obvious over Bouevitch, Sparks, and Lin.

3. Claims 9, 10, 13, 19, and 20

Claims 9, 10, 13, 19, and 20 ultimately depend from claim 1. In addition to addressing the elements of claim 1, we agree with Petitioner's identification of how claims 9, 10, 13, 19, and 20 would have been obvious over Bouevitch, Sparks, and Lin. Claim 9 requires that "each channel micromirror is continuously pivotable about one axis," while claim 10 requires "each channel micromirror is pivotable about two axes." Petitioner has shown that Bouevitch, Sparks, and Lin teach each of the features of claims 9, 10, 13, 19, and 20. Pet. 44–46, 48–49. Bouevitch discloses micromirrors continuously pivotable about one axis (Ex. 1003, 14:5–65, 15:30–34) and Sparks discloses mirrors that are continuously-pivotable in two axes (which includes "pivotable about one axis"). Ex. 1004, 4:43–47 (describing "movable micromirrors (16,26), which are fabricated using MEMS technology and are capable of two axis movement, to carefully align the beams so as to ensure that the maximum possible input optical signal is received at the output of the switch").

Claim 13 requires that the fiber collimators "are arranged in a one- dimensional array." Both Bouevitch and Sparks disclose the claimed feature. *See* Pet. 44–46 (citing Ex. 1003 6:1–5, 13:9–18, 5:22–42, Figs. 2a, 2b, 9b–9d; Ex. 1004, 4:33–38).

Claim 19 requires that "each output port carries a single one of said spectral channels," a feature disclosed by Bouevitch. Pet. 48 (citing Ex. 1003, 14:27–15:18).

Claim 20 requires "one or more optical censors, optically coupled to said output ports," a feature disclosed by Sparks. Pet. 48–49 (citing Ex. 1004, 2:59–65, 4:61–67, Fig. 4. We also find persuasive Petitioner's rationale for applying the optical sensors taught by Sparks to Bouevitch to "help achieve the equalization of the power levels." Pet. 49.

Patent Owner has not raised additional arguments with respect to claims 9, 10, 13, 19, and 20 beyond those asserted with respect to claim 1, addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 9, 10, 13, 19, and 20 would have been obvious over Bouevitch, Sparks, and Lin for the same reasons discussed above with respect to claim 1.

4. Claims 21–23 and 27

Independent claim 21 recites many features substantially the same as features of claim 1, with the addition of "a servo-control assembly," as recited by claim 2. However, unlike claim 1, claim 21 does not require that the channel micromirrors be "pivotal about two axes" or that they "control the power." Petitioner provides an element-by-element analysis of each feature of claim 21, relying in substantial part on its discussion of the same features from claims 1 and 2. Pet. 49–51. Claim 22 depends from claim 21 and requires the same additional features recited in claim 3. Claim 23 depends from claim 22 and requires the same additional features recited in claim 4. Claim 27 depends from claim 21 and requires the same additional features recited in claim 9. Petitioner contends claims 22, 23, and 27 would have been obvious for the same reasons provided with respect to claims 3, 4, and 9. *See id.* at 51–52.

Patent Owner has not raised additional arguments with respect to claims 21–23 and 27 beyond those asserted with respect to claims 1–4 and 9, addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 21–23 and 27 would have been obvious over Bouevitch, Sparks, and Lin for the same reasons discussed above with respect to claims 1–4 and 9.

5. Claims 44–46

Independent claim 44 generally recites features substantially the same as features of claim 1, with relatively minor differences. For example, claim 1 recites a "wavelength-separating-routing apparatus" and "multiple fiber collimators," whereas claim 44 recites an "optical system comprising a wavelength-separating-routing apparatus" and "an array of fiber collimators." Unlike claim 1, claim 44 further requires "a pass-through port and one or more drop ports" among the plurality of output ports, and recites "said pass-through port receives a subset of said spectral channels."

We agree with Petitioner's contentions with respect to claim 44:

> Bouevitch also discloses that the output port can be used as the pass-through port of element 44[a] when the "modifying means" of the Bouevitch's ROADM allows a light beam to pass through unchanged. (Ex. 1003 at 6:20–25; []McLaughlin Decl., Ex. 1028 at ¶ 121). Bouevitch teaches another output port in the form of "OUT DROP" drop port in element 80b, port 3. [] Bouevitch also discloses additional output ports. (Ex. 1003 at 10:56–61

> ("wherein each band has its own corresponding in/out/add/drop ports.") Each of these ports is provided by and comprised of microlens microcollimators. (McLaughlin Decl., Ex. 1028 at ¶ 121.)

Pet. 54. Claim 45 depends from claim 44 and requires the same additional features recited in claim 2. Claim 46 depends from claim 45 and requires the same additional features recited in claim 3.

Patent Owner has not raised additional arguments with respect to claims 44–46 beyond those asserted with respect to claims 1–3, addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 44–46 would have been obvious over Bouevitch, Sparks, and Lin as discussed above, and for the same reasons provided with respect to claims 1–3.

6. Claims 61–65

Claim 61 is a method claim that parallels the features of claim 1. For example, claim 1 recites "a wavelength-separator, for separating said multi-wavelength optical signal from said input port into multiple spectral channels," whereas claim 61 recites "separating said multi-wavelength optical signal into multiple spectral channels." Petitioner contends, and Patent Owner does not dispute, that the only substantive difference between claim 1 and claim 61 is the replacement of the term "individually and continuously controllable" in claim 1 with "dynamically and continuously controlling" in claim 61. Pet. 55. Petitioner has demonstrated that both Bouevitch and Sparks disclose "dynamically" controlling. We agree with Petitioner's contentions with respect to claim 61:

> Both Bouevitch and Sparks teach dynamic control during operation. (McLaughlin Decl., Ex. 1028 at ¶ 135). Bouevitch's device can be used as a "dynamic gain equalizer and/or configurable add/drop multiplexer," which includes dynamic control of the mirrors that perform those actions. (Ex. 1003 at 2:24–25.) Sparks teaches closed-loop 2-axis control (Ex. 1004 at 4:39–47) which the [person of ordinary skill] would have understood to mean making adjustments to the deflection of the beam in response to real-time monitoring of the channel power level. (McLaughlin Decl., Ex. 1028 at ¶ 135.)

Pet. 58.

Claim 62 depends from claim 61 and, similar to claim 2, further requires "the step of providing feedback control of said beam-deflecting elements to maintain a predetermining coupling of each spectral channel directed into one of said signal output ports." We agree with Petitioner that "Sparks discloses this feedback control in the form of a control means 130 that receives feedback from an power measuring means 130 (Ex. 1004 at 4:65–67; *see also id.* at Fig. 4; McLaughlin Decl., Ex. 1028 at ¶ 136.)." Pet. 59.

Claim 63 depends from claim 62 and substantively requires the same additional features recited in claim 4. Claim 64 depends from claim 62 and substantively requires the same additional features recited in claim 19. Claim 65 depends from claim 61 and requires the same additional features recited in claim 44.

Patent Owner has not raised additional arguments with respect to claims 61–65 beyond those asserted with respect to claims 1, 2, 4, 19, and 44 addressed above. We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 61–65 would have been obvious over Bouevitch, Sparks, and Lin as discussed above, and for the same reasons provided with respect to claims 1, 2, 4, 19, and 44. *See* Pet. 55–60.

D. Asserted Obviousness Over Bouevitch, Sparks, Lin, and Dueck

Petitioner contends claims 17, 29, and 53 would have been obvious over Bouevitch, Sparks, Lin, and Dueck. Pet. 46–48, 52, 55. Claim 17, which depends from claim 1, and claim 53, which depends from claim 44, both further require "said wavelength-separator comprises an element selected from the group consisting of ruled diffraction gratings, h[o]lographic diffraction gratings, echelle gratings, curved diffraction gratings, and dispersing gratings."[8] Claim 29 contains essentially the same recitation, but refers to "dispersing prisms" in place of "dispersing gratings." Petitioner contends that any of the types of wavelength-selective devices recited in claim 17 would have been obvious because "[e]ach type was known in the prior art, each was interchangeable as a wavelength- selective device, and each was one of a small set of possible choices." Pet. 47 (citing Ex. 1028 ¶ 101). Petitioner also contends that Bouevitch discloses the claimed wavelength selective device by disclosing the use of dispersing gratings. Pet. 47. Patent Owner does not dispute that Bouevitch discloses the additional elements of claims 17, 29, and 53. Petitioner also asserts that Dueck discloses "ruled diffraction gratings," as claimed. *Id.*; Ex. 1021, 6:26–30. Petitioner further asserts that it would have been obvious to try Dueck's ruled diffraction gratings in the devices of Bouevitch and Sparks because it represents the "best mode" of separating wavelengths in WDM devices. *Id.* at 47–48.

Patent Owner argues that a person of ordinary skill would not have been motivated to use Dueck's diffraction grating. PO Resp. 30–32. According to Patent Owner, Dueck discloses a diffraction grating that reflects an input light beam to an output port at very nearly the same angle as the incident angle. *Id.* at 30. Patent Owner reasons that because no configuration shown in Bouevitch is

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[8] Claim 17 appears to misspell "holographic" as "halographic."

designed to reflect a light beam at the same angle as Dueck, there is no motivation to use Dueck's diffraction grating in Bouevitch. *Id*. at 31–32. In reply, Petitioner asserts that Dueck was relied on "to show that ruled diffraction gratings were one of a small set of known and interchangeable choices." Pet. Reply 8. As noted above, the obviousness test has no bodily incorporation requirement, and is instead focused on "what the combined teachings of the references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d at 425. While the particular configuration of the ruled diffraction grating in Dueck may not be incorporated readily into Bouevitch, Dueck nonetheless discloses the broader concept of a ruled diffraction grating. Indeed, Dr. Sergienko testified that a ruled diffraction grating could have been used in Bouevitch, as well as holographic diffraction grating, or an echelle grating, as they are all reasonable substitutes for one another and would be expected to work. *See* Ex. 1051, 256:13–259:7.

We have assessed the information provided and determine that Petitioner has established by a preponderance of the evidence that claims 17, 29, and 53 would have been obvious over Bouevitch, Sparks, Lin, and Dueck.

E. Conclusion

Petitioner has shown by a preponderance of the evidence that claims 1–4, 9, 10, 13, 19–23, 27, 44–46, and 61–65 would have been obvious over Bouevitch, Sparks, and Lin, and that claim 17, 29, and 53 would have been obvious over Bouevitch, Sparks, Lin, and Dueck.

IV. MOTIONS TO SEAL

Petitioner and Patent Owner filed a joint motion to seal Exhibit 2032, along with a proposed protective order. Paper 17. Petitioner also filed a motion to Seal (Paper 22) directed to its Motion to Re-Caption the Proceeding (Paper 20). Patent Owner also filed a motion to seal Exhibit 2035. Paper 28. Redacted copies of Exhibits 2032 and 2035 and Paper 20 were also filed. We hereby grant entry of the parties' Stipulated Protective Order.

There is an expectation that information will be made public where the information is identified in a final written decision, and that confidential information that is subject to a protective order ordinarily becomes public 45 days after final judgment in a trial, unless a motion to expunge is granted. 37 C.F.R. § 42.56; Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,761 (Aug. 14, 2012). In rendering this Final Written Decision, it was not necessary to identify, nor discuss in detail, any confidential information. However, a party who is dissatisfied with this Final Written Decision may appeal the Decision pursuant to 35 U.S.C. § 141(c), and has 63 days after the date of this Decision to file a notice of appeal. 37 C.F.R. § 90.3(a). Thus, it remains necessary to maintain the record, as is, until resolution of an appeal, if any.

In view of the foregoing, the confidential documents filed in the instant proceeding will remain under seal, at least until the time period for filing a notice of appeal has expired or, if an appeal is taken, the appeal has concluded. The record for the instant proceeding will be preserved in its entirety, and the confidential documents will not be expunged or made public, pending appeal. Notwithstanding 37 C.F.R. § 42.56 and the Office Patent Trial Practice Guide, neither a motion to expunge confidential documents nor a motion to maintain these documents under seal is necessary or authorized at this time. *See* 37 C.F.R. § 42.5(b).

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, based on a preponderance of the evidence, claims 1–4, 9, 10, 13, 17, 19–23, 27, 29, 44–46, 53, and 61–65 of U.S. Patent No. RE42,678 are unpatentable;

FURTHER ORDERED that the Stipulated Protective Order of the parties is entered;

FURTHER ORDERED that the Joint Motion to Seal Exhibit 2032 is granted;

FURTHER ORDERED that Petitioner's Motion to Seal Paper 20 is granted;

FURTHER ORDERED that Patent Owner's Motion to Seal Exhibit 2035 is granted; and

FURTHER ORDERED that, because this is a Final Written Decision, the parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

For PETITIONER:

J. Pieter van Es
pvanes@bannerwitcoff.com

Thomas K. Pratt
TPratt@bannerwitcoff.com

Jordan N. Bodner
JBodner@bannerwitcoff.com

Michael S. Cuviello
mcuviello@bannerwitcoff.com

Matthew J. Moore
matthew.moore@lw.com

Robert Steinberg
Bob.Steinberg@lw.com

Wayne O. Stacy
wstacy@cooley.com

Christopher Chalsen
cchalsen@milbank.com

Lawrence T. Kass
lkass@milbank.com

Nathaniel Browand
nbrowand@milbank.com

Suraj Balusu
sbalusu@milbank.com

For PATENT OWNER:

Jason D. Eisenberg
Jasone-ptab@skgf.com

Robert Greene Sterne
rsterne-PTAB@skgf.com

Jon E. Wright
jwright-PTAB@skgf.com

APPENDIX K

Trials@uspto.gov
571-272-7822

Paper 28
Entered: September 18, 2015

UNITED STATES PATENT AND
TRADEMARK OFFICE

BEFORE THE PATENT TRIAL
AND APPEAL BOARD

CISCO SYSTEMS, INC.,
Petitioner,

v.

CAPELLA PHOTONICS, INC.,
Patent Owner.

Cases IPR2014-01166 and IPR2014-01276
Patents RE42,368 and RE42,678[1]

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[1] This order addresses issues that are the same in the identified cases. The parties are authorized to use this heading when filing a single paper in each proceeding, provided that such heading includes a footnote attesting that "the word-for-word identical paper is filed in each proceeding identified in the heading."

Before JOSIAH C. COCKS, KALYAN K. DESHPANDE, and JAMES A. TARTAL, *Administrative Patent Judges*.

TARTAL, *Administrative Patent Judge.*

ORDER

Conduct of the Proceeding
37 C.F.R. § 42.5

In both IPR2014-01166 and IPR2014-01276 we instituted trial on grounds asserted by Petitioner Cisco Systems, Inc., which relied upon U.S. Patent No. 6,798, 941 B2, issued September 28, 2004 ("Smith"). Petitioner contends Smith is 102(e) prior art as of September 22, 2000, the filing date of its corresponding provisional application No. 60/234,683 (the "Smith '683 Provisional"). On September 16, 2015, Petitioner contacted the Board by email to seek guidance on how to respond to what Petitioner suggests is a recent change in 102(e) law discussed in *Dynamic Drinkware LLC v. Nat'l Graphics, Inc.*, No. 15-1214, 2015 WL 5166366 (Fed. Cir. Sept. 4, 2015). In *Dynamic Drinkware*, the Federal Circuit stated: "A provisional application's effectiveness as prior art depends on its written description support for the claims of the issued patent of which it was a provisional." *Id.* at *6. Petitioner requested leave to file supplemental information consisting of a five page claim chart showing where the Smith '683 Provisional provides written description support for claim 1 of Smith.

Because both Smith and the Smith '683 Provisional are in the record of these proceedings, we are not persuaded that providing a claim chart, as Petitioner requests, constitutes supplemental information, as opposed to additional argument. We, however, are interested in the parties' views on the impact, if any, of *Dynamic Drinkware* on these proceedings and, in accordance with § 37 C.F.R. 42.20(d), request additional briefing to address the following:

(1) what a party must show to establish that a patent is prior art as of the date of its provisional application when relied upon to challenge claims in an *inter partes* review proceeding alleging obviousness under 35 U.S.C. § 103(a), particularly with respectto whether *Dynamic Drinkware* altered the required showing;

(2) whether *Dynamic Drinkware* is consistent with, or conflicts with, *In re Giacomini,* 612 F.3d 1380, 1383 (Fed. Cir. 2010) or *Ex parte Yamaguchi,* 88 U.S.P.Q.2d 1606 (B.P.A.I. 2008);

(3) whether the Smith '683 Provisional provides written description support for the claims of Smith.

Each party shall be limited to five (5) pages, not including the cover sheet or certificate of service, for their respective briefs, which shall be strictly limited to the issues identified above. Petitioner may additionally include as an exhibit to its brief a claim chart not to exceed five (5) pages showing where the Smith '683 Provisional provides written description support for the claims of Smith. The claim chart may not include any argument or explanatory text. The same brief should be entered in both IPR2014-01166 and IPR2014-01276.

It is

ORDERED that Petitioner is authorized to file a brief as described in this Order due seven (7) business days after filing of this order; and

FURTHER ORDERED that Patent Owner is authorized to file a brief responsive to Petitioner's as described in this Order due seven (7) business days after the filing of Petitioner's brief.

For PETITIONER:

Wayne O. Stacy
Matthew J. Leary
COOLEY LLP
wstacy@cooley.com
CapellaCisco@cooley.com

For PATENT OWNER:

Robert Sterne
Jon E. Wright
Jason D. Eisenberg
Nicholas Nowak
Jonathan Tuminaro
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.
rsterne-PTAB@skgf.com
jwright-PTAB@skgf.com
jasone-PTAB@skgf.com
nnowak-PTAB@skgf.com
jtuminar-PTAB@skgf.com