

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

PANDUIT CORP.,
Petitioner,

v.

CCS TECHNOLOGY, INC.,
Patent Owner.

Case IPR2017-01323
Patent 6,758,600 B2

Before JONI Y. CHANG, JENNIFER S. BISK, and
DANIEL J. GALLIGAN, *Administrative Patent Judges*.

GALLIGAN, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
Inter Partes Review
35 U.S.C. § 318(a)

I. INTRODUCTION

In this *inter partes* review, Panduit Corp. (“Petitioner”) challenges the patentability of claims 3 and 4 of U.S. Patent No. 6,758,600 B2 (“the ’600 patent”), which was assigned to CCS Technology, Inc. (“Patent Owner”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision, issued pursuant to 35 U.S.C. § 318(a), addresses issues and arguments raised during the trial in this *inter partes* review. For the reasons discussed below, we determine that Petitioner has proven by a preponderance of the evidence that claims 3 and 4 of the ’600 patent are unpatentable. *See* 35 U.S.C. § 316(e) (“In an *inter partes* review instituted under this chapter, the petitioner shall have the burden of proving a proposition of unpatentability by a preponderance of the evidence.”).

A. Procedural History

On May 1, 2017, Petitioner requested *inter partes* review of claims 3 and 4 of the ’600 patent. Paper 2 (“Pet.”). Patent Owner filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). We instituted trial on the sole ground of unpatentability, namely Petitioner’s assertion that claims 3 and 4 are unpatentable under 35 U.S.C. §103(a) as obvious over the combined teachings of Eichenberger¹ and Bennett.² Paper 8 (“Dec. on Inst.”), 22. During the trial, Patent Owner filed a Response (Paper 14, “PO Resp.”), and Petitioner filed a Reply (Paper 16, “Pet. Reply”). An oral hearing was held on July 18, 2018, a transcript of which appears in the record. Paper 22 (“Tr.”).

¹ US 7,021,837 B2, filed Feb. 20, 2001, issued Apr. 4, 2006 (Ex. 1004).

² US 5,915,055, issued June 22, 1999 (Ex. 1005).

B. Real Parties in Interest

Patent Owner indicates that Corning Optical Communications LLC (“Corning”) is a real party in interest by virtue of CCS’s assignment of “all substantial rights in the ’600 patent to Corning.” Paper 4, 1.

C. Related Matters

The parties indicate that the ’600 patent is at issue in *Corning Optical Communications LLC v. Panduit Corp.*, No. 1:16-cv-00268-GMS (D. Del.). Pet. 1; Paper 4, 1. In IPR2016-01647, the Board issued a Final Written Decision as to claims 1 and 2 of the ’600 patent. IPR2016-01647, Paper 27. In IPR2016-01648, the Board issued a Final Written Decision as to claims 1–3 and 8–10 of related Patent 6,869,227 B2 (“the ’227 patent”). IPR2016-01648, Paper 27. We are concurrently issuing a Final Written Decision in IPR2017-01375 addressing claims 6, 7, and 11 of the ’227 patent.

D. The ’600 Patent

Claims 3 and 4 are directed to “[a]n optical assembly” having “at least two optical interconnection modules.” Although the ’600 patent describes an optical module having a particular fiber routing scheme (*see* Ex. 1001, Fig. 2), claims 3 and 4 do not require optical modules having any particular internal routing scheme. *See* Dec. on Inst. 9 (“[I]ndependent claim 3 is directed to a particular ‘optical assembly’ configuration but does not require the optical interconnection module configuration recited in claim 1.”).

The ’600 patent illustrates optical assemblies in Figures 3 and 4. *See* Ex. 1001, 2:30–33, 3:44–4:11. Figure 3 is reproduced below.

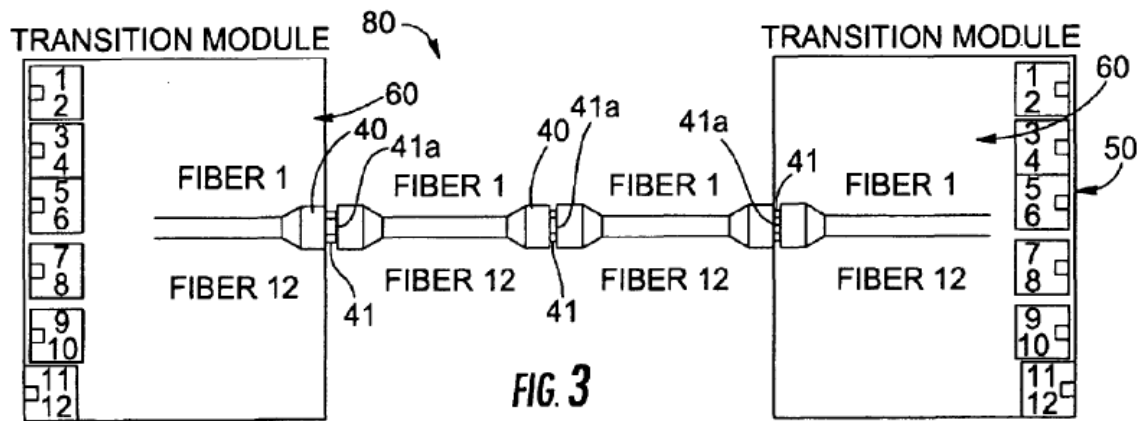


Figure 3 depicts “a schematic view of a first optical assembly according to the present invention.” Ex. 1001, 2:30–31. The ’600 patent explains:

In system[] 80, . . . the polarity is not reversed, fibers one through twelve are not flipped between the modules. In other words, the optical paths are not flipped at the adapters or other position between the modules. For example, the optical path remains with its color, blue stays with blue (1-1), orange with orange (2-2), green with green (3-3), and so on, from one module to another including the connectors 40 externally of the modules 60.

Ex. 1001, 3:50–57.

E. Claims at Issue

Claims 3 and 4 are reproduced below.

3. An optical assembly, comprising:
 - (a) at least two optical interconnection modules;
 - (b) said modules being optically interconnected by optical paths, said optical paths being established through connectors and adapters having respective keys being positioned in the same place on the connectors, and optical fiber ribbons;
 - (c) said connectors and adapters being mated with keys in the same relative position; and
 - (d) polarity of the optical fibers located externally of the modules is not reversed, such that at least some of said optical paths remain with their respective color, blue is in optical communication with blue (fibers 1-1), orange with orange (fibers

2-2), green with green (fibers 3-3), and so on, from one module to another.

4. The optical assembly of claim 3, wherein all of said optical paths remain with their respective color from one module to another.

II. ANALYSIS

A. Level of Ordinary Skill in the Art

Citing the testimony of its declarant, Dr. Casimer DeCusatis, Petitioner argues that the level of ordinary skill in the art is “(a) a Bachelor’s degree in Electrical Engineering or similar, with at least 5 years of experience designing fiber optic cassettes or harnesses; or (b) a Master’s degree in Electrical Engineering or similar, with at least 3-5 years of experience designing fiber optic cassettes or harnesses.” Pet. 9 (citing Ex. 1003 ¶¶ 11–19).

Patent Owner, citing the testimony of its declarant, Mr. Eric Pearson, argues that “[a] person of ordinary skill in the art of the ’600 patent would have a bachelor’s degree in mechanical engineering, materials science, or a related field; and 2 years of experience in fiber optic equipment design.” PO Resp. 1 (citing Ex. 2001 ¶¶ 14–15).

Although there are differences between the proposed levels of ordinary skill in the art, the parties and their declarants agree that an ordinarily skilled artisan would have had a four-year technical degree and some amount of professional experience with fiber optic equipment. Based on the evidence of record, including the testimony of the parties’ declarants, the subject matter at issue, and the prior art of record, we determine that the skill level of a person of ordinary skill in the art would have been that of a

person having a four year technical degree with a minimum of two years of professional technical experience in fiber optic equipment design. We apply this level of ordinary skill in the art in our analysis below. However, we note that our analysis would be the same if we adopted either party's proposed level of ordinary skill.

B. Claim Interpretation

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b). In applying a broadest reasonable construction, claim terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

1. "Optical Interconnection Module"

In its Preliminary Response, Patent Owner argued:

The broadest reasonable interpretation in light of the specification of the term "optical interconnection module" is a module that performs an optical interconnection (i.e., forming an optical path between two fiber optic components of the module). It cannot be read so broadly as to encompass modules that do not form optical interconnections, such as transceivers that receive electrical signals and convert them to optical signals and vice versa.

Prelim. Resp. 8. In our Decision on Institution, we largely agreed, stating:

Although the particular fiber routing scheme depicted in Figure 2 of the '600 patent is not recited in claim 3, we agree with Patent Owner that the specification's description of optical interconnection modules, such as module 60, requires, at the least, an optical connection within the module. *See Ex. 1001, Abstract, 1:66–2:15, 2:41–3:30, Fig. 2.* On this record, we also agree with Patent Owner that "optical interconnection module"

“cannot be read so broadly as to encompass modules that do not form optical interconnections.” See Prelim. Resp. 8.

Dec. on Inst. 10–11.

In its Response, Patent Owner argues that “further construction is necessary to address what it means for a module to form optical interconnections.” PO Resp. 9. According to Patent Owner, “[a]n ‘optical interconnection module’ is a module that performs an optical interconnection by accepting an incoming fiber and connecting it to an outgoing fiber.” PO Resp. 10 (citing Ex. 2001 ¶¶ 16–27); *see also* PO Resp. 14 (“a box or housing that distributes optical signals from at least one incoming fiber optic cable to at least one outgoing fiber optic cable.”). Patent Owner cites Figure 2, reproduced below, and its associated description in support of its proposed construction. PO Resp. 11–12.

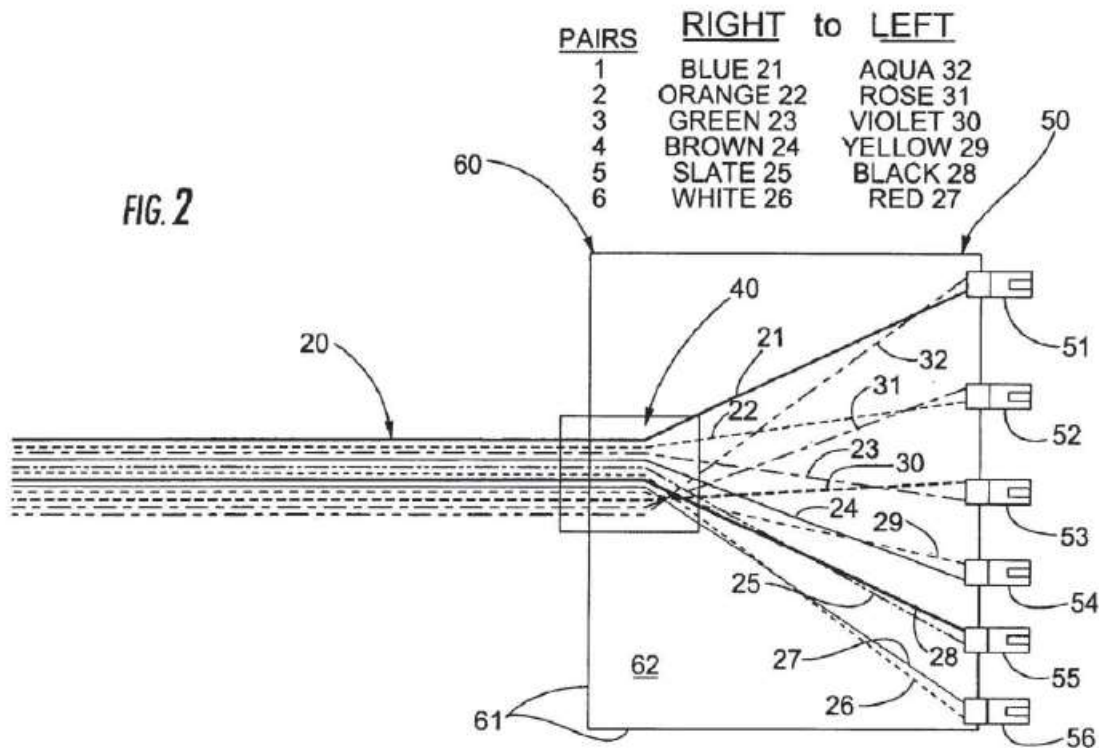


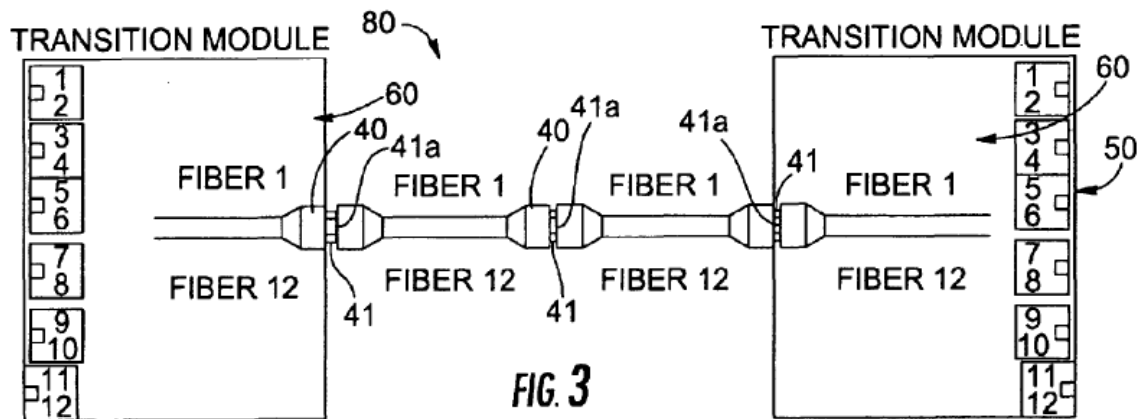
Figure 2 “illustrates an exemplary fiber wiring scheme for routing of optical fibers from connector 20³ to single or multi-fiber connectors located at connector stations 51–56, defined at a break-out section 50 of module 60.” Ex. 1001, 3:6–9.

Patent Owner argues that “module 60 accepts a set of incoming fibers via the multi-fiber connector 40 on the left and then forms optical paths to the outgoing fibers in the plurality of duplex connectors 51-56 on the right.” PO Resp. 11. According to Patent Owner, “[t]he ’600 patent explicitly states that the module performs the interconnection between the incoming fibers at connector 40 and the outgoing fibers at connectors 51-56.” PO Resp. 11 (citing Ex. 1001, 3:20–24; Ex. 2001 ¶¶ 17–20). The cited portion of the ’600 patent states: “In other words, the optical paths of connector 40 and the optical connectors at stations 51–56 are optically interconnected by optical fibers disposed in cavity 62 of the module 60, the fiber pairs being formed by the optical fibers.” Ex. 1001, 3:20–24. This cited portion, therefore, describes optically interconnecting connector 40 and connector stations 51–56 within the module. It does not “explicitly” mention “outgoing fibers at connectors 51-56,” as Patent Owner argues. Although outgoing fibers may be connected to connector stations 51 through 56, these fibers are not themselves part of module 60.

Patent Owner also cites the following testimony of Mr. Pearson: “An ‘optical interconnection module,’ which is sometimes called an ‘interconnection box,’ refers to a structure that performs optical

³ This appears to be a typographical error. Elsewhere, the ’600 patent denotes “connector” using numeral 40, and the patent uses numeral 20 to refer to “optical fiber ribbon.” See Ex. 1001, 2:43, 2:51, 3:20–21.

interconnection at the module level. Interconnection modules accept one or more incoming fibers or fiber cables and form optical paths to corresponding outgoing fibers or cables.” Ex. 2001 ¶ 25, *quoted in* PO Resp. 12. Patent Owner and Mr. Pearson also cite a definition of “fiber optic interconnection box” from *Fiber Optics Standard Dictionary*. PO Resp. 12–13 (citing Ex. 2003, 346); Ex. 2001 ¶ 26. Patent Owner’s arguments based on this evidence, however, focus on what is external to the modules, specifically that “an optical interconnection module requires at least one incoming fiber and at least one outgoing fiber.” PO Resp. 13 (citing Ex. 2001 ¶ 27). Claim 3, however, recites “[a]n optical assembly” having “at least two optical interconnection modules,” and claim 3 then separately recites what is required between the modules and external to the modules. Figure 3 is reproduced below.



As explained above, figure 3 depicts “a schematic view of a first optical assembly according to the present invention.” Ex. 1001, 2:30–31. Claim 3 encompasses what happens between the modules, reciting “said modules being optically interconnected by optical paths, said optical paths being established through connectors and adapters having respective keys being positioned in the same place on the connectors, and optical fiber ribbons.”

Figure 3 shows “connectors 40 with associated adapters 41” and optical fiber ribbons. Ex. 1001, 3:44–48. The claimed “optical assembly” does not require fibers to be connected to the left of the left module or to the right of the right module.

Furthermore, claim 3 does not recite any particular structure for the claimed “optical interconnection modules.” In stark contrast, claim 1, which is directed to “[a]n optical interconnection module,” recites limitations that specifically define the module of claim 1. Claim 3 recites no such limitations but, rather, focuses on the manner in which the “optical interconnection modules” are connected to form the claimed “optical assembly.”

Based on the evidence of record, we maintain our determination that an optical interconnection module requires an optical connection within the module. See Dec. on Inst. 10. This is consistent with the intrinsic record, particularly the ’600 patent’s disclosure that “the optical paths of connector 40 and the optical connectors at stations 51–56 are optically interconnected by optical fibers disposed in cavity 62 of the module 60, the fiber pairs being formed by the optical fibers.” Ex. 1001, 3:20–24, Fig. 2. As discussed above, the module itself does not require fibers to be plugged into it. Rather, an “optical assembly,” such as that recited in claim 3, is formed by connecting modules via fibers.

We further clarify that, because it is an “*optical interconnection module*,” it must be a module that forms an *optical interconnection*. This is consistent with the ’600 patent’s disclosure that “[m]odule 60 also includes an *optical interconnection section* having an optical connector. The preferred connector is an MTP or MPO connector 40.” Ex. 1001, 2:49–51

(emphasis added). In Figure 2, the optical interconnection section optically interconnects with fibers in ribbon 20. The '600 patent describes that the optical paths of the connector in the optical interconnection section are “immediately adjacent to at least one other optical path for optical alignment with the optical fibers in an optical fiber ribbon.” Ex. 1001, 2:57–60.

Patent Owner’s arguments are directed to distinguishing Eichenberger’s disclosure of an optoelectronic transceiver module from the claimed optical interconnection modules. *See* PO Resp. 14–22. Patent Owner argues:

It would be unreasonable . . . to conclude that an ‘optical interconnection module’ is so broad that it includes modules that accept a signal from an incoming fiber optical cable but then, rather than distribute the signal to an outgoing fiber, instead convert it to electricity and output an electrical signal to a wire.

PO Resp. 14. As explained below, however, Eichenberger describes a module that forms an optical interconnection and makes optical connections within the module and also converts light signals to electrical signals and vice-versa. Claim 3 uses the open-ended transitional term “comprising,” which does not exclude additional unrecited elements, and the claim language does not preclude optical to electrical conversion. We see no reason to disregard Eichenberger’s teachings merely because it discloses more than claim 3 requires in certain respects.

2. Remaining Terms

In our Decision on Institution, we determined that the remaining terms of the challenged claims did not require express constructions at that time. Dec. on Inst. 11. Based on the record developed during trial, we maintain our initial determination that the remaining terms of the challenged claims do not require express constructions.

C. Principles of Law

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). 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 ordinary skill in the art; and (4) any secondary considerations, if in evidence. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

D. Obviousness over Eichenberger and Bennett

Petitioner contends claims 3 and 4 are unpatentable under 35 U.S.C. § 103(a) as obvious over the combined teachings of Eichenberger and Bennett. Pet. 5, 17–36.

1. Eichenberger

Eichenberger “relates generally to the field of optical fiber data transmission and communication and more particularly concerns an optical interface in the form of an optical interface for interconnecting a 4-channel optoelectronic transmitter-receiver module and an 8-fiber optical fiber transmission ribbon.” Ex. 1004, 1:8–13. Figure 1 of Eichenberger is reproduced below.

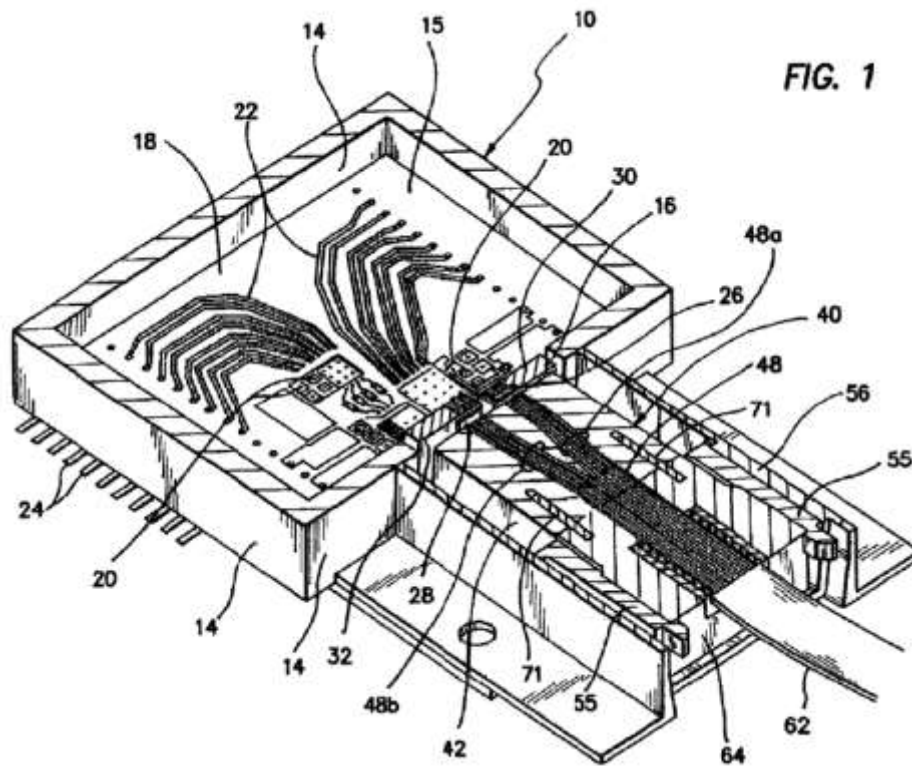


Figure 1 depicts “a typical 4-channel fiberoptic transceiver module equipped with the optical interface.” Ex. 1004, 5:8–10.

More particularly with respect to Figure 1, Eichenberger discloses that “module 10 includes a module housing 12” and “transmitter chip 26 comprising a 4-diode laser diode array and a receiver chip 28 comprising a 4-diode photodetector array.” Ex. 1004, 5:45–53. Eichenberger further discloses:

Turning to FIGS. 1, 1A and 1B the optical interface in its first embodiment includes an optical head body 40 which is a rectangular block comprised of [a] lower half 42a and an upper half 42b. . . . The diode elements on photodiode receiver chip 28 and laser diode transmitter chip are optically aligned to the fiber ends of the head body 40 and the chips are permanently assembled to the head body also as by laser welding. The assembly comprising the head body 40 and the diode array chips 26, 28 form an optical head assembly which is mounted to the transceiver housing 12 as by soldering of the proximal surface 51

to the apertured wall 14 of the housing such that the chips 26, 28 are supported through the wall opening 16 within the housing where the diode array chips are electrically interconnected to other appropriate electronic transmitter and receiver circuits.

Ex. 1004, 6:41–60.

Figure 3 of Eichenberger is reproduced below:

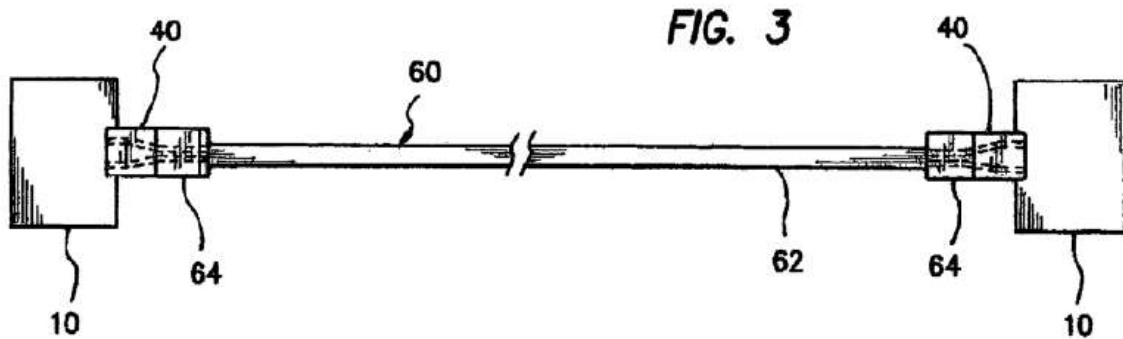


Figure 3 depicts “a 4-channel optical fiber communications system including two 4-channel transceiver modules interconnected by an 8-fiber transmission cable.” Ex. 1004, 5:22–24. Eichenberger discloses:

The optical fiber connector 64 at the opposite end of transmission ribbon 62, not seen in FIG. 1, is similarly coupled to a second transceiver module 10 also equipped with an optical head 40 arrangement similar to that shown in FIG. 1. The interconnection of two transceiver modules optically interfaced in this fashion to a[n] optical ribbon transmission cable 60 is illustrated in FIG. 3.

Ex. 1004, 7:45–52.

2. Bennett

Bennett relates to “connectorizing fiber optic cable” and discloses fiber coatings that “are usually made in twelve standard colors used in the industry (blue, orange, green, brown, slate, white, red, black, yellow, violet, rose and aqua).” Ex. 1005, 1:6, 3:9–11.

3. Independent Claim 3

a. “Optical interconnection module”

Independent claim 3 is directed to “[a]n optical assembly” having “at least two optical interconnection modules.” Petitioner contends Figure 3 of Eichenberger teaches an optical assembly having two optical interconnection modules, specifically modules 10 connected via ribbon 62. Pet. 18, 25–26 (citing Ex. 1004, 5:22–27, 7:30–42; Ex. 1003 ¶¶ 49–50).

Patent Owner argues that module 10 is an optoelectronic module rather than an “optical interconnection module,” as recited in claim 3. PO Resp. 17–22; *see also* Ex. 2001 ¶ 33 (Mr. Pearson testifying that “a device that accepts an incoming fiber and converts it to electricity rather than performing an optical interconnection by routing the signal to an outgoing fiber is not an ‘optical interconnection module’ but rather an optoelectronic module”). We agree that Eichenberger’s module 10 is an optoelectronic module because Eichenberger expressly states that it is: “FIG. 1 shows a 4-channel optoelectronic transceiver module generally designated by numeral 10.” Ex. 1004, 5:43–45. As explained below, however, we do not find Eichenberger’s disclosure of structure that performs optical to electrical signal conversion and vice-versa as disqualifying it from also teaching an optical interconnection module.

As an initial matter, as we explained in our Decision on Institution, Eichenberger’s module 10 includes connector 40. In particular, Eichenberger discloses that “[t]he assembly comprising the head body 40 and the diode array chips 26, 28 form an optical head assembly *which is mounted to the transceiver housing 12 as by soldering of the proximal*

surface 51 to the apertured wall 14 of the housing.” Ex. 1004, 6:53–57 (emphasis added). Eichenberger further discloses:

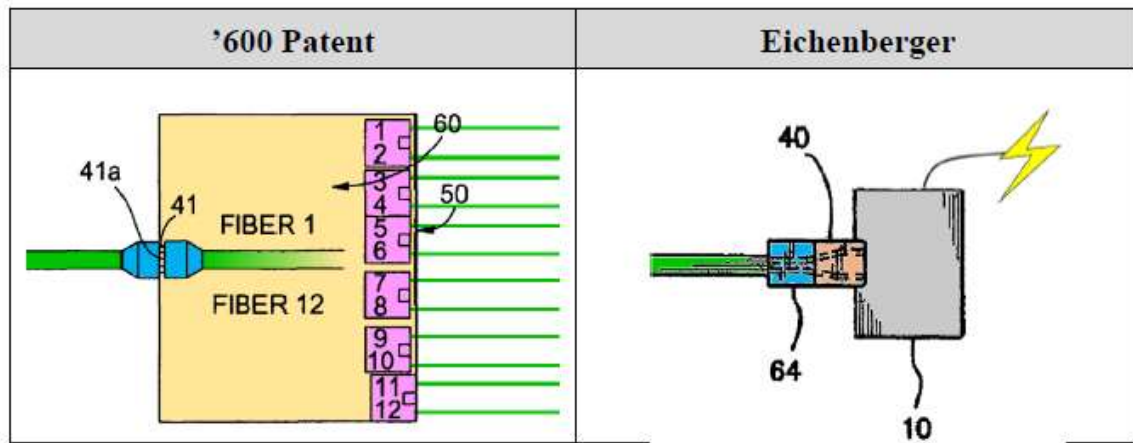
The optical head is also contained in a fiber ribbon connector receptacle 56 *fastened to the module housing 12*. The purpose of receptacle 56 is to receive and mechanically retain an optical ribbon connector in optical coupling with the fiber ends on the rear or distal surface of the optical head.

Ex. 1004, 6:60–65 (emphasis added). Eichenberger further discloses that “[a]n optical fiber connector 64 is retained in optical fiber receptacle 56 by retainer arms 55 of the receptacle to hold the optical fiber connector 64 in optical coupling with the optical head 40.” Ex. 1004, 7:42–45. According to Eichenberger, therefore, optical head 40 and receptacle 56 are both mounted to module 10’s housing 12, and connector 64 is inserted into receptacle 56 and held in place therein by retainer arms 55. Ex. 1004, 6:53–57, 6:60–65, 7:42–45. In addition, Dr. DeCusatis testifies that “those having ordinary skill in the art of fiber optics would understand that modules generally include all the module connectors, and anything external of the module would not include components of the module itself.” Ex. 1003 ¶ 67, *cited in* Pet. 33; *see also* Ex. 1003 ¶ 71 (“[M]odule connector 40 is associated with and a component of the module 10 in Eichenberger . . .”). Thus, we agree with Petitioner that “module connector 40 of Eichenberger is associated with and a component of the module 10.” Pet. 33.

Patent Owner argues Petitioner’s assertion that “optical head body 40 is ‘a component of the module 10’ is inconsistent with the theory advanced by Petitioner’s expert at his deposition that ‘there’s not an optical interconnect inside module 10 portion, it’s outside in module 40.’” PO Resp. 18 (citing Ex. 2002, 20:12–14). This quoted testimony is excerpted from a larger passage, in which Dr. DeCusatis explained: “I can’t take

head 40 off of the body 10 according to Eichenberger. So even though there's not an optical interconnect inside module 10 portion, it's outside in module 40, they're one single piece and I can't separate them." Ex. 2002, 20:10–15. Dr. DeCusatis's deposition testimony, therefore, is fully consistent with his declaration testimony that connector 40 is part of module 10. Ex. 1003 ¶¶ 67, 71.

Patent Owner argues that, even if module 10 includes connector 40, Eichenberger still does not teach an optical interconnection module, and it produces the following illustrations in support:



PO Resp. 20. The figure above on the left is an annotated excerpt from Figure 3 of the '600 patent, and the figure above on the right is an annotated excerpt from Figure 4 of Eichenberger. PO Resp. 20. Patent Owner argues:

Starting on the left with the '600 patent disclosure, module 60 accepts incoming fibers via the connector (blue) on the end of optical fiber ribbon 20 (green) that pairs with a connector internal to the module (also blue). Module 60 performs an interconnection, i.e., it forms an optical path from those external fibers to the external fibers at the plurality of fiber optic connectors 51-56 (pink). [Ex. 2001] ¶ 32[.] As the '600 patent explains, module 60 uses internal fibers to perform this interconnection: "connector 40 and the optical connectors at

stations 51-56 are optically interconnected by optical fibers disposed in cavity 62 of the module 60.” [Ex. 1001], 3:20-24.

PO Resp. 20.

We agree with Patent Owner that the ’600 patent describes optically interconnecting connector 40 and connector stations 51–56. Ex. 1001, 3:20–24. The green fibers to the right of module 60, however, are not part of the original drawing and are not part of the “optical interconnection module.” More importantly, the “optical assembly” of claim 3 does not require fibers to be connected to the right of the module, as shown in Patent Owner’s annotated drawing. Thus, we do not interpret the claimed “optical interconnection module” to require that external fibers be connected to it. Claim 3 elsewhere recites the configuration of fibers connected in the claimed “optical assembly.”

We find that Eichenberger’s module 10, which includes optical head 40, teaches an “optical interconnection module.” Figure 1 of Eichenberger is reproduced below.

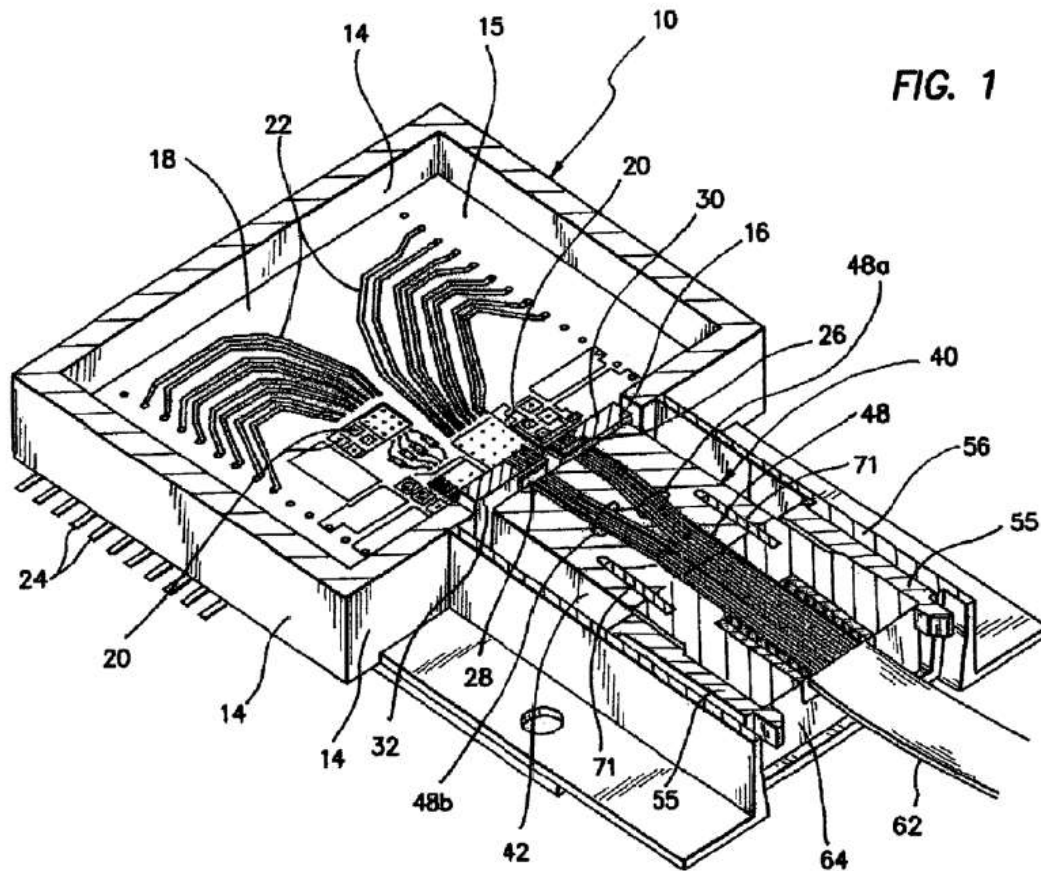


Figure 1 depicts “a typical 4-channel fiberoptic transceiver module equipped with the optical interface.” Ex. 1004, 5:8–10.

As shown in Figure 1, ribbon 62 with connector 64 plugs into the module. Eichenberger discloses: “An optical fiber connector 64 is retained in optical fiber receptacle 56 by retainer arms 55 of the receptacle to hold the optical fiber connector 64 in optical coupling with the optical head 40.” Ex. 1004, 7:42–45. Eichenberger explains that connector 64 has pins 71 that “mate into corresponding pin holes 58 of optical head 40 as shown in FIG. 1 to precisely position and optically align the fiber end array 68 of the transmission 40 cable 60 with the array of distal fiber ends 54 on the distal face 53 of the optical head.” Ex. 1004, 7:37–42. Thus, Eichenberger describes fibers within optical head 40 optically interconnecting to fibers

from the ribbon. Therefore, Eichenberger teaches a module that forms an optical interconnection.

Eichenberger also discloses that optical head 40 contains eight fiber segments 48. Ex. 1004, 6:44–45. Eichenberger discloses:

The proximal fiber ends are grouped in two fiber end arrays 48a, 48b of four fiber ends each. One fiber end array 48a is in optical alignment with the 4-channel transmitter chip 26 while the other fiber end array 48b is in optical alignment with the 4-channel receiver chip 28.

Ex. 1004, 7:4–8. Eichenberger describes that “the 4-diode laser diode array of the transmitter chip 26 . . . emit[s] light pulses” into the optical fibers and also that “[t]he four photodetector diodes of receiver chip 28 are each illuminated by a corresponding optical fiber.” Ex. 1004, 5:60–6:6. Thus, Eichenberger describes fibers 48 within optical head 40 optically interconnecting fibers from ribbon 62 and diodes on the transmitter and receiver chips, thereby describing an optical connection within the module. This is similar to the ’600 patent’s disclosure that fibers within module 60 optically connect fibers from ribbon 20 to connector stations 51–56. In particular, the ’600 patent describes:

FIG. 2 illustrates an exemplary fiber wiring scheme for routing of optical fibers from connector [40] to single or multi-fiber connectors located at connector stations 51–56, defined at a break-out section 50 of module 60. . . . At least one but preferably at least 80% of the fiber pairs routed to respective connector stations 51–56 are made by fibers not immediately adjacent in the optical fiber ribbon 20. In other words, the optical paths of connector 40 and the optical connectors at stations 51–56 are optically interconnected by optical fibers disposed in cavity 62 of the module 60, the fiber pairs being formed by the optical fibers.

Ex. 1001, 3:6–24.

As discussed above, claim 3 does not require the particular routing scheme of Figure 2. Rather, this disclosure is useful for illustrating how Eichenberger's internal optical connection of the ribbon fibers to the optical diodes via fibers 48 teaches an internal optical connection as described in the '600 patent. Although the terminals are different—laser diodes and photodetector diodes in Eichenberger and connector stations in Figure 2 of the '600 patent—claim 3 does not recite particular connector stations within its claimed “optical interconnection modules,” unlike claim 1, which expressly recites “an optical connector station formed in a wall of said module having a plurality of optical fiber connectors.” This confirms that Eichenberger's module 10, including optical head 40, teaches “an optical interconnection module,” as recited in claim 3.

Patent Owner also argues: “To be sure, there is an optical interconnection at the point where the fibers of optical head body 40 are connected to the separate fibers of connector 64. . . . This, however, only speaks to the limitation of claim 3 that ‘said modules be[] optically interconnected.’” PO Resp. 19. We disagree. The limitation to which Patent Owner refers recites “said modules being optically interconnected by optical paths, said optical paths being established through connectors and adapters having respective keys being positioned in the same place on the connectors, and optical fiber ribbons.” As discussed above, claim 3 is directed to an “optical assembly,” and this limitation speaks to the particular manner in which the modules are interconnected in the assembly, specifically via “optical paths,” which “are established through connectors and adapters” and “optical fiber ribbons.”

In view of the foregoing, we find that Eichenberger’s module 10 including optical head 40 teaches a module that forms an interconnection and that makes an optical connection within the module and therefore teaches an “optical interconnection module.” We further find that Figure 3 of Eichenberger teaches an optical assembly having two such optical interconnection modules, specifically modules 10 connected via ribbon 62.

b. Remaining limitations

Although Patent Owner does not provide specific arguments regarding the remaining limitations of claim 3, the burden remains on Petitioner to demonstrate unpatentability. *See Dynamic Drinkware LLC, v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). For the reasons explained below, we determine Petitioner has met its burden.

i. Limitation (b)

Claim 3 further recites “said modules being optically interconnected by optical paths, said optical paths being established through connectors and adapters having respective keys being positioned in the same place on the connectors, and optical fiber ribbons.” Petitioner contends Eichenberger teaches “that the modules 10 are interconnected using receptacles 56, connectors 40, 64, and a ribbon 62.” Pet. 26 (citing Ex. 1004, 7:30–52). Citing the testimony of Dr. DeCusatis, Petitioner argues that a person of ordinary skill in the art would have understood “that the receptacles 56 of Eichenberger are adapters because the receptacles 56 mechanically retain and optically couple connectors 40, 64” and “that the fibers 48 extending through the ribbon 62, the adapters 56, and the connectors 40, 64 are optical paths because the fibers 48 allow for the transmission of data.” Pet. 26–27

(citing Ex. 1004, 1:8–13; Ex. 1003 ¶ 52). We are persuaded by these contentions.

With respect to the claimed “adapters,” Eichenberger discloses that “[t]he purpose of receptacle 56 is to receive and mechanically retain an optical ribbon connector in optical coupling with the fiber ends on the rear or distal surface of the optical head.” Ex. 1005, 6:62–65. Dr. DeCusatis testifies that “retaining mechanism 56 would be considered an adapter by those having ordinary skill in the art because adapters generally mechanically mate and optically couple multiple connectors together.” Ex. 1003 ¶ 37, *cited in* Pet. 13; *see also* Ex. 1003 ¶ 51 (“[A] person of ordinary skill in the art would immediately understand and recognize that the receptacles 56 of Eichenberger are adapters because Eichenberger teaches that the receptacles 56 are used to mechanically retain and optically couple connectors 40, 64. Optical coupling and mechanical retention are fundamental purposes of fiber adapters, and, therefore, the receptacle 56 is an adapter.”). Therefore, we find Eichenberger’s receptacles 56 teach the claimed “adapters.”

With respect to the claimed “connectors,” Eichenberger discloses “optical ribbon connector 64” on either end of ribbon 62: “The cable 60 has a transmission ribbon 62 which is a commercially available standard 8-fiber ribbon terminated at each of its opposite ends with an industry standard 8-fiber optical ribbon connector 64.” Ex. 1004, 7:32–35, *quoted in* Pet. 19. Thus, we find Eichenberger’s connectors 64 teach the claimed “connectors.” We further find Eichenberger’s modules are optically interconnected by optical paths because optical ribbon 62 has eight fibers. *See* Ex. 1004, Fig. 3 (showing connection of modules via ribbon 62).

With respect to the requirement of claim 3 of “connectors and adapters having respective keys being positioned in the same place on the connectors,” Petitioner asserts “Eichenberger teaches that the adapter 56 mates with the connector 64 such that the key tab 69 of the connector 64 is pointing upward.” Pet. 27 (citing Ex. 1004, 7:52–64; Ex. 1003 ¶ 53). Petitioner argues “Eichenberger suggests a keyed adapter because the receptacle (adapter) 56 only allows for a key-up positioning.” Pet. 27 (citing Ex. 1004, Fig. 1). Petitioner further argues:

[T]o the extent that Eichenberger does not explicitly teach an adapter 56 having a key, it would have been obvious to a [person of ordinary skill in the art] to include a corresponding key on the adapter 56 that receives and is compatible with the key 69. (Ex. 1003, ¶54). It would have been obvious to a [person of ordinary skill in the art] to include a key adapter 56 because a keyed adapter would assure that the ribbon connector 64 fits within the adapter 56 and that the ribbon connector 64 cannot be improperly oriented when inserted into the adapter 56. *Id.* Indeed, Eichenberger even provides the motivation for a keyed adapter by stating that the key limits orientation of the connector 64 when inserted into the adapter 56. (Eichenberger 7:52-64).

Pet. 28.

We are persuaded by these contentions. Eichenberger discloses that “the connectors 64 have key tabs 69 which limit the orientation of the connector when inserted in connector receptacle 56, in that the connector can only be mated to the receptacle with the key tab point upwards in FIG. 1.” Ex. 1004, 7:52–56. We find Eichenberger’s disclosure of a key on the connector for proper mating with the adapter teaches an adapter having a key. *See* Ex. 1003 ¶ 53. We further credit Dr. DeCusatis’s testimony that “[a] key 69 would provide no orientation limitation without a compatible, keyed adapter 56 configured to receive the key 69.” Ex. 1003 ¶ 54. We

further find a person of ordinary skill in the art would have been motivated to include a key on adapter 56 to properly mate the keyed connector with the adapter, to the extent this is not taught, as we find it is. See Ex. 1003 ¶ 54; Ex. 1004, 7:52–56.

With respect to claim 3’s requirement of “optical fiber ribbons,” Petitioner argues that, in Figure 5, “Eichenberger teaches . . . the use of multiple ribbons to interconnect two modules 10,” and Petitioner argues “[i]t would have been obvious to modify Fig. 3 to include two interconnected ribbons 62 mechanically mated through an adapter 56 and connectors 64 in order to extend the data transmission distance between the two modules 10.” Pet. 29–31 (citing Ex. 1004, 8:56–62, Fig. 5; Ex. 1003 ¶¶ 55, 59, 61). With reference to Figure 5, Eichenberger describes connecting ribbon 82 and ribbon 62:

The opposite end of ribbon 82 is terminated with a standard 8-fiber optical fiber connector 86 which has distal fiber ends of the ribbon 82 and which mechanically and optically couples with an end connector 64 of transmission ribbon 62 of cable 60, so as to interface the transmitter-receiver module 10 for optical communication via the optical fiber ribbon 62.

Ex. 1004, 8:56–62. Thus, Eichenberger describes using multiple ribbons. As Dr. DeCusatis explains, “[f]iber ribbons 62 have a finite length, which may not be enough to span the distance between two fiber modules 10.” Ex. 1003 ¶ 59, *cited in* Pet. 31. Therefore, we find a person of ordinary skill in the art would have been motivated to include two ribbons in the assembly of Figure 3 to extend the transmission distance between the modules.

ii. Limitation (c)

Claim 3 further recites “said connectors and adapters being mated with keys in the same relative position.” Petitioner contends “Eichenberger

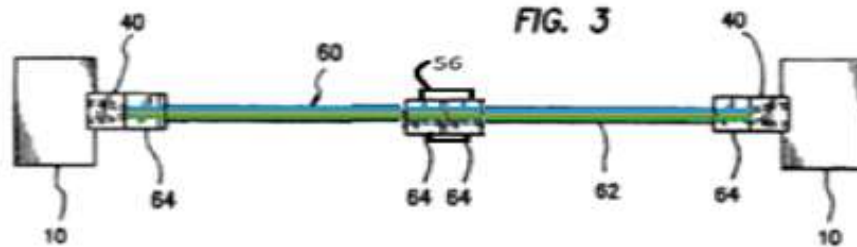
teaches that all MPO connectors and adapters must be mated key-up to key-up.” Pet. 32 (citing Ex. 1004, 7:52–64; Ex. 1003 ¶¶ 53–54). We agree because, as discussed above, Eichenberger discloses that “the connectors 64 have key tabs 69 which limit the orientation of the connector when inserted in connector receptacle 56, in that the connector can only be mated to the receptacle with the key tab point upwards in FIG. 1.” Ex. 1004, 7:52–56. In Eichenberger, therefore, connectors and adapters are mated with keys in the same position to ensure proper orientation. Thus, we find Eichenberger teaches “said connectors and adapters being mated with keys in the same relative position,” as recited in claim 3.

iii. Limitation (d)

Claim 3 further recites that “polarity of the optical fibers located externally of the modules is not reversed, such that at least some of said optical paths remain with their respective color, blue is in optical communication with blue (fibers 1-1), orange with orange (fibers 2-2), green with green (fibers 3-3), and so on, from one module to another.” Petitioner argues that Eichenberger teaches a “straight” ribbon configuration in which polarity is not reversed between modules 10 (including connectors 40) and, therefore, that “polarity is not reversed externally of the modules and fiber order remains the same externally of the module.” Pet. 33 (citing Ex. 1003 ¶ 72).

Petitioner further argues that “Bennett teaches that fibers have colors, such as blue, green, and orange” and that “[i]t would have been obvious to combine the module interconnection method of Eichenberger with the fiber color coating method taught by Bennett to improve fiber identification for human installers in the field and also to comply with industry standards.”

Pet. 34–35 (citing Ex. 1005, 3:7–14; Ex. 1003 ¶¶ 76–77). Petitioner provides the figure below.



According to Petitioner, “modified Fig. 3 above . . . represents the combination of Eichenberger and Bennett, [and] fiber color is consistent externally of the modules.” Pet. 34.

We agree with Petitioner that it would have been obvious to provide color coatings as taught in Bennett because Bennett identifies “*twelve standard colors used in the industry* (blue, orange, green, brown, slate, white, red, black, yellow, violet, rose and aqua).” Ex. 1005, 3:9–11 (emphasis added). As Dr. DeCusatis explains, “Bennett teaches that it has long been industry standard to color coat optical fibers within ribbons and jumper connectors.” Ex. 1003 ¶ 73 (citing Ex. 1005, 3:6–16). Thus, the evidence of record confirms that color coating fibers represents nothing more than industry standard practice and would have been well within the knowledge and skill of a person of ordinary skill in the art. Furthermore, the color coating would have facilitated proper identification of fibers within an array of multiple fibers, as Dr. DeCusatis explains. Ex. 1003 ¶ 76. We find, therefore, that a person of ordinary skill in the art would have been motivated to combine Bennett’s teachings of color coating fibers with Eichenberger’s teachings of connecting modules with fiber ribbons.

We also find that, in Petitioner's proposed configuration illustrated in the figure reproduced above, the polarity of the fibers between the modules (i.e., externally of modules 10 including connectors 40) is not reversed such that the optical paths stay with their respective colors.

c. Conclusion as to Claim 3

In summary, we find that the combination of Eichenberger and Bennett teaches all of the limitations of claim 3, and we find that a person of ordinary skill in the art would have had reason to, and would have been motivated to, combine the teachings of Eichenberger and Bennett in the manner asserted. Patent Owner does not present any objective evidence of nonobviousness as to any of the challenged claims. Having considered the full record developed during trial, we conclude that Petitioner has shown, by a preponderance of the evidence, that claim 3 would have been obvious based on Eichenberger and Bennett under 35 U.S.C. § 103(a).

4. Dependent Claim 4

Claim 4 depends from claim 3 and recites that "all of said optical paths remain with their respective color from one module to another." Petitioner argues that "[t]he straight ribbon illustrated in modified Fig. 3 shows that all colors are connected to the same colors." Pet. 35 (citing Ex. 1003 ¶ 79). Although Patent Owner does not provide specific arguments regarding claim 4, the burden remains on Petitioner to demonstrate unpatentability, as discussed above. We agree with Petitioner that all of the optical paths stay with their respective colors from one module to another in Petitioner's proposed configuration because, as discussed above with respect to claim 3, the optical paths stay with their respective colors between the modules.

Therefore, having considered the full record developed during trial, we conclude that Petitioner has shown, by a preponderance of the evidence, that claim 4 would have been obvious based on Eichenberger and Bennett under 35 U.S.C. § 103(a).

III. ORDER

Accordingly, it is:

ORDERED that claims 3 and 4 of the '600 patent have been shown to be unpatentable; and

FURTHERED ORDERED that, because this is a Final Written Decision, 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.

IPR2017-01323
Patent 6,758,600 B2

For PETITIONER:

Kelly Eberspecher
keberspecher@steptoe.com

Daniel Stringfield
dstringfield@steptoe.com

Katherine Cappaert
kcappaert@steptoe.com

For PATENT OWNER:

Eric Hayes
eric.hayes@kirkland.com

Eugene Goryunov
egoryunov@kirkland.com

George Foster
billy.foster@kirkland.com