

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

OPTICIS CO., LTD

Petitioner,

v.

INNEOS LLC,

Patent Owner.

Case No. IPR2023-01256
U.S. Patent No. 7,198,416

**PATENT OWNER'S RESPONSE TO INSTITUTION OF
INTER PARTES REVIEW**

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EXHIBIT LIST

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2003	Declaration of Dr. Michael Lebby, Ph.D.
2004	WEBSTER’S NINTH NEW COLLEGIATE DICTIONARY 962, 1059, 1061, 1161 (9th ed.1986).
2005	<i>Radial</i> , CHAMBERS DICTIONARY OF SCIENCE AND TECHNOLOGY (rev. ed. 1974).
2006	<i>Ferrule</i> , NEWTON’S TELECOM DICTIONARY (21st ed. 2005).
2007	JOSEPH E. PALAIS, FIBER OPTIC COMMUNICATIONS 33–48 (2nd ed. 1988).
2008	<i>Fiber optic spot illumination</i> , FIBER OPTICS STANDARD DICTIONARY (2nd ed. 1989).
2009	Pages of Eric Grann Inventor Notebook.
2010	Curtis Ray Inventor Notebook.
2011	Declaration of Michael Liang.
2012	Wilfrid B. Veldkamp et al., <i>Coherent Summation of Laser Beams Using Binary Phase Gratings</i> , 11 OPTICS LETTERS, 303–05 (1986).
2013	J. W. Goodman et al., <i>Optical Interconnections for VLSI Systems</i> , 7 PROCEEDINGS OF THE IEEE, 850–66 (1984).
2014	H. John Caulfield, <i>Parallel N4 Weighted Optical Interconnections</i> , 26 APPLIED OPTICS, 4039–40 (1987).

Exhibit No.	Description
2015	Adolf W. Lohmann et al., <i>Optical Perfect Shuffle</i> , 25 APPLIED OPTICS, 1530–31 (1986).
2016	<i>Ferrule</i> , NEWTON’S TELECOM DICTIONARY (28th ed. 2014).
2017	JEFF HECHT, UNDERSTANDING FIBER OPTICS 317 (5th ed. 2015).
2018	U.S. Patent No. 6,201,908 to Grann.
2019	Scheduling Order, Dkt. 53, Inneos LLC v. Opticis Co. Ltd. et al., No. 8-23-cv-00185 (C.D. Cal. Aug. 10, 2023).
2020	Order Denying Stay, Dkt. 74, Inneos LLC v. Opticis Co. Ltd. et al., No. 8-23-cv-00185 (C.D. Cal. Sept. 13, 2023).
2021	<i>Ferrule</i> , IBM DICTIONARY OF COMPUTING (10th ed. 1993).
2022	Opticis USA’s Notice of Joinder in Connection with Motion to Stay, Dkt. 70, Inneos LLC v. Opticis Co. Ltd. et al., No. 8-23-cv-00185 (C.D. Cal. Aug. 28, 2023).
2023	Exhibit from April 11, 2024, Deposition of Dr. Alan Willner, Ph.D., University of Southern California Optical Communication Laboratory Research Webpage Printout.
2024	Exhibit from April 11, 2024, Deposition of Dr. Alan Willner, Ph.D., Annotated Optical Communication Laboratory Research Webpage Printout, dated April 11, 2024.
2025	Exhibit from April 11, 2024, Deposition of Dr. Alan Willner, Ph.D., Declaration in Support of Defendant Opticis Co., Ltd.’s Opening Claim Construction Brief, Dkt. 83, Inneos LLC v. Opticis Co. Ltd. et al., No. 8-23-cv-00185 (C.D. Cal. Dec. 15, 2023).

Exhibit No.	Description
2026	Exhibit from April 11, 2024, Deposition of Dr. Alan Willner, Ph.D., Exhibit A to the Declaration of Dr. Alan Willner, Ph.D. (EX1003)
2027	Computer file titled “straightmux”, last modified October 16, 2003.
2028	Computer file titled “straightmuxsec”, last modified October 16, 2003.
2029	Computer file titled “ceramic”, last modified July 18, 2003.
2030	Computer file titled “ymux”, last modified July 21, 2003.
2031	Computer file titled “ymuxxsec”, last modified October 16, 2003.
2032	Email from Curtis Ray to Eric Grann with attachment, dated October 16, 2003.
2033	Windows Explorer window containing metadata for “straightmux,” “straightmuxsec,” and “ymuxxsec”.
2034	Email from Curtis Ray to Brian Peters and Eric Grann with screenshot of attachment, dated November 11, 2003.
2035	Email from Curtis Ray to Eric Grann with screenshot of attachment sheet 1, dated January 13, 2004.
2036	Email from Brian Peters to Mike Rogers, dated July 17, 2003.
2037	Computer file titled “Ultem Focuser”, last modified July 21, 2003.

Exhibit No.	Description
2038	Computer file titled “Ultem Focuser.SMF”, last modified July 22, 2003.
2039	Windows Explorer window containing metadata for “Ultem Focuser” and “Ultem Focuser.SMF”.
2040	Windows Explorer window containing metadata for “New LX4 mux with 500 micron pitch” and contents of “New LX4 mux with 500 micron pitch”.
2041	Email from Brian Peters to Hatch Graham, dated December 8, 2003.
2042	Computer file titled “Single Lens LX4 coupler1”, last modified January 9, 2004.
2043	Windows Explorer window containing metadata for “Single Lens LX4 coupler1”.
2044	Windows Explorer window containing metadata for “ceramic” and “ymux”.
2045	Declaration of Curtis Ray, dated April 23, 2024.
2046	Declaration of Eric Grann, dated April 23, 2024.
2047	Declaration of Scott Fluegel, dated April 23, 2024.
2048	Deposition Transcript of Dr. Alan Willner, Ph.D., dated April 11, 2024.
2049	Supplemental Declaration of Dr. Lebby, Ph.D.

Exhibit No.	Description
2050	Email from Brian Peters to Eric Grann and Curtis Ray, dated November 10, 2003.

I. INTRODUCTION

Inneos submits this Response to Opticis Co. Ltd.'s Petition for *Inter Partes* Review of U.S. Patent No. 7,198,416 (“the ’416 Patent”).

The Petition primarily relies on the Kurita reference (Ground 1), but Kurita does not disclose a compact, cost-effective, pre-aligned “optical combiner” as the ’416 Patent claims. The ’416 Patent’s specification defines “the present invention” as a “compact device” that utilizes “passive alignment.” The Board recognized the optical combiner as a device but did not fully construe the term. As set forth below, Kurita differs from the ’416 Patent invention as it is not integrated. Its components are separate, require manual alignment, and do not use passive alignment. Kurita also does not disclose or teach using radial sectors of the focusing lens; Kurita teaches linear alignment of collimating lenses.

Petitioner relied on Lemoff (Ground 3), which the Board acknowledged did not expressly disclose the claimed “collimating lenses.” Petitioner relied “solely upon Dr. Willner’s opinion evidence” to give rise to what the Board characterized as “a material issue of fact,” which the Board found could be resolved on a complete record. Additionally, Petitioner relied on combined disclosures of Kurita, LaMarche, and/or and Lemoff (Ground 2) and Lemoff and LaMarche (Ground 4). The Board recognized Inneos raised questions as to whether Petitioner has adequately explained

why a POSITA would have made these combinations. Those questions are addressed below.

Finally, as established during prosecution, the '416 Patent is entitled to an invention date of July 17, 2003, with the consequence that Bhandarkar (Ground 5) is not prior art. The Board recognized Inneos' diligence evidence, but it sought further explanation. This Response incorporates additional corroborating evidence and testimony from the inventors, highlighting their reasonable continuous diligence.

II. OVERVIEW OF THE TECHNOLOGY, '416 PATENT, AND PRIOR ART

A. The '416 Patent

The '416 Patent relates to advancements in WDM technology. Conventional WDM systems used expensive dielectric filters or waveguides requiring alignment. EX1001 1:43-46; 2:21-26; 4:64-65. Other attempts at WDM used discrete optical components in experimental settings that were bulky and not commercially practical. Being able to accomplish WDM using a compact, inexpensive multiplexer is a problem the inventors of the '416 Patent sought to solve. EX2003 §§V-VI.

The purpose of the '416 Patent is “to create a compact device capable of combining multiple optical signals into a single optical fiber.” EX1001 1:43-51, 2:11-15 (“The present invention provides, for the first time, an inexpensive, injection molded, one piece optical combiner capable of combining, separately collimating

and focusing the output of multiple lasers into a single optical fiber with a uniform, high coupling efficiency.”); 2:21-26 (“One of the key objects of the present invention is to provide a compact and cost effective optical combiner....”). The ’416 Patent explains that “a single molded device can be constructed to create one embodiment of the present invention, two or more parts can be combined to accomplish the same function.” *Id.* 1:51-55. The patent is entitled “Optical Combiner Device” and the specification explains, “this invention relates to an optical multiplexing device which spatially combines multi-wavelength light from a plurality of lasers into an optical fiber.” *Id.* 1:13-16.

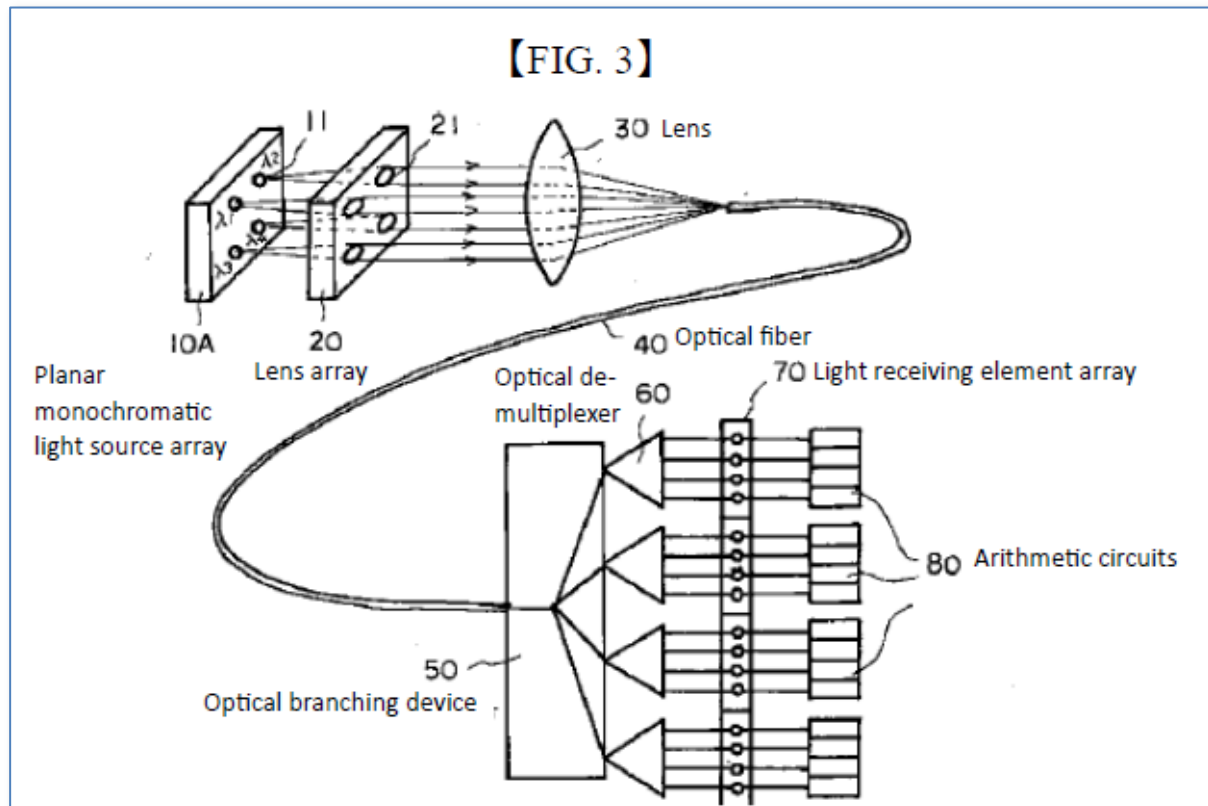
The inventors of the ’416 Patent developed an inexpensive, integrated device capable of combining, separately collimating and focusing the output of multiple lasers into a single optical fiber with a uniform, high coupling efficiency. *Id.* 1:13-16, 1:51-55, 2:11-26; 3:19-21; EX2003 §§V-VI.

B. Cited Prior Art

1. Kurita (EX1004)

In contrast with the ’416 Patent, Kurita discloses an arrangement of individual, discrete optical component pieces. EX1004 ¶[0006], [0015]. In Figure 3, Kurita discloses an arrangement of three individual optical components—1) elements 10A with light emitting portions 11, 2) lens array 20 with lens portions 21, and 3) lens 30. EX1004 ¶¶ [0015]-[0016].

In FIG. 3, the optical components are part of a multiplexing switch configuration. The other end of optical fiber 40 is connected to optical branching device 50 where the lights are separated into individual wavelengths.



Kurita does not disclose how the optical components or fiber are fixed in place to function properly. EX1004 ¶[0006].

Due to the need for manual alignment of components that must be held in place relative to each other, and the sensitive alignment issues, Kurita's system is commercially impractical. EX2003 ¶116. Kurita does not teach how to go from a conceptual optical arrangement that could be produced in an optical lab to a

commercially deployable product. Kurita's components are not passively aligned but must use manual active alignment. EX2003 ¶¶131; EX2049 §V.A.1.

Unlike the '416 Patent, Kurita does not disclose or teach an optical combiner with integrated optical components. While Kurita's object was to reduce cost by reducing the number of individual optical components (EX1004 ¶¶[0005]-[0006]), Kurita still discloses discrete optical components that must be manually aligned. *Id.* ¶[0017]; EX2003 §IX.A.1.

Because Kurita is an arrangement of discrete parts, it fails to disclose numerous claim elements of the '416 Patent that are part of the claimed optical combiner. Additionally, Kurita as a standalone §103 reference also fails to disclose these missing elements. EX2003 §IX.A.

2. LaMarche (EX1005)

LaMarche discloses “an optical arrangement for interconnecting, via free space, light emitting devices to light detecting devices,” utilizing “multipoint to multipoint” interconnections. EX1005, 1:6–8. LaMarche does not disclose an optical combiner, even under Petitioner's construction, or teach how to combine multiple different wavelengths onto a single fiber for WDM. EX1005 FIG. 6.

LaMarche is directed to the problem of improving signal integrity in multipoint-to-multipoint interconnections. EX1005 1:11-2:17, 7:16-25. LaMarche permits “multipoint to multipoint interconnections by utilizing the concept of pupil

division in conjunction with a non-collinear arrangement of lenses” (*id.* at 3:5–8), and “overcomes the drawbacks of the prior art methods of interconnections by using in a new manner a non-collinear arrangement of lenses, i.e., the optical axes of two or more lenses are parallel, but offset in the radial direction.” *Id.* at 2:13–17. EX2003 §IX.B.2.

In the optical arrangement of FIG. 6, each light emitting device (e.g., 620-1 through 620-M) communicates with each light detecting device (e.g., 680-1 through 680-K) on the other side of an array of ball lenses that fans out or broadcasts the light. EX1005 FIG. 6.

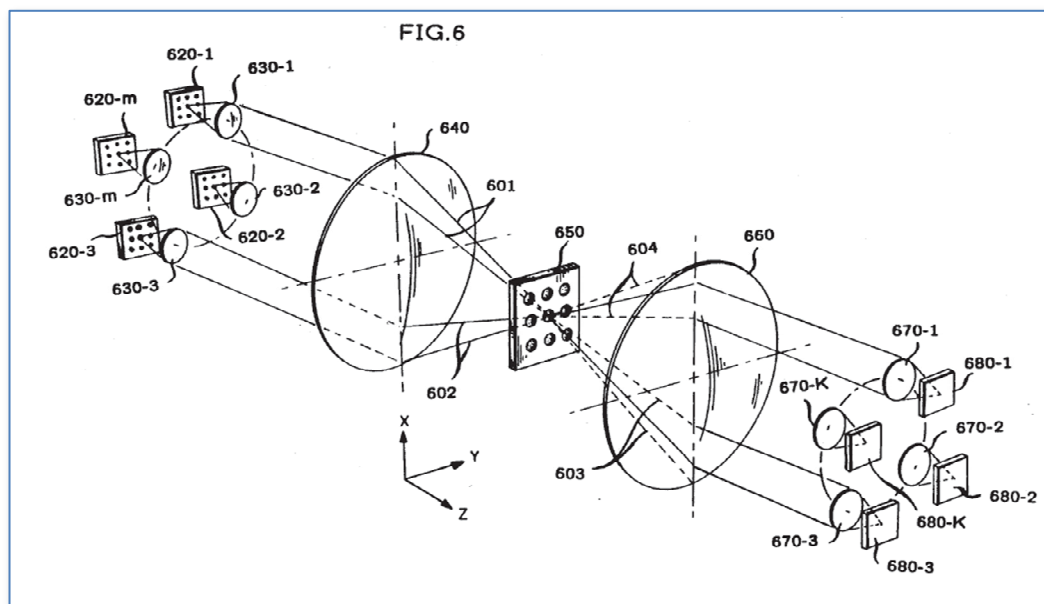
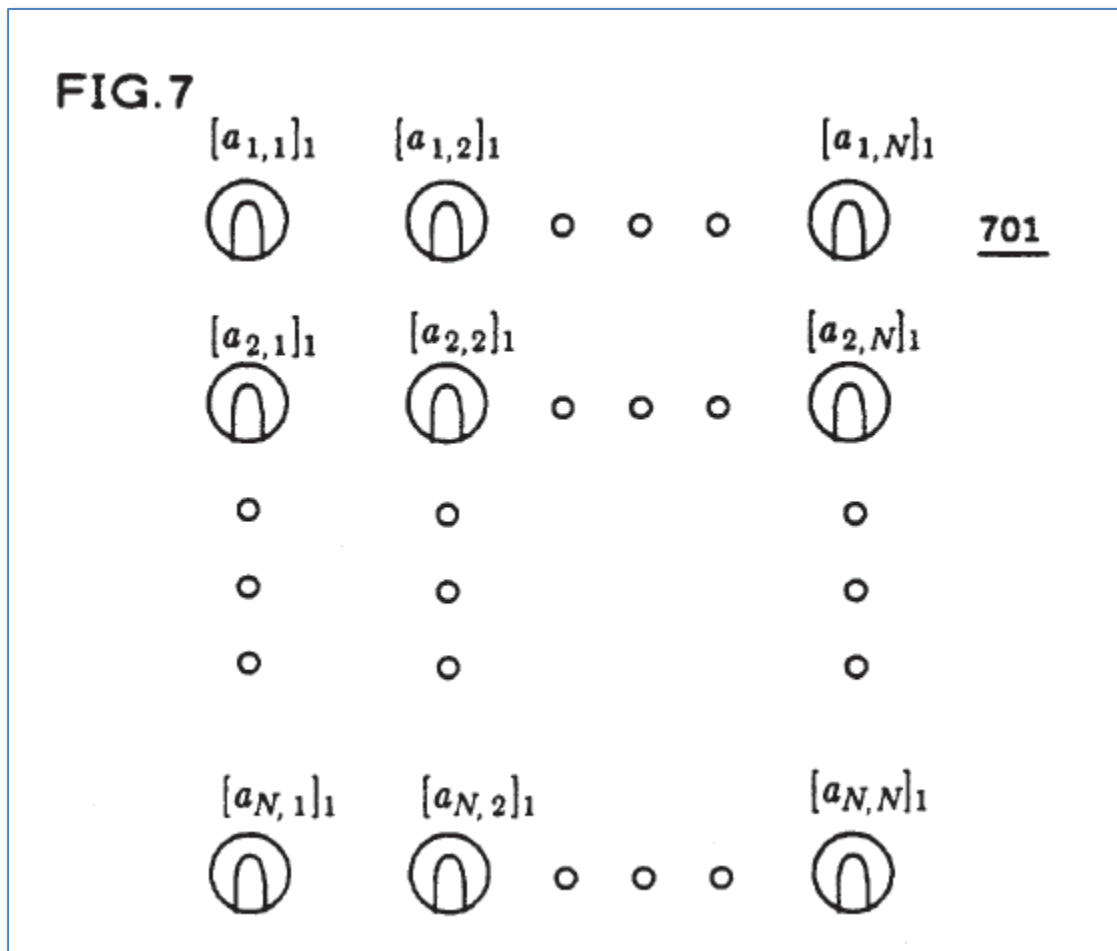
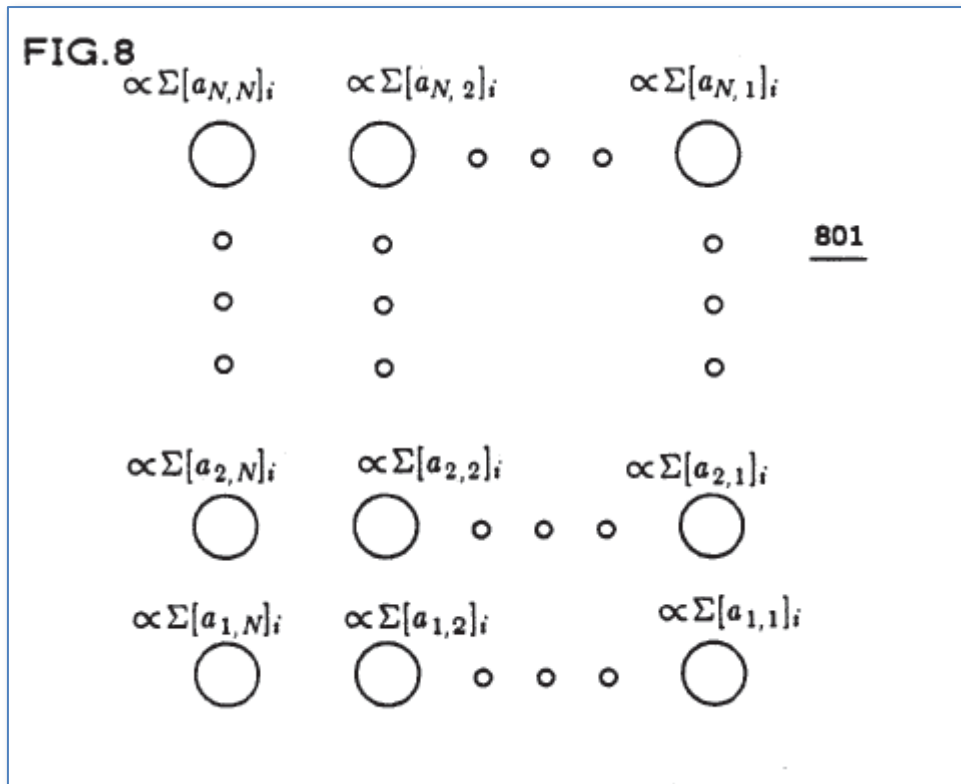


FIG. 7 represents the “cross-sectional view of light emitting device array 620-1.” EX1005 6:3-6. Each of the other arrays will have an identical pattern as 620-1. EX1005 at 6:5-7. This means that the light emitted from each array does not pass through a separate sector of the pupil lens, but repeats the same pattern shown in FIG. 7 along the perimeter of the pupil lens. EX2049 ¶¶72-75.



EX1005 FIG. 7

At the focal plane of pupil lens 640, coincident pattern 801 is formed:



EX1005 FIG. 8; EX2049 ¶¶75-76. The ball lenses are arranged in a pattern identical to the coincident pattern 801. *Id.* 6:68-7:7.

LaMarche is not analogous art to the '416 Patent. EX2003 §IX.B.2. LaMarche does not disclose a WDM method for combining multiple wavelengths *onto a single fiber*. Dr. Willner concedes the relevant field of endeavor is multiplexing devices. EX1003 ¶105; EX2048 13:18-14:2. Instead, LaMarche is related to “an optical arrangement for interconnecting, via free space, light emitting devices to light detecting devices.” EX1005 1:5-8. LaMarche teaches a “fanout or broadcasting capability” to improve interconnectivity in such “multipoint-to-multipoint” systems. *Id.* 6:41. In this regard, LaMarche discloses using a *multitude of optical fibers* for an

experimental test to collect light from the free space system and convey that light out of the system to remotely positioned photodetectors. EX2003 ¶188.

Nor is LaMarche, numerous discrete parts that must be aligned relative to each other, pertinent to the '416 Patent's problem. Its expensive and complex setup contrasts with the low-cost, integrated, compact, pre-aligned solution of the '416 Patent. Further, the '416 Patent is not directed to multipoint-to-multipoint optical arrangements used for simultaneous broadcasting; it is focused on multiplexing light *onto a single optical fiber* using the claimed optical combiner. EX2003 §IX.B.2.

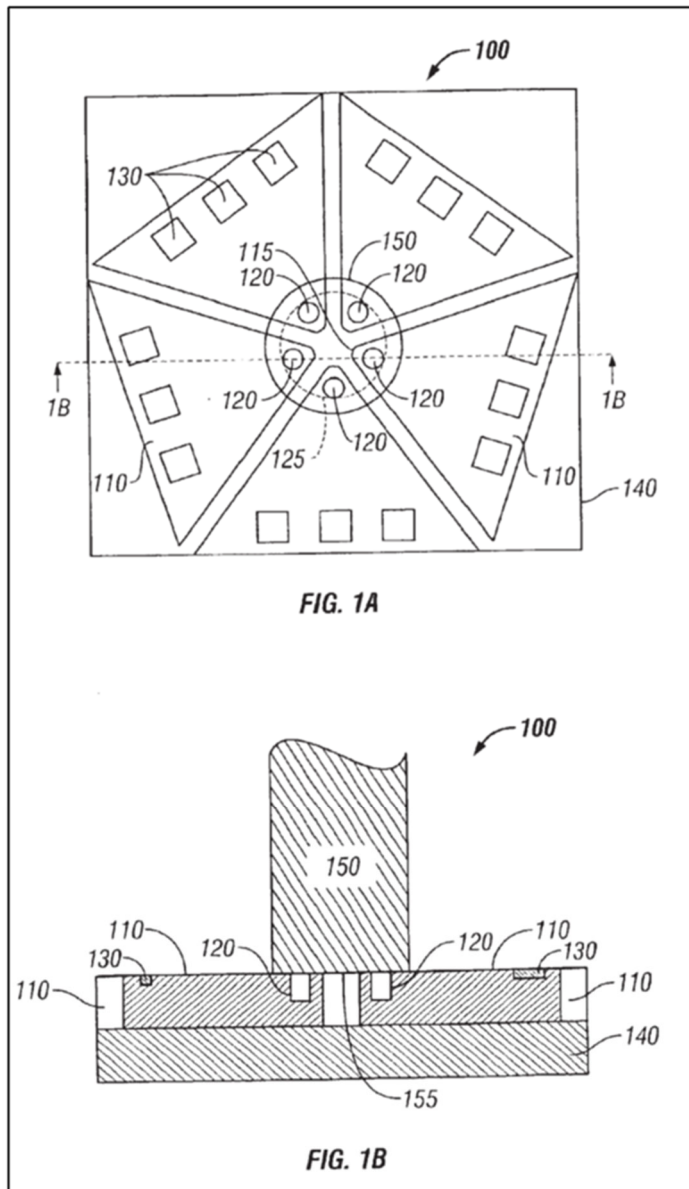
3. Lemoff (EX1006)

Lemoff discloses a multi-channel optical signal emitter for a WDM communication system “*without using an optical multiplexer or other device external to the emitter.*” EX1006 1:52-56. Instead, Lemoff utilizes multiple “emission apertures” to emit light toward the core of the optical fiber.

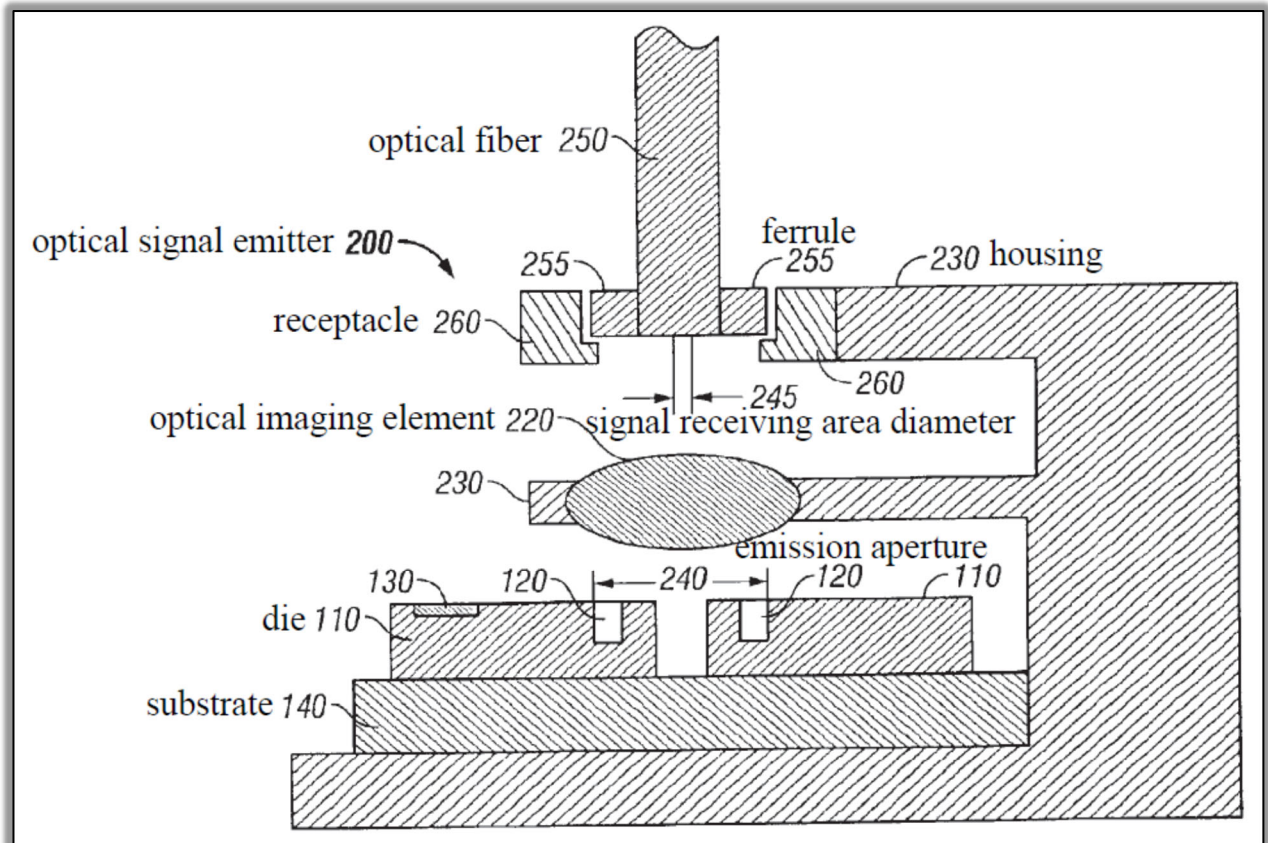
Lemoff discourages using optical wavelength multiplexers for short distances. EX1006 1:42-48. Lemoff discloses that using WDM is “particularly problematic” in applications requiring “only relatively short distance lengths,” which are “more cost sensitive than other applications.” *Id.* Lemoff discloses that the complexity of WDM design “can dramatically increase production and maintenance costs.” *Id.* 1:34-41, 1:46-48.

To address what Lemoff characterizes as the problems of short-distance

WDM, Lemoff's optical signal emitter *emulates* a WDM multiplexer "without using an optical multiplexer or other device external to the emitter." *Id.* 1:52-56. Lemoff discloses multiple "emission apertures" located off center at aperture corners that point toward the center of the signal-emitting area. *Id.* 1:61-65. As shown in FIGS. 1A-1B, the fiber is abutted against the emitters at surface 110, allowing for "butt coupling." *Id.* 3:29-33.



Thus, the light signals do not enter the fiber at a single spot, but at different locations. *Id.*; EX2003 ¶223. FIG. 2 shows a second example of the invention, using an imaging lens. No collimating lenses are shown in this diagram or disclosed in Lemoff.



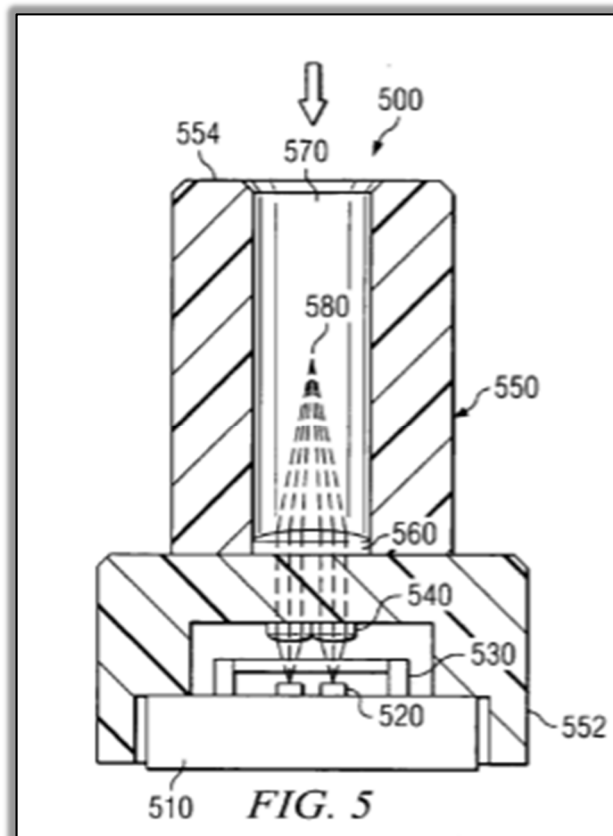
EX1006 FIG. 2.

By contrast, the '416 Patent is an optical multiplexer, *i.e.*, an optical combiner that multiplexes light of multiple wavelengths for short distance WDM. *Id.* 1:13-16, 1:51-55, 2:11-26; 3:19-21. Thus, Lemoff teaches that the very thing that inventors of the '416 Patent were trying to solve—using a cost-effective optical

multiplexer/combiner for short distance WDM—was not attainable. EX2003 §IX.C.1.

4. Bhandarkar (EX1013)

Bhandarkar discloses a WDM multiplexer that includes a plurality of lasers and collimating lenses and a focusing lens. The collimating lenses collimate each laser's beam of light and the focusing lens is positioned to focus the collimated beams into a point of light. Bhandarkar's collimating lenses 540 are non-overlapping, but touching. The WDM multiplexer includes a receptacle that houses each of these optical components. EX1013, Abstract.



As discussed below, Bhandarkar is not prior art.

III. LEVEL OF A POSITA

The Board stated, during trial, the parties may address the appropriate level of a POSITA, to the extent it has an impact on the unpatentability analysis. For the purposes of this POR, Inneos has adopted Petitioner's POSITA definition.

IV. CLAIM CONSTRUCTION

A. The Preambles Are Limiting.

Inneos contends the entire preamble is limiting; Petitioner contends it is not. The Board's Decision only addressed the term "optical combiner" and found it to be limiting. Dr. Willner did not offer an opinion on whether the preamble is limiting and could not remember at deposition whether he was asked to assume the preamble was non-limiting. EX2048 60:16-62:13.

Whether a preamble is limiting is "determined on the facts of each case in light of the overall form of the claim, and the invention as described in the specification and illuminated in the prosecution history." *Applied Materials, Inc. v. Advanced Semiconductor Materials Am., Inc.*, 98 F.3d 1563, 1572–73 (Fed. Cir. 1996). The preamble is limiting when it is used to "define the claimed invention" or "is essential to understand limitations or terms in the claim body." *Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (citation omitted).

In one brief paragraph, Petitioner cites *Catalina Mktg.* for the proposition that when the body of a claim defines a structurally complete invention and the preamble only states a purpose or intended use, the preamble is not limiting. Petition p.13. In *Catalina Marketing*, the preamble phrase at issue was “located at predesignated sites such as consumer stores.” This phrase was not limiting because the body of the claim defined “a structurally complete invention.” *Id.* That is, the “location of the terminals in the stores merely gives an intended use for the claimed terminals.” *Id.* That is not the case here.

As the Federal Circuit held, the determination whether the preamble is limiting is “resolved only on review of the entire[...]patent to gain an understanding of what the inventors actually invented and intended to encompass by the claim.” *Id.* (cleaned up). The Court continued, “when reciting additional structure or steps underscored as important by the specification, the preamble may operate as a claim limitation.” *Id.* Thus, *Catalina Marketing* is distinguishable, the preamble is limiting, and its component phrases must be construed, as established below.

Inneos breaks the preamble into its three separate parts to explain why each portion is limiting:

1. **“An optical combiner...comprising:”**
2. **“usable in data communication systems for multiplexing the outputs of a plurality of n lasers wherein each of said n outputs has a different output wavelength...”**
3. **“for transmission into and through a stopped single optical fiber”**

While the Board did not adopt a complete construction of “optical combiner” for the purposes of the Decision, the Board found the term to be limiting “because it is needed to specify the type of device being claimed.” Decision at p.9. Inneos addresses the construction of “optical combiner” below.

The remaining two portions of the preamble are also limiting. The phrase “usable in data communication systems for multiplexing...,” provides important context for nature and structure of invention being claimed. *Applied Materials*, 98 F.3d at 1572–73. Further, the language “plurality of n lasers” and “each of said n outputs has a different output wavelength” are referenced in the body of the claim, thus providing antecedent basis for the claim body. *Catalina Mktg.*, 289 F.3d at 808 (antecedent basis may limit claim scope). EX2003 ¶¶71-73. Additionally, the “stopped single optical fiber,” is referred to three times throughout claims 1 and 7 – once in the preamble and twice in the body of the claims, indicating its significance as discussed throughout this response, and provides the antecedent basis for the “said” stopped single optical fiber in the body of the claim. *See* cls. 1, 7. Accordingly, each of these phrases are limiting. EX2003 §VII.

B. “Optical Combiner”

The ’416 Patent’s “optical combiner” is “an integrated subassembly of optical components for multiplexing light of different wavelengths, which includes an integrated pre-aligned connector with a stop to hold the single fiber optic cable.”

The Board concluded that the specification discloses two structures for the optical combiner—“an integrated, monolithic molded optical combiner” and one “comprised of components that are integrated sufficiently to combine multiple optical inputs into an optical output focused onto a spot on an optical fiber but are not integrated in a pre-aligned unit.” Decision p.8-9. The Board invited the parties to further address the meaning of this term.¹

a. “an integrated subassembly of optical components”

Inneos maintains the claimed optical combiner is comprised of integrated optical components—components that are integrated sufficiently to utilize passive alignment. That is, the claimed optical combiner is not a collection of discrete optical components that have been placed in alignment relative to each other. The optical combiner is a package. EX2049 §IV.A.

¹ Petitioner did not offer a construction for “optical combiner” in its Petition. Petitioner offered a construction in its Preliminary Reply which Inneos addresses below.

As an initial matter, integration is different from being in alignment. EX2049 III.A. Optical components can be in alignment without being integrated. *Id.* The '416 Patent discloses the optical components are not only aligned to focus the multiple laser outputs onto a single spot of a fiber, but also integrated into a compact, cost-effective device facilitating passive alignment. EX2049 §IV.A.

First, the specification makes clear that the inventors of the '416 Patent were working to solve a particular problem with existing WDM devices typically designed using dielectric filters requiring alignment or expensive waveguides. The inventors developed a compact, inexpensive, integrated, single device capable of combining, separately collimating, and focusing the output of multiple lasers onto a single optical fiber, i.e., multiplexing. *See* EX1001 1:47-51 (invention covers a “combiner/WDM device” that “utilizes plastic-mold injection **to create a compact device** capable of combining multiple optical signals into a single optical fiber, and which avoids the use of dielectric filters and the use of expensive waveguides”); 2:11-18 (“The present invention provides, for the first time, an inexpensive, injection molded, one piece optical combiner”); 2:21-26 (“[o]ne of the key objects of the present invention is to provide a **compact and cost effective optical combiner.**”).

Second, the '416 Patent defines “the present invention” as an integrated device that is either a one-piece combiner or one where two or more parts have been combined to form a single device. *Id.* 2:11-15, 1:51-55. The specification explains,

“The **present invention provides**, for the first time, an inexpensive, injection molded, **one piece optical combiner** capable of combining, separately collimating and focusing the output of multiple lasers into a single optical fiber with a uniform, high coupling efficiency.... An **optional two piece combiner** is also provided for use in certain environments.” *Id.* 2:11-18.

Consistent with these disclosures of what the present invention is, other disclosures in the specification describe the optical combiner as forming a “module” made up of a single part or multiple parts that have been combined. EX1001 3:32-34 (“**a single piece plastic molded coupling module 16...**”), 3:39-40 (“The **plastic molded coupling module 16** is formed by integrating [optical components]”), 4:10-11 (“bottom surface 240 of **module 216** is recessed with four separate inclined surfaces...”), 4:32-34. Further, the specification explains that the optical combiner is “formed” by integrating its parts. *See id.*, 3:39-44 (“The plastic molded coupling module 16 is formed by integrating [optical components] all within a single part 16.”); *see also id.*, 3:67-4:9, 4:10-13, 4:55-57, 4:61-63. The specification further describes other components as being molded into the combiner or formed into the combiner. *Id.*, 2:15-16 (“passive alignment pins molded into the combiner”); 2:38-40 (“integrate a fiber optic connector”); 3:17-18.

Each embodiment of the '416 Patent utilizes integrated, optical components. FIGS 1-9 show optical components that are formed from a single, monolithic molded block are all a single unit. *Id.* at 3:32-38, 3:67-4:9.

FIGS. 10 and 11 describe a combiner comprising of two separately molded components: “[T]he combiner shown generally as 310 includes **a two-piece molded module** including a separately molded output lens 350 and separately molded collimating lenses 321–324.” *Id.* 4:35-39. The collimating lenses “are supported by the top of housing 319” and the “focusing lens 350 is supported in its position shown in FIG. 10 by means known to those skilled in the art which are deleted in the interest of brevity.” *Id.*, 4:42-45; EX2049 ¶¶29-30.

Third, the specification details the benefits of the '416 Patent's invention that originate from the components being integrated rather than discrete optical components. The invention makes possible passive alignment because the components are integrated. The '416 Patent explains, “[o]ne of the key objects of the present invention is to provide a compact and cost effective optical combiner ... **without requiring** the use of dielectric filters **and the alignment necessitated by those filters or expensive waveguides.**” *Id.* 2:21-26. Further, the specification explains, “[a]nother object of the present invention is **to integrate a fiber optic connector within the optical module, to passively align an optical fiber to the coupling optic.**” *Id.* 2:27-30. The specification further describes a key feature of the

invention is “**Passive Alignment**” in that “[a]ll of the optical components within the multiplexer could utilize passive alignment mechanisms.” *Id.* 4:58-59. In view of these disclosures, a POSITA would understand that the claimed optical combiner components are integrated, not discrete components. EX2003 ¶¶59-63; EX2049 ¶¶15-24. The invention makes it possible to manufacture the optical combiners using replicable manufacturing procedures because the combiner can be molded as a single or two-piece module, capable of passive alignment. EX1001 2:28-40, 4:55-57, 4:58-59, 4:61-63; EX2003 ¶¶59–66.

Thus, the specification defines the invention as an optical combiner with integrated components. Though the Board correctly notes that the specification does not require a “single, monolithic molded block,” (Decision, p.8), these components can be separately formed and combined to carry out the same function as a single-piece optical combiner using passive alignment. As explained by Dr. Lebby, a POSITA would understand that the optical combiner is an integrated unit, that is either made of one-part or a combination of parts, not discrete optical components. EX2003 ¶¶60-63, EX2049 §IV.A.

The file history also supports Inneos’ construction. During prosecution, the Examiner gave structural meaning to the term “optical combiner.” EX1002 at 139; EX2049 ¶¶31-32. Inventor’s conception evidence includes an integrated, optical combiner. *See* §V.D.1.a, below; EX2049 ¶¶33-38.

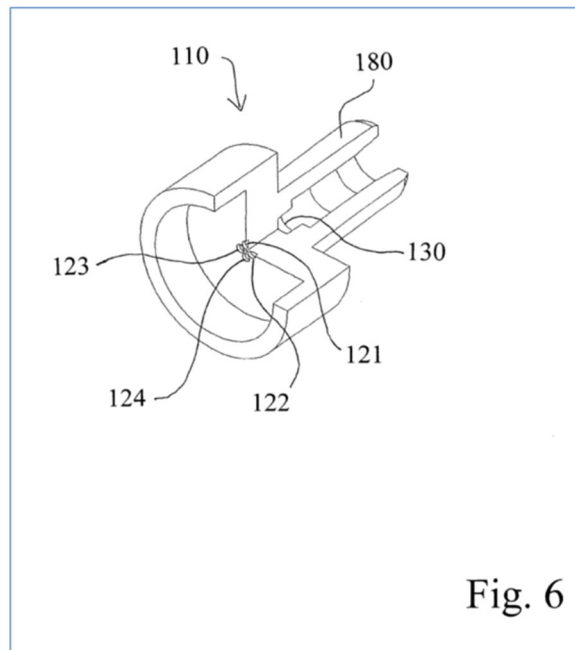
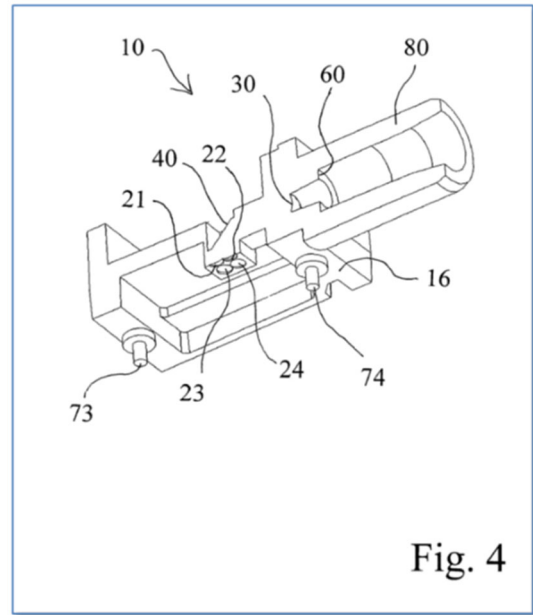
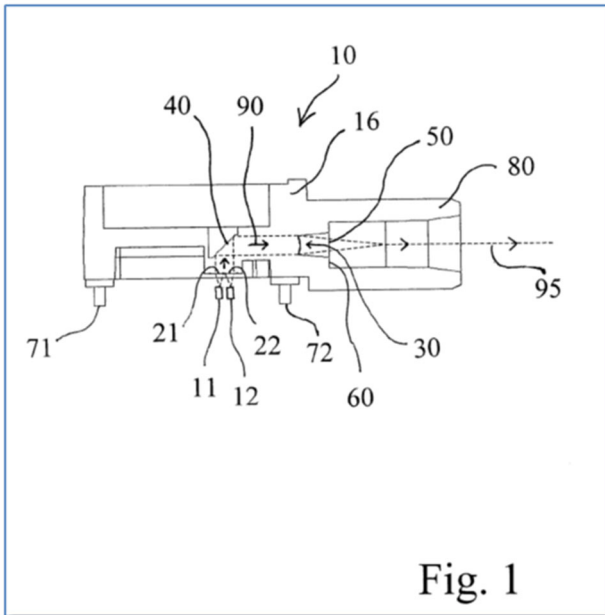
b. “integrated, pre-aligned connector with a stop to align the single fiber optic cable”

Inneos maintains the claimed optical combiner includes a pre-aligned connector with a stop to pre-align the fiber.

The Federal Circuit has explained that “an inventor may disavow claims lacking a particular feature when the specification describes ‘the present invention’ as having that feature.” *Poly-America, L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1136 (Fed. Cir. 2016) (citation omitted). Here, the specification states “**[a]nother object of the present invention is to integrate a fiber optic connector within the optical module, to passively align an optical fiber to the coupling optic.**” EX1001 2:38-41. Thus, passive alignment of the fiber is a feature of the claimed invention.

The specification further explains, “[t]he integrated ferrule 80 enables one to place an output fiber optic cable **into the pre-aligned connector.**” *Id.* 3:17-18, [Abstract]. Each of the figures of the complete optical combiner and corresponding descriptions describe an optical combiner with an integrated pre-aligned connector. *Id.* 3:7-18; 3:39-44; 3:54-60. EX2003 ¶¶64-66.

Further, the pre-aligned connector must contain a stop. The specification describes the stop as being inside the integrated ferrule. *Id.* 3:11-15; 3:23-24. Consistent with these descriptions, as well as FIGS. 1, 4 and 6, the stop 60 is a physical structure that blocks the inserted optical fiber from being inserted further. *See infra* §IV.D. EX2003 ¶¶67-69.



c. Response to Petitioner's Preliminary Reply

In its Preliminary Reply, Petitioner pivoted from its non-limiting position and has provided an overly broad definition of “optical combiner”—*a device that*

combines multiple optical inputs into an output—under the guise of the plain and ordinary meaning, which is not supported by the specification.

Even though Dr. Willner adopted this construction in the district court litigation and was aware that the Institution Decision stated the parties can address what the ordinary and customary meaning of the claim term “optical combiner” would be to a POSITA, Dr. Willner would not engage over this construction at his deposition. EX2048 64:25-78:4. This purposed construction is simply made-up and not tied to the specification of the ’416 Patent.

Further, Petitioner’s Reply cherry-picked two quotes from the specification, one broad statement about the capabilities of the claimed invention, and one discussion of Lee, a prior art reference that the ’416 Patent describes as an “optical **power** combiner.” (EX1001 3:19-21, 1:56-62).

As for describing the invention, the first quote is consistent with both constructions. EX1001 3:19-21 (“This combiner device has the ability to combine individual light signals into an optical path 90....”). This passage is describing FIGS. 1-4—an optical combiner comprising of *integrated components*. *Id.*

Concerning Lee, Petitioner notes the specification referring to Lee as a “combiner” but overlooks that the specification first identifies Lee as an “optical power combiner,” using “combiner” as shorthand thereafter. EX1001 1:56-2:10. Lee does not disclose WDM, and the specification explains ways in which the

present invention differs from Lee. *Id.* Thus, a POSITA would not think the “optical power combiner” informs the meaning of the claimed optical combiner. EX2049 ¶25.

Regarding the pre-aligned connector, Petitioner alleges that, other than the first embodiment shown in FIGS. 1-4, the other three embodiments do not show a stop or seat, or explain how the fiber is stopped. Reply p.7. Petitioner simply ignores the specification’s clear characterization of the invention an optical combiner having a pre-aligned connector.

FIGS. 5-6 show a stop and how the fiber is to be placed into the pre-aligned connector, even if the stop and seat are not called out on the Figures. EX2049 ¶48.

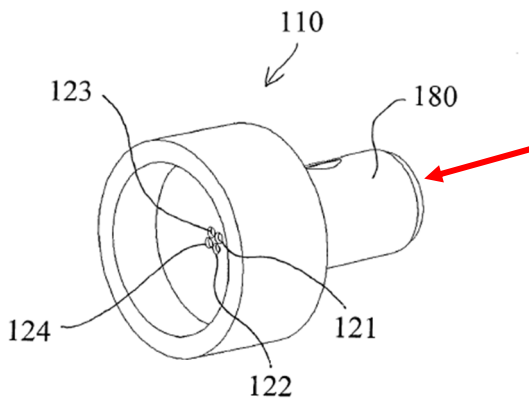


Fig. 5

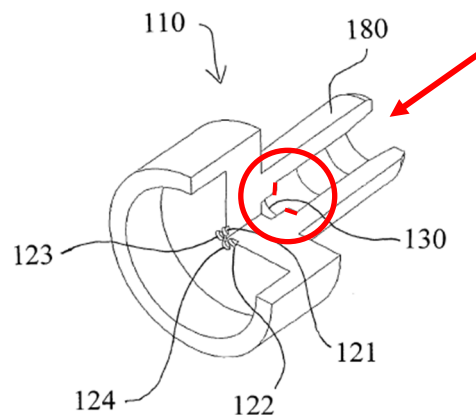


Fig. 6

As noted in the specification, in FIGS. 7-11, the optical combiner is only shown “generally.” The disclosures describe the optical components within the optical combiner, without the fiber. *Id.* 2:59-3:2; 3:61-63; 4:35-39; 4:32-47 (“FIG. 9 shows a “single slice of optic 216 to more clearly illustrate the interaction with the module 216 with the circular array of lasers...””).

Regarding the third embodiment shown in FIGS. 7-9, the specification explains that the third embodiment includes a “stopped single fiber optic,” but that fiber is not shown. *See id.* 4:20-27. Thus, a POSITA would understand the optical combiner contains a pre-aligned connector with a stop, even if not shown. EX2049 ¶48.

Thus, only the fourth embodiment in FIGS. 10-11 does not either show the pre-aligned connector with a stop or refer to the stopped fiber in the description. A POSITA would understand that the integrated connector for these embodiments is simply not shown. EX2003 ¶¶65-66; EX2049 ¶¶49-51.

To the extent “optical combiner” has a broader meaning in the field of optics, the ’416 Patent disavows claim scope beyond the “optical combiner” that is described in the specification. EX2049 ¶38; *Poly-America*, 839 F.3d at 1136. As discussed above, the specification defines the “present invention” as “a compact and cost effective optical combiner” that is a “single molded device” or “two or more

parts” that “can be combined to accomplish the same function,” with an integrated pre-aligned connector for the fiber. EX1001 1:50-55, 2:21-26. Nowhere in the specification has the ’416 Patent used the term “the present invention” in a way that expressly contradicts the specification’s defining of the invention in such a way.

C. “Focusing means...”

The parties agree that the “focusing means” limitation is a means-plus function limitation that should be construed under §112 ¶6. The parties agree on the recited function: “focusing said n collimated output beams onto a single spot at said stopped single optical fiber.” For the purposes of this Response, Inneos agrees that the corresponding structure is a focusing lens.

D. “Stopped”/“Stopped single optical fiber”

“Stopped single optical fiber” as used in the ’416 Patent means “a single optical fiber that has been inserted into the optical combiner until it abuts a physical structure that prevents the fiber from being inserted further into the optical combiner.” Even though the specification discloses the fiber is inserted into a pre-aligned connector with a stop as “the present invention,” the Board found the specification “does not appear to limit [the term] to a fiber having a connector that abuts against a fiber stop or seat but, rather, appears to include a fiber that is fixed in other ways.” Decision p.11. The Board added the parties can further address this term’s meaning and methods for stopping the fiber. At deposition, Dr. Willner

identified no ways to fix a fiber other than using a ferrule. EX2048 96:4-103:6; EX2049 ¶¶45-46.

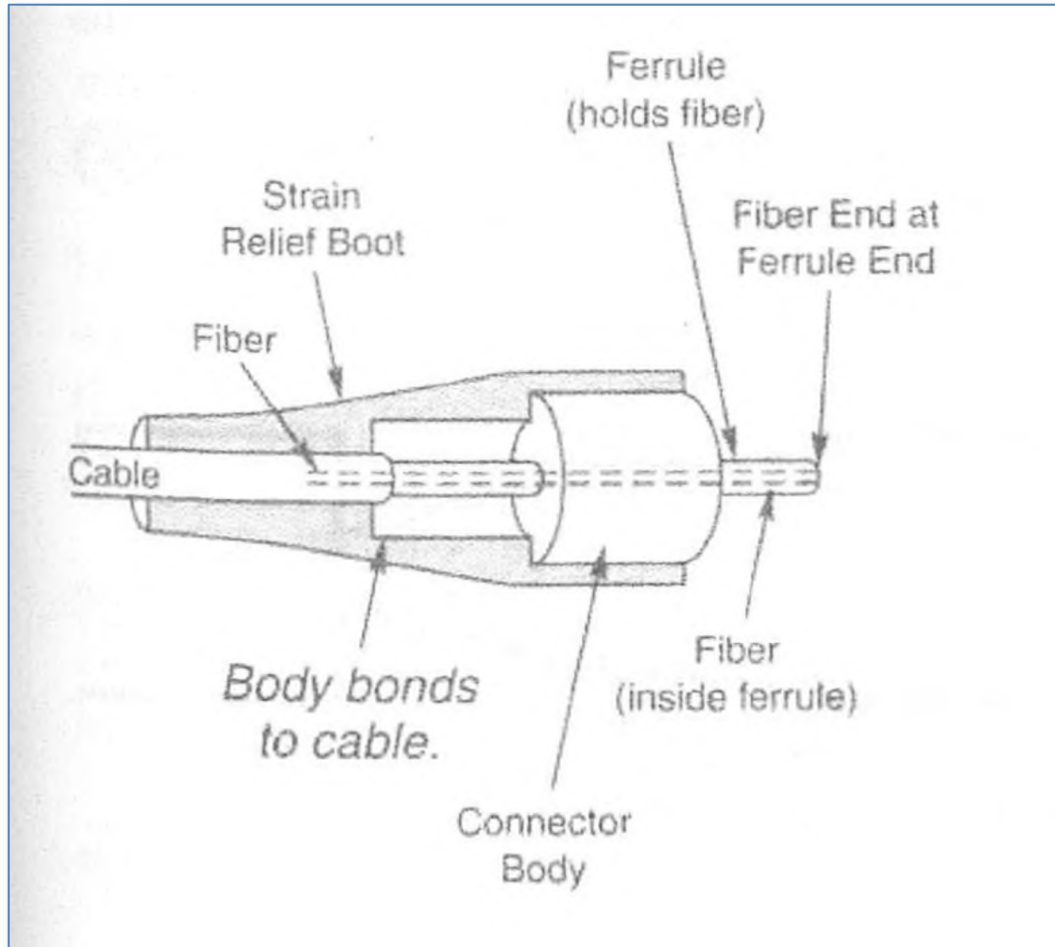
Inneos maintains that the “stopped optical fiber” must be a fiber that has been placed into the optical combiner’s pre-aligned connector. The specification provides, “[a]nother object of the present invention is to integrate a fiber optic connector within the optical module, to passively align an optical fiber to the coupling optic.” EX1001 2:38-41. Thus, according to the present invention, the only way the fiber can be stopped is to be inserted into the optical connector. EX1001 3:11-18. No other methods for fixing or aligning the fiber is disclosed in the specification. EX1001 3:13-24.

Petitioner’s construction, that the fiber is fixed in space, contradicts the specification defining the optical combiner has including an integrated **pre-aligned** connector for receiving the light properly—onto a single spot on the stopped fiber. Petitioner’s construction excludes the concept of alignment. EX2048 85:12-96:6. Fixing the fiber is not equivalent pre-aligning the fiber. EX2049 ¶¶42-44. The ’416 Patent discloses that the “stopped single optical fiber” is passively aligned with the optical components. EX2003 §VII.C.

Further, Dr. Willner admits that the term “stopped” does not have a plain and ordinary meaning as understood by a POSITA; thus, a POSITA must rely on the specification to understand the meaning of the term. EX1003 ¶117; EX2048 80:8-

82:5. The '416 Patent identifies only one way for the fiber to be stopped—when it is seated within the optical combiner's integrated connector so it can be held in alignment with the other components of the optical combiner. EX1001 3:10-15, 3:22-26. The adjective “stopped” single optical fiber is clearly related to the “stop” that is inside the ferrule that the single optical fiber abuts against.

A “ferrule” is a “component of a fiber optic connection that holds a fiber in place and aids in its alignment.” EX2016 p.336. Not all ferrules are structurally the same. Below is a ferrule that does not have a stop, where the fiber passes all the way through the ferrule. EX2017 p.317.



EX2017; *see also* EX2021.

However, unlike the example shown above, the ferrule disclosed in the '416 Patent includes a stop or seat to block the fiber's further insertion into the ferrule. *See* FIG. 1 (stop 60 is inside ferrule 80); *see also* 3:24 (fiber is "seated at the fiber stop 60").

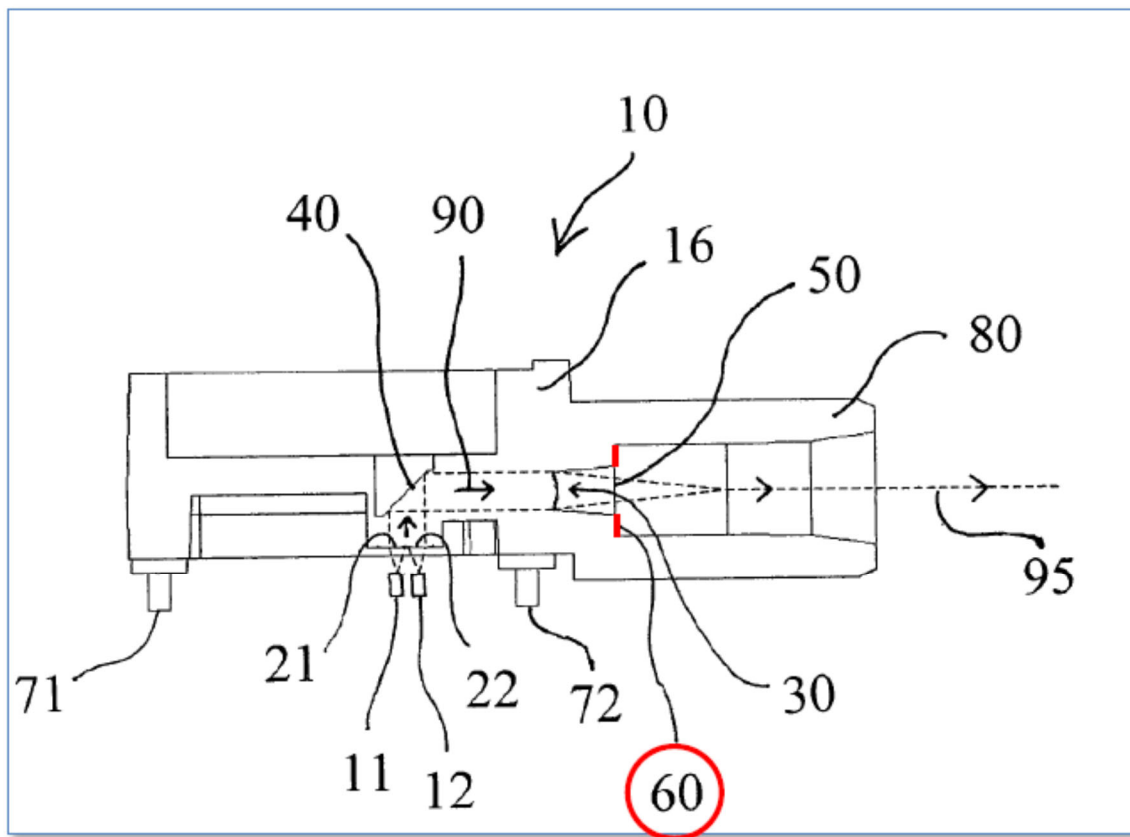


FIG. 1; FIG. 4, stop 60.

The “stop” of the optical combiner’s pre-aligned connector prevents the fiber from going further into the optical combiner, allowing the fiber to be pre-aligned with the optical components of the optical combiner. *Id.* 3:11-15. “The integrated ferrule 80 enables one to place an output fiber optic cable into the pre-aligned connector.” *Id.* 3:17-18; *see also id.* 3:39-44; 3:54-60, 4:27-31, 4:58-60.

Dictionary definitions also support Inneos’ construction. “Stopped” means “[t]o arrest the progress or motion of; cause to halt.” EX2004 p.1161. The word “seat” means “a part (as a socket) or surface on or in which another part or surface rests.” EX2004 p.1059.

Petitioner’s Reply points to the third and fourth embodiments of the invention, but these embodiments do not contradict that the invention includes a pre-aligned connector with a stop. The figures for these embodiments “show[] generally.” EX1001 3:62, 4:36-37. This wording is not used for Figures 1–6, and it is clear from the context that Figures 7–11 illustrate particular, different, configurations of optical components without depicting all aspects of the embodiment. EX2003 ¶¶65-66. Further, the stop is disclosed in the third embodiment (EX1001 4:24, FIG. 6), even though it is not labeled in the corresponding figures. EX2049 ¶¶47–48. The figures for the fourth embodiment are of the same general structure; nothing in the specification suggests that the embodiment *excludes* a stop or pre-aligned connector. *Id.* ¶¶49-50; *see Authenex, Inc. v. EMC Corp.*, No. 210-CV-01251-MRP, 2011 WL 13176739, at *3 (C.D. Cal. Feb. 16, 2011) (“The figure is not evidence that the preferred embodiment has been eliminated from the scope of the claims.”). Thus, a POSITA would understand that the integrated connector for these embodiments is simply not shown in Figures 7–11 even though it is included. EX2049, ¶¶47–51.

V. PETITIONER FAILS TO ESTABLISH THE UNPATENTABILITY

A. Ground 1: Kurita Does Not Render Challenged Claims Obvious

Kurita does not render any challenged claim obvious because it does not disclose or teach an optical combiner comprising of integrated optical components and a pre-aligned connector, or radial sectors on lens 30. EX2003 §IX.A.2. Kurita is

an arrangement of discrete components and teaches manually-aligning them with each other and the end of a fiber.

1. Claim 1: Elements [1.0]-[1.2]

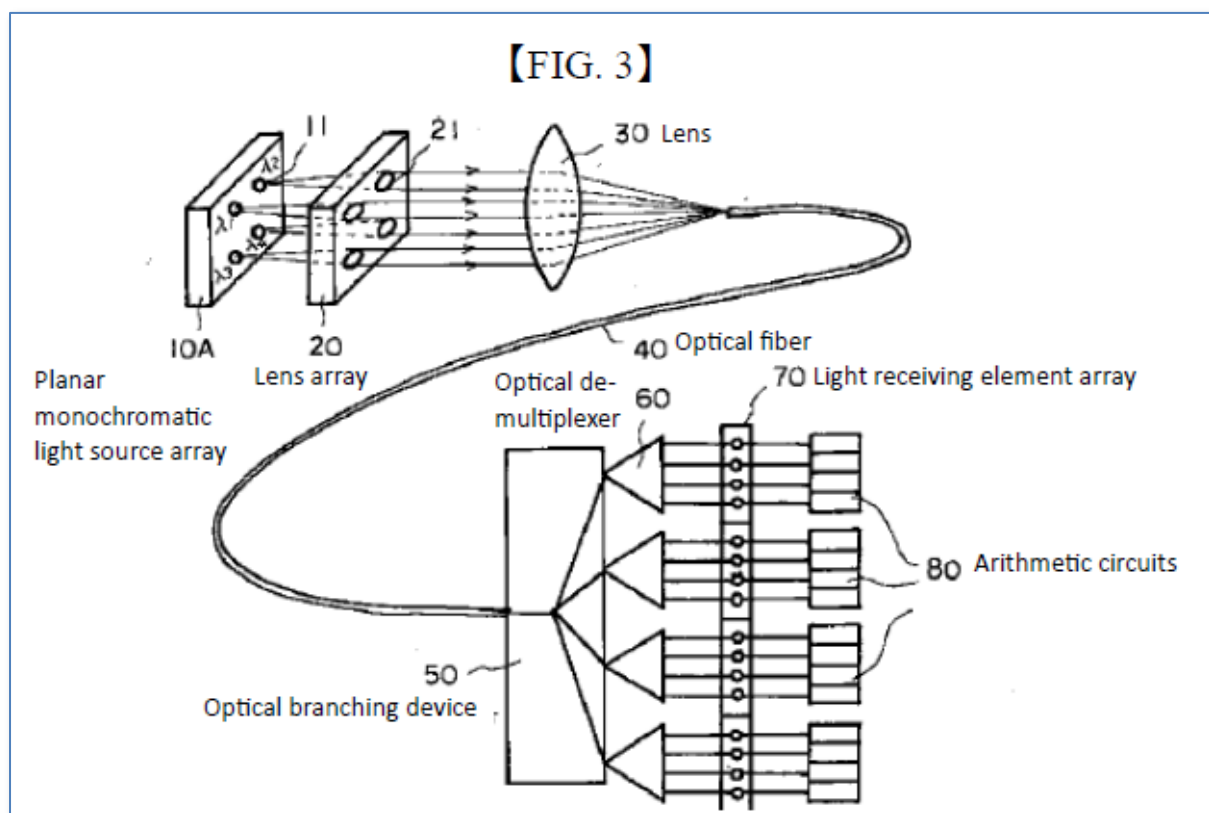
Kurita does not disclose or teach an “optical combiner” because Kurita discloses discrete optical components that are not integrated and cannot utilize passive alignment.

The Board found Kurita’s optical components “appear[] to be integrated as needed to enable the light connection device to function properly,” Decision at p.13; however, Petitioner made no argument, and Dr. Willner provided no opinion, that Kurita’s components are integrated. EX2048 129:19-131:12. Kurita’s optical components are discrete components that function properly because they are in alignment; alignment is not the same as being integrated. EX2049 ¶¶52-58. While Dr. Willner opined that “[f]ixing the optical fiber therefore allows for proper operation of the device in Kurita,” a fiber may be “fixed” without being in alignment—if the fiber is out of alignment, the light will not go where it is supposed to go. EX1003 ¶172; EX2049 §III.A.

The Decision further states that Petitioner contends “Kurita’s light connection device (Figure 3) is an ‘optical combiner.’” Decision, p.12. However, Petitioner and Dr. Willner do not contend that Figure 3 is an optical combiner. Dr. Willner contends the alleged optical combiner is elements 11, 21, 30 of Figure 3. EX2048 131:13-

133:17. Each of these elements—11, 21, and 30—are discrete, individual components. EX2003 ¶¶121-129.

FIG. 3's "light connection device" is a wavelength multiplex switch. It uses an arrangement of discrete optical components to multiplex the light from multiple fibers onto a single optical fiber. EX1004 ¶[0015]. These discrete, individual component parts are not integrated and do not disclose an integrated optical combiner, as FIG. 3 shows. EX2003 ¶¶123-129.



A POSITA would understand that to function properly, Kurita's singular components (10A, 20, 30, 40) and single fiber must be fixed in place **and manually aligned**. EX2003 §IX.A.1; EX2049 ¶¶52-58.²

A POSITA would be familiar with how to set up Kurita's optical arrangement in a laboratory using an optical bench like the one in Dr. Willner's lab. EX2049 ¶57. The discrete components would be secured in place attached to the optical bench, utilizing specialized tools for precise alignment of the optical components and the fiber, such as clamps and "XYZ stages." EX2048 43:21-49:4; EX2049 ¶¶8-13. Once set up, a POSITA would be capable of manually aligning the components. EX2049 ¶¶8-13, 57. Thus, a POSITA would understand that Kurita's individual components are individually aligned *without being integrated or combined together*. EX2049 ¶¶52-58. Kurita's components are not pre-packaged, pre-combined, or pre-aligned in any way, nor has Dr. Willner opined that they are.

² The POPR described Kurita's components as "free floating" to explain the difference between discrete optical components and optical components that have been integrated together as a structural device such as the claimed optical combiner. Dr. Lebby explained that Kurita teaches manual alignment, which means the discrete components may be manually placed and fixed relative to one other and with the fiber, and then manually aligned. *E.g.*, EX2003 ¶127.

Additionally, Kurita does not disclose an optical combiner that includes an integrated, pre-aligned connector with a stop to hold the single fiber optic cable. Because a stopped optical fiber must be physically inserted into the optical combiner until it reaches a stop or seat, Kurita does not disclose the claimed optical combiner.

The Board found Inneos' position "not well taken because it does not address Kurita would have suggested to a [POSITA] regarding fixing Kurita's single optical fiber (40) in place." Decision p.13-14. A POSITA would understand that Kurita's fiber can be securely mounted and manually aligned on an optical bench. EX2049 ¶¶59-68. Dr. Willner agrees that optical fibers (and lenses) may mounted to optical tables and fixed in place. EX2048 46:12-48:21.

Kurita does not teach or suggest any method of passively aligning or pre-alignment of the fiber using a ferrule and stop. EX2049 ¶¶59-68.

Further, Petitioner's obviousness argument is limited to modifying the fiber disclosed in Kurita to be "fixed." Fixing a fiber in place does not passively align the fiber with the optical components, as required to be a "stopped optical fiber." EX2049 ¶¶59-68; EX2048 83:7-96:6.

Further, Petitioner has not presented evidence that a POSITA would have been *motivated* to incorporate a pre-aligned connector with a stop, as part of Kurita. EX1003 ¶173. Rather, Dr. Willner claims it is a "typical" way to secure the optical fiber. *Id.* Being "typical" does not satisfy the motivation to combine analysis; a

reason for combining must exist. *Virtek Vision Int’l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 887 (Fed. Cir. 2024) (mere fact that possible arrangements existed in the prior art does not provide a POSITA would have substituted one for the other). Using fiber mounts on an optical bench is also typical. EX2049 ¶¶66.

Additionally, a POSITA would understand that because of the required manual alignment, there is no benefit of adding a receptacle or stop to Kurita’s system. EX2003 ¶¶130-131, 143-145.

Because Kurita does not disclose an optical combiner as claimed, it does not disclose elements [1.0] through [1.2].

2. Claim 1: Elements [1.3]-[1.4]

Because Kurita does not disclose an optical combiner (§V.A.1, claim [1.0]), it does not disclose a “an optical combiner...comprising: a plurality of n collimating lenses...” EX2003 §IX.A.2.b.

Petitioner argues that Kurita’s “the individual lens portions 21” equate to “plurality of n collimating lenses,” disregarding its lack of integration into an optical combiner as the claim requires. Kurita’s lenses are part of an array, not an integrated optical combiner. EX1004 ¶[0017]; EX2003 ¶¶136-138. A POSITA could reproduce Kurita’s setup but would recognize that it involves manually aligning individual components, not utilizing passive alignment. EX2049 ¶¶54-58.

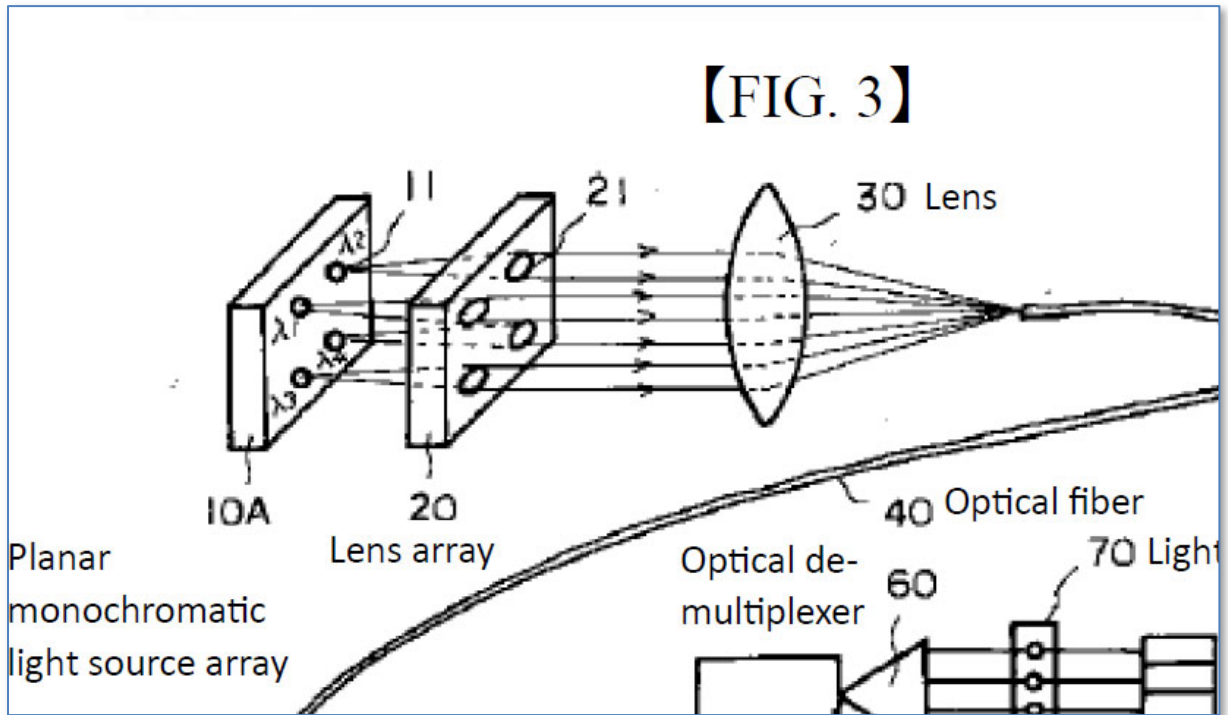
Accordingly, Kurita does not disclose or teach claims [1.3] or [1.4].
EX2003 §IX.A.2.b.

3. Claim 1: Elements [1.5]-[1.6]

Because Kurita does not disclose an optical combiner (*see* §V.A.1, Claim [1.0], above), Kurita does not disclose an optical combiner comprising a “focusing means.” EX2003 ¶¶141-157. Petitioner relies on lens 30 of the structure for the focusing means, but lens 30 is not integrated into an optical combiner as required by the claim. EX1004 ¶[0015].

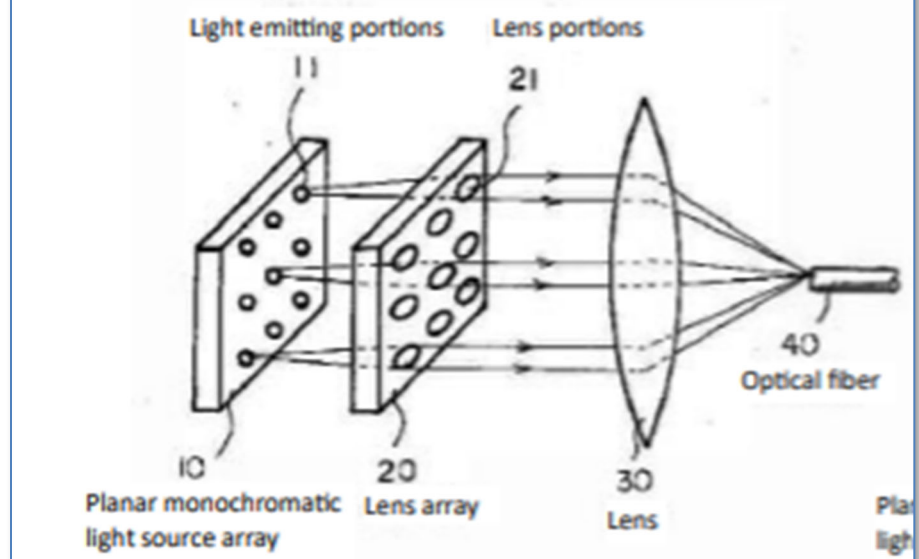
Kurita does not disclose a stopped single optical fiber. *See* §V.A.1, claim [1.1]; EX2049 ¶¶59-66.

Kurita does not disclose or teach the collimating light passing through separate radial sectors on lens 30 of FIG 3. EX2003 ¶¶155-156. Indeed, the arrows showing the passage of light from lens array (20) to lens (30) are in a straight line when they intersect with Lens (30), as seen below:

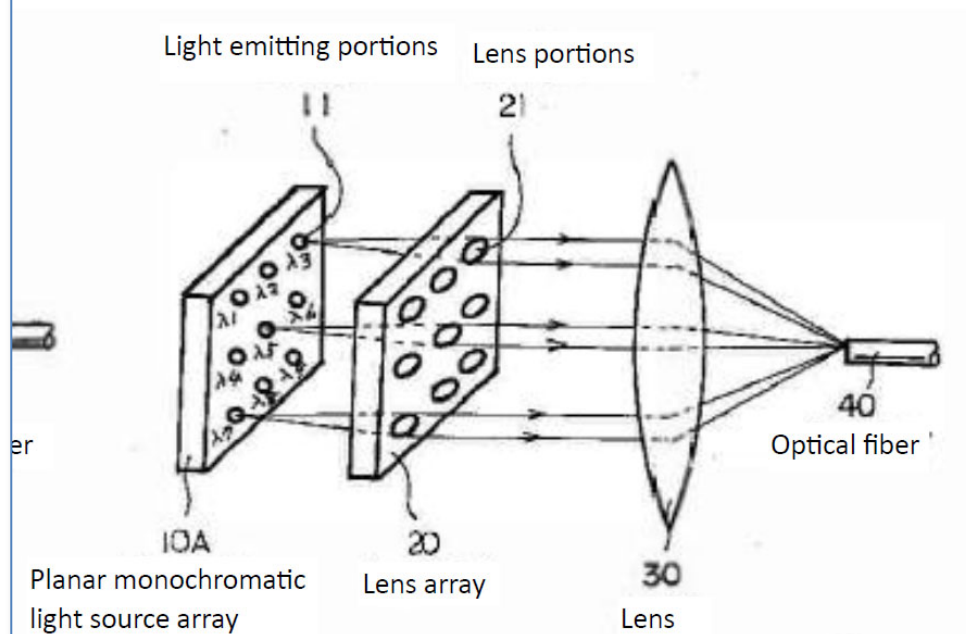


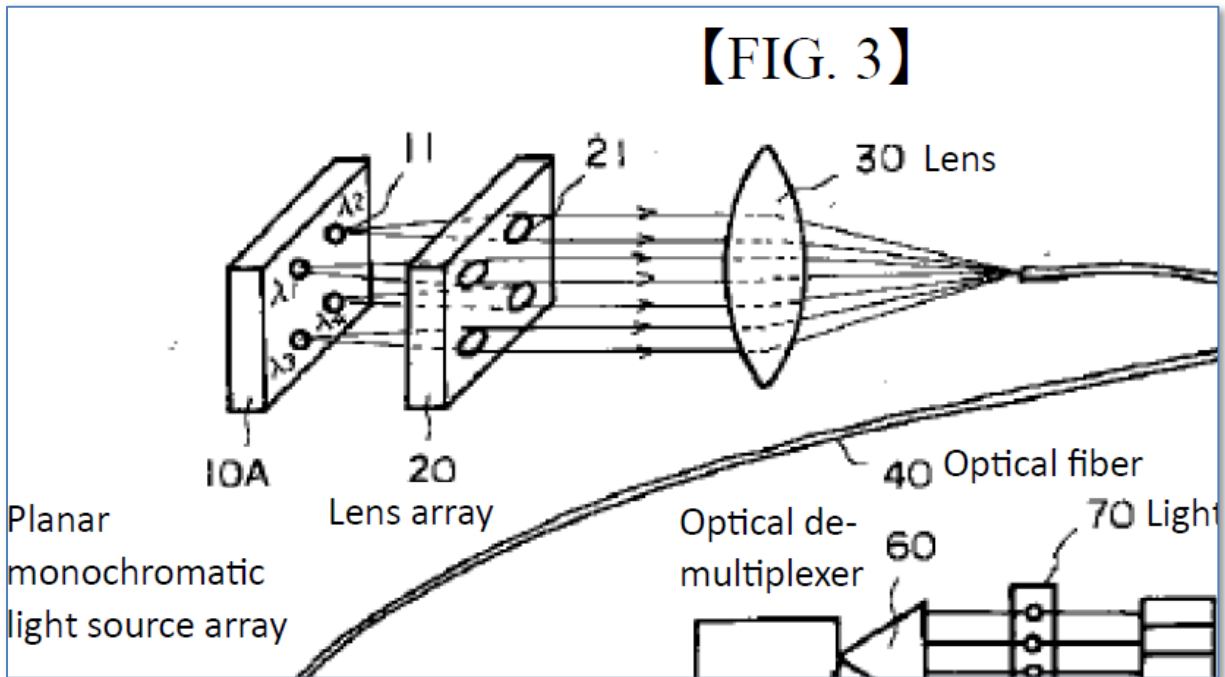
Kurita teaches linear arrangements of the lens portions, as shown in FIGS. 1-3. EX2003 ¶¶159-161. Dr. Willner testified that radial arrangement means moving around the azimuthal direction from the center of a circle. EX2048 134:3-24. However, none of the figures of Kurita disclose or teach this. EX2049 ¶¶67-71.

【FIG. 1】



【FIG. 2】





The Board preliminarily credited Dr. Willner’s testimony that Kurita’s two-by-two array of plural lens portions 21 of FIG. 3 “results in radially arranged lenses that will each pass their respective collimated light to a separate radial portion (or sector) of the lens 30” (Ex. 1003 ¶182).” Decision p.14. However, at deposition, Dr. Willner would not answer whether FIGS. 1-2 in Kurita disclose a radial arrangement of lenses, *even though he cited these figures in support for his opinion.* EX2048 138:18-142:11; EX1003 ¶182 (citing to FIGS 1-2). If Dr. Willner cannot decipher whether FIGS. 1-2 are radial or not, his opinion does not support finding that Kurita teaches radial arrangement. In all of the figures, FIGS. 1-3, the lenses are aligned linearly and are not arranged about a circular axis. EX2049 ¶¶67-71.

Moreover, in asserting that radial arrangement of the lenses would have been obvious, Dr. Willner relies on a disclosure that describes FIG. 1. EX1003 ¶183 (citing EX1004 ¶[0010], which refers to FIG. 1). Because FIG. 1 is a *linear arrangement*, it does not disclose or teach the “respective collimated light to a separate radial portion (or sector) of the lens 30.” *Id.* ¶182. In other words, Kurita’s disclosure that “lens 30, [] having an aperture equal to or greater than the area encompassing the individual light emitting portions 11 of the abovementioned planar monochromatic light source array 10 and the individual lens portions 21” (EX1004 ¶[0010]) does not teach that the light passes through separate radial sectors of the focusing lens as this disclosure is equally applicable to linear alignments. EX2049 ¶¶68-69.

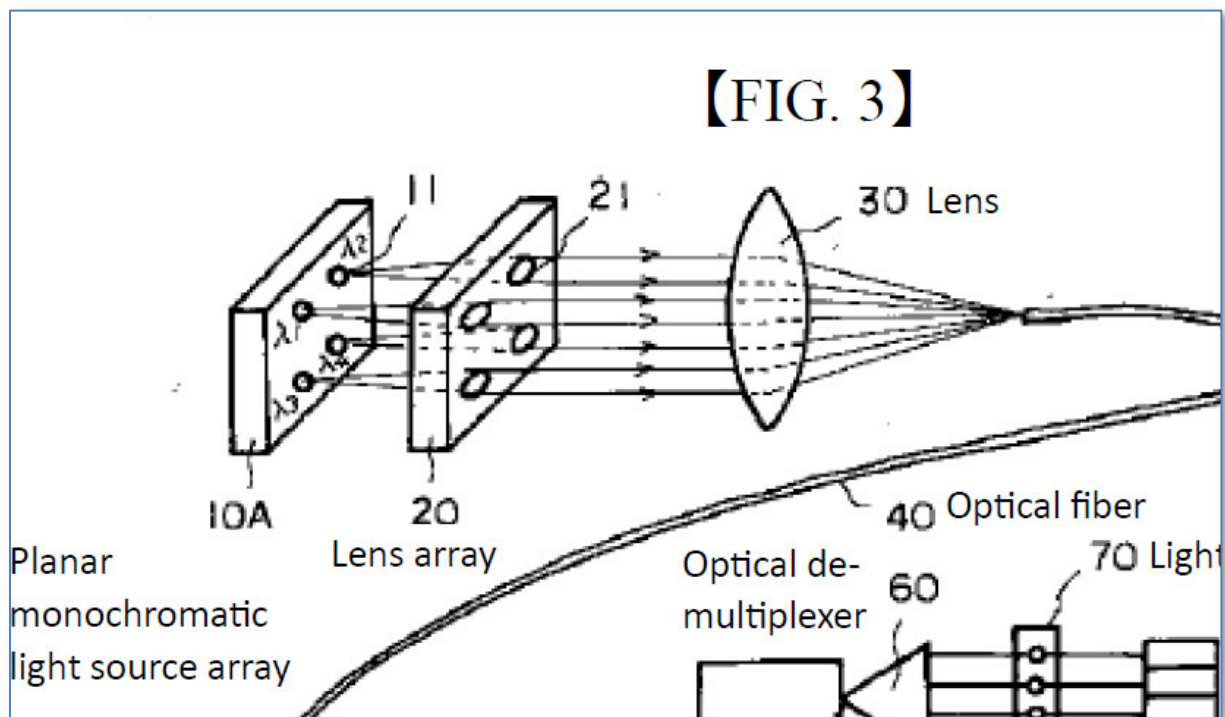
The Board also preliminarily credited Dr. Willner’s conclusory statement that aligning the lens portions 21 around the center axis of focusing lens “would have resulted in better coupling efficiency,” but Kurita does not state or teach a radial arrangement or that such arrangement is any better than the liner arrangement taught in FIGS. 1-3. *Virtek Vision*, 97 F.4th at 887 (“The petition does not argue Briggs articulates any reason to substitute one for another or any advantages that would flow from doing so.”); EX2049 ¶71.

In sum, Kurita does not disclose or teach elements [1.5] or [1.6]. EX2003 §IX.A.2.c.

4. Ground 1: Claims 2 and 6.

Because Kurita does not disclose the optical combiner (*see* §V.A.1-3), Kurita does not disclose claims 2 and 6. EX2003 §IX.A.3-4.

Further, Kurita discloses and teaches linear arrangements of the lens portions, as shown in FIGS. 1-3, which do not result in pie-shaped radial sectors. EX2003 ¶¶159-161; EX2049 ¶¶67-71. At deposition, Dr. Willner could not explain whether FIGS 1-2 are radially arranged. EX2048 138:18-142:11. Further, Kurita does not disclose or teach pie-shaped radial sectors on lens 30 of FIG. 3 as can be seen in FIG. 3.



5. Ground 1: Claims 7 and 9

Petitioner contends that claim 7 is substantially the same in scope as claim 2 and incorporates by reference its analysis for claims 1-2. Petition p.25. Because Kurita does not satisfy the claim elements of claims 1-2, the same analysis for claims 1-2 applies equally here. *See* §V.A.1-4; EX2003 §IX.A.5-6.

B. Ground 2: Petitioner Fails to Show Challenged Claims Are Obvious Over Kurita in View of LaMarche and/or Lemoff

In Ground 2, Petitioner relies on LaMarche for the “radial arrangement of collimating lenses” to disclose that the collimated light passes through separate radial sectors of the focusing means. Petition p.31–32. Petitioner relies on Lemoff for the sole element of “receptacle and ferrule arrangement for securing an optical fiber” to disclose a “stopped optical fiber.” Petition p.33.

These combinations do not overcome the shortcomings of Kurita as discussed above in Ground 1. *See* §V.A; EX2003 §IX.B.

1. Kurita, LaMarche, and/or Lemoff Are Not Combinable

To combine references to show obviousness, it is not enough merely to “check all the boxes” of the claim elements. There must be a reason, suggestion or motivation to combine, and a reasonable likelihood of success. *Virtek Vision*, 97 F.4th at 887 (mere fact that possible arrangements existed insufficient for combining); *TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1357 (Fed. Cir. 2019). In suggesting combinations, “[a] factfinder should be aware, of course, of the

distortion caused by hindsight bias.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007); MPEP §2143.01.

Petitioner’s proposed combination of Kurita, LaMarche and/or Lemoff fail to meet this standard.

a. Kurita and LaMarche Are Not Combinable

A POSITA would not look to LaMarche to improve Kurita for several reasons. EX2003 §IX.B.3. As a threshold matter, LaMarche is not analogous art and should not be considered for obviousness. *See* §II.B.2; EX2003 §IX.B.2, ¶198.

First, because LaMarche would drastically increase the number of components in the optical arrangement, a POSITA would not look to LaMarche to improve Kurita. EX2003 ¶¶199-202. Kurita teaches that increasing the number of optical components reduces coupling efficiency and increases costs. EX1004 ¶[0004]-¶[0017]. By contrast, LaMarche would require *six additional discrete parts* for the same number of lenses and emitters disclosed in Kurita—the same number that Kurita FIG. 4 discloses and Kurita describes as “unnecessary.” EX1004 ¶[0012]; EX2003 ¶201.

Second, a POSITA would understand that the optical arrangement in LaMarche using “simultaneous broadcasting,” even when properly aligned after spending increased man hours and expenditures, results in losses of light and would not have necessarily improved coupling efficiency or achieved greater bandwidths.

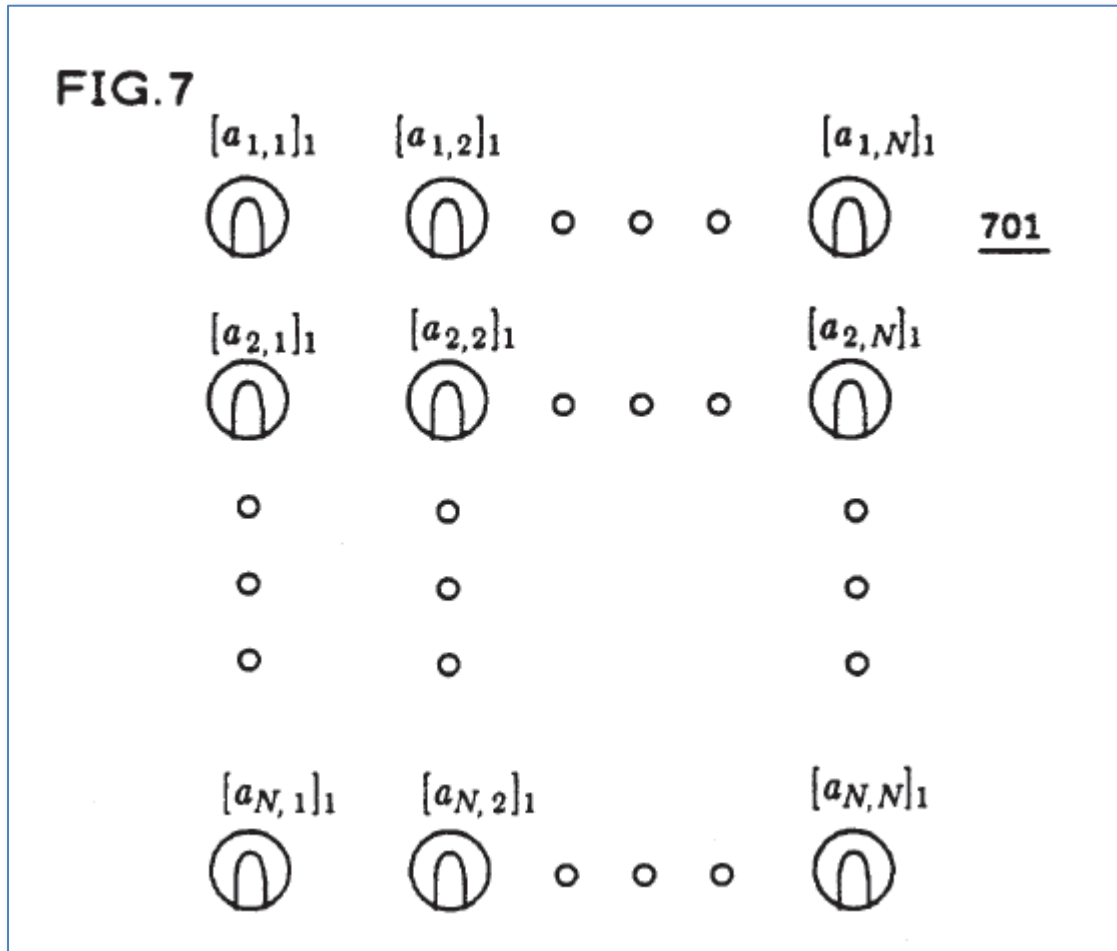
EX1004 ¶¶[0004], [0012], [0017], [0019]; EX2003 ¶¶202-204. LaMarche acknowledges inherently large losses of light in simultaneous broadcasting. EX1005 7:35-41 (“Only a fraction of the total energy impinging on pupil lens, 408 or 660, is received....”). A POSITA would understand this is a very inefficient design to maintain a certain data rate. EX2003 ¶¶202-204.

Third, the degree of modification necessary for Kurita is not a simple substitution, requiring significant modification. *See KSR*, 550 U.S. at 416. Kurita’s entire system would need to be overhauled, against the teachings of Kurita. *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984) (“The mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification”); *see also In re Giannelli*, 739 F.3d 1375, 1380 (Fed. Cir. 2014). Not only would Kurita’s lenses need to be arranged radially, the lenses would need to be aligned. EX2003 ¶¶201, 218-219.

Petitioner claims it is merely “combining prior art elements” (EX1003 ¶208); however, the physically integrated radially aligned lenses, which Petitioner contends would have been obvious, are not disclosed in Kurita or LaMarche. Moreover, LaMarche teaches using one collimating lens *per array* suggesting *one* collimating lens per light emitting array 11 in Kurita. EX1005 5:62-6:13; EX2003 ¶240; EX2049 §V.B. LaMarche teaches using the perimeter of the pupil lens which creates

a pattern of light within each sector of the pupil lens such as that shown in FIG. 7.

EX1005 5:62-6:13; EX2049 ¶¶72-76.



Petitioner has taken an impermissible piecemeal, hindsight-driven approach to try to match individual claim terms to the disclosures in Kurita and LaMarche.

Further, Dr. Willner's contention that LaMarche, which predates Kurita by nearly a decade, would improve coupling efficiency, reduce physical complexity, and be able to achieve high-bandwidth connection, is misconstruing the disclosures in LaMarche, which are actually a comparison of LaMarche to prior art systems that

pre-date LaMarche and use a single high bandwidth channel being broadcast over multiple points and have nothing to do with Kurita's multiplexer. EX2003 ¶¶205-219. Thus, a POSITA would have no reason to combine Kurita with LaMarche's optical arrangement.

b. Kurita and Lemoff Are Not Combinable

As discussed above, Lemoff discourages using optical wavelength multiplexers for short distances because the complexity of the design is often cost-prohibitive. EX1006 1:42-56. Conversely, Kurita discloses an expensive multiplexer comprised of discrete components, which require costly manual alignment and high precision. EX2003 §IX.B.1. By contrast, Lemoff discloses that its signal emitter can be used in a WDM communication system “without using an optical multiplexer or other device external to the emitter,” (*id.* 1:52-56) *i.e.*, without using a system such as Kurita or any external device. Thus, taking the references as a whole, a POSITA would not have a reason to combine Lemoff with a large, costly WDM system disclosed in Kurita. EX2003 §IX.B.5. Lemoff suggests augmenting the signal emitters themselves, positioning them near the fiber to emulate WDM without the need for an external optical multiplexer or similar device. EX1006 1:52-56; EX2003 ¶227. Kurita's discrete components are external to light array 10A. EX2003 ¶¶226-227.

Concerning functionality, a POSITA would have no reason to combine Lemoff's receptacle and ferrule with discrete components in Kurita because the ferrule would serve no purpose—the fiber would need to be manually fixed and aligned with or without a ferrule. EX2003 ¶¶234-236. Moreover, Lemoff is not physically combinable with Kurita due to Lemoff's small size. EX2003 ¶¶230-233.

2. Claim 1: Kurita does not disclose elements [1.0]-[1.5]

For Ground 2, Petitioner relies on Kurita alone to disclose elements [1.0]-[1.5]. *See* Petition p.31. Kurita does not disclose elements [1.0]-[1.5]. *See* §V.A.1-3; EX2003 §IX.B.3, §IX.B.5.

3. Claim 1: Kurita in view of LaMarche and/or Lemoff does not disclose element [1.6]

For Ground 2, Petitioner relies on LaMarche and/or Lemoff to disclose only element [1.6] in combination with Kurita. Petition p.31. Kurita in view of LaMarche and/or Lemoff do not disclose element [1.6].

Petitioner relies on LaMarche to teach a radial arrangement of collimating lenses. As explained above, a POSITA would not have combined Kurita with LaMarche. *See* §V.B.2; EX2003 §IX.B.3.

LaMarche teaches one collimating lens *per array* which forms a pattern of light entering on the surface of the pupil lens—not one light per radial sector. EX2049 ¶¶72-76. Dr. Willner opines that the NxN array is arbitrary and a POSITA would understand that N=1 to correspond to a single laser, but this is hindsight bias.

At deposition, Dr. Willner would not answer a simple question about what is shown in FIG. 6 in terms of N or the effects of modifying N=1 would have on the system of LaMarche. EX2048 148:1-152:15. He would not point to any disclosure in LaMarche to support his position. *Id.* 152:25-154:1. Nor could he explain why a POSITA would be motivated to set N to 1 over 2 or 3. *Id.* 154:2-155:25.

Moreover, the pupil lens does not focus the light onto a single spot but onto an array of ball lenses arranged in an identical pattern as the light emitting devices. EX1005 6:68-7:7.

Petitioner relies on Lemoff to satisfy the “stopped optical fiber” element. Petition p.33. However, a fiber inserted into Lemoff’s ferrule and receptacle does not satisfy the “stopped optical fiber” limitation because the ferrule arrangement does not include a stop. EX1006 5:58-60. The receptacle and ferrule allow the fiber to be “plugged into or removed from the optical signal emitter 200.” *Id.* 5:65-6:2. As shown in FIG. 2, a stop is not part of the ferrule. *Id.* FIG. 2; EX2003 ¶¶242-243.

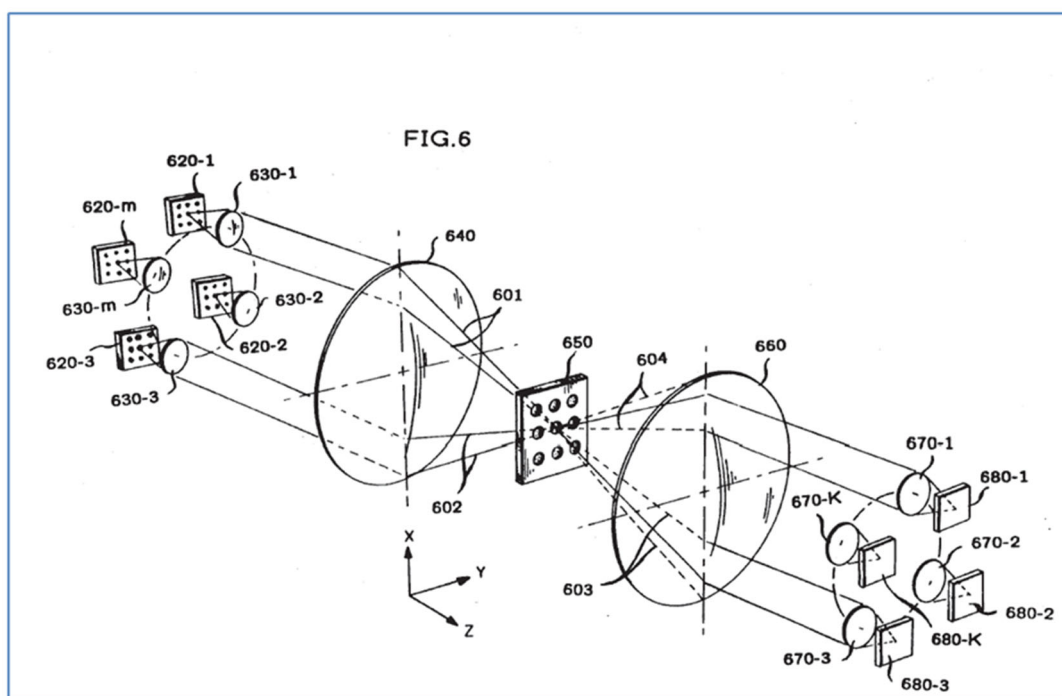
Additionally, Lemoff does not disclose an integrated ferrule—the ferrule in Lemoff is removable. *Id.* 5:65-6:2; EX2003 ¶244.

In Ground 2, Petitioner does not rely on LaMarche or Lemoff to cure any other shortcomings of Kurita. Because Kurita is missing claim elements beyond the ones Petitioner depends upon Lemoff and LaMarche to fulfill, this combination does not satisfy all claim limitations for claim 1. *See supra* §V.A.1-5.

4. Ground 2: Claims 2 and 6

Because Kurita, LaMarche, and/or Lemoff do not disclose all elements of claim 1 (§V.B.2-3), this combination does not disclose dependent claims 2 and 6. *See also* §V.B.5.

Petitioner further relies on LaMarche (and only LaMarche) to disclose a two-by-two array in claim 2. However, LaMarche discloses one collimating lens *per array* of lasers. EX1005 5:27-38, 6:3-7; EX2049 ¶¶72-76. As shown in FIG. 6, LaMarche discloses a three-by-three array.



The three-by-three array does not result in the light passing through separate radial sectors of pupil lens. Instead, the light forms a pattern in the N=N arrangement as represented in FIG. 7. EX1005 5:62-65; EX2049 ¶76.

Where Kurita is an array of 2x2 lenses, Dr. Willner does not explain why a POSITA would be motivated to use an array where N=1. EX2048 154:2-155:25. Petitioner simply uses hindsight bias. Combining Kurita and LaMarche also does not cure this shortcoming. EX2003 §IX.B.7-8.

5. Ground 2: Claims 7 and 9

Petitioner contends that claim 7 is substantially the same in scope as claim 2. Because Kurita, LaMarche, and/or Lemoff do not satisfy the claim elements of claims 1-2, these references do not disclose or render obvious claim 7 or claim 9 which depend from claim 7. §V.B.2-4; EX2003 §IX.B.9-10.

C. Grounds 3 and 4: Petitioner Fails to Show Challenged Claims Are Obvious Over Lemoff Alone and/or in View of LaMarche

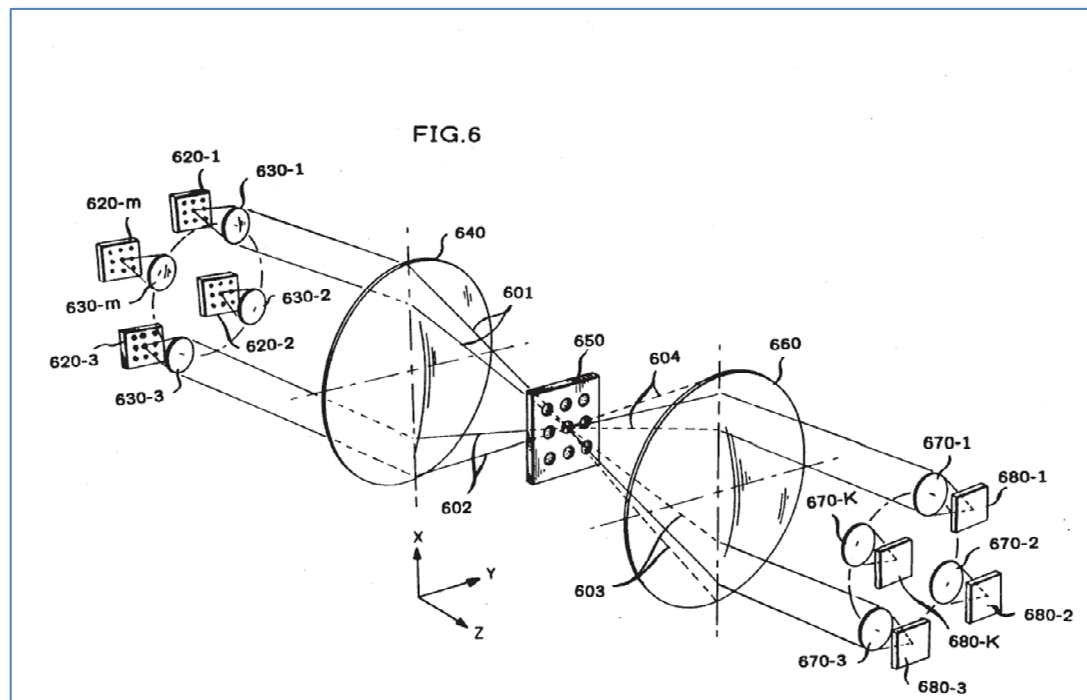
For Ground 3, Petitioner relies on Lemoff as a standalone §103 reference and for Ground 4 relies on Lemoff in view of LaMarche.

1. Lemoff and LaMarche Are Not Combinable

Petitioner argues that a POSITA would combine the collimating lenses from LaMarche, placed in a radial arrangement, with Lemoff's optical signal emitter. Petition p.37. However, there are several reasons why a POSITA would not turn to LaMarche to modify Lemoff. EX2003 §IX.C.3. As an initial matter, LaMarche is not analogous art with the '416 Patent or Lemoff. EX2003 §IX.C.2 and ¶¶289-290.

Combining Lemoff and LaMarche would not have led to a predictable result because they are not capable of being physically combined due to the size differences; any such system would lead to inoperable results. EX2003 ¶¶268-275. *See Depuy Spine Inc. v. Medtronic Sofamor Danek*, 567 F.3d 1314, 1326 (Fed. Cir 2009) (KSR's "predictable result" refers to expectation that prior art elements are capable of being physically combined); *In re ICON Health & Fitness, Inc.*, 496 F.3d

1374, 1382 (Fed. Cir. 2007) (“[A] reference teaches away from a combination when using it in that combination would produce an inoperative result.”). LaMarche discloses a system that spans over 160mm. EX1005 7:16-25.



By contrast, Lemoff is on the order of 1-2 centimeters. Lemoff discloses embodiments where the entire signal-emitting area **240** is 100 μ m-2,000 μ m (up to 2mm). EX1006 3:34-43, 5:15-49, 6:3-6.

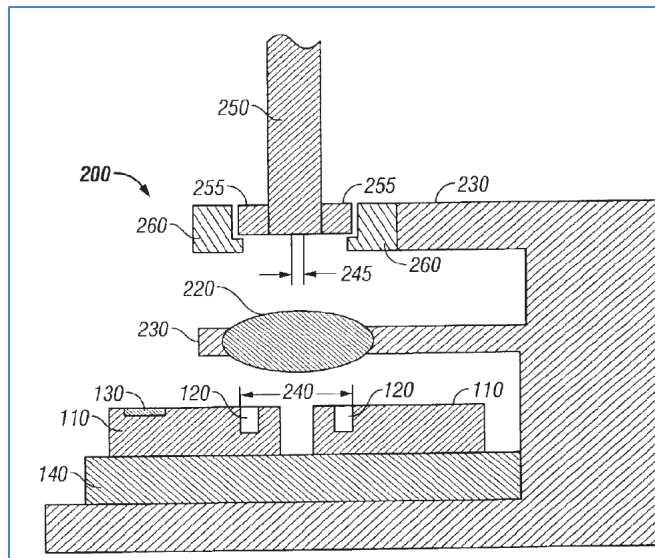


FIG. 2

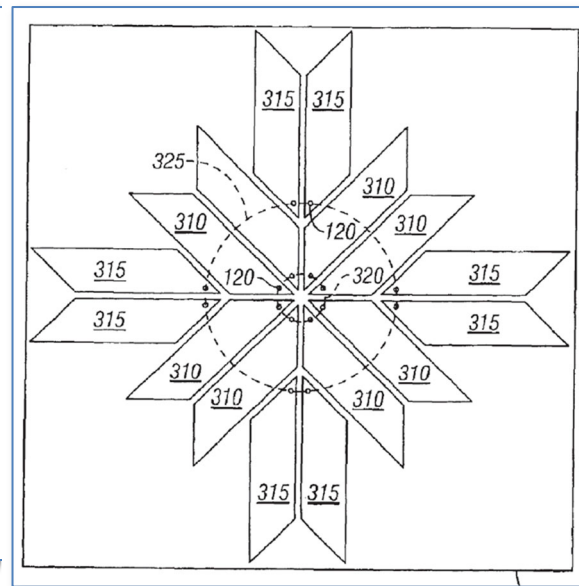


FIG. 3

LaMarche's optical setup is significantly larger than the signal-emitting area in Lemoff, resulting in a non-functional device. EX2003 ¶¶268-275.

Lemoff discourages using optical wavelength multiplexers to accomplish WDM for short distances and instead, *emulates* WDM. EX1006 1:42-48, 1:52-56. By contrast, LaMarche discloses numerous discrete optical components that are external to the signal emitter arrays 620-1 to 620-m, which are highly dependent on placement, requiring a high degree of precision and man-hours to align. EX2003 ¶276. Given the overall size of Lemoff compared to the complexity of the system in LaMarche, a POSITA would have no reason to combine LaMarche's discrete lenses with Lemoff. EX2003 ¶¶276-282. Lemoff repeatedly reinforces that its optical signal emitter is usable for short distances without any external components—the antithesis of LaMarche. EX1006 3:62-65, 7:13-18, 7:47-55. EX2003 ¶¶284.

Further, there is no evidence that adding collimating lenses to Lemoff would improve its coupling efficiency or maximize efficiency. EX2003 ¶¶312-319. LaMarche’s disclosure of a radial lens arrangement for better efficiency in multi-point broadcasting is not pertinent to improving coupling efficiency of Lemoff’s signal emitter. EX2003 ¶285-287.

LaMarche also recognizes the losses inherent in its design. EX1005 7:35-46. LaMarche himself only used two input probe lenses in an experiment. EX1005 7:16-34. Thus, Petitioner’s reasoning lacks the required factual underpinnings for claiming obviousness. *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006). Additionally, LaMarche would lead to *greater* physical complexity than Lemoff—requiring additional optical components, further discouraging a POSITA from modifying Lemoff. EX2003 ¶285-287.

Moreover, Lemoff does not teach or suggest using collimating lenses. Petitioner cites to Lemoff’s disclosure of various types of imaging lenses for imaging the optical signals to the fiber (EX1006 6:16-23), but none of these are described as collimating lenses, let alone lenses corresponding to each emission aperture. EX2003 ¶¶266-267; *In re Warner*, 379 F.2d 1011, 1017 (CCPA 1967) (the Board cannot “resort to speculation, unfounded assumptions or hindsight reconstruction to supply deficiencies in its factual basis”).

Neither Lemoff nor LaMarche disclose an optical combiner with integrated collimated lenses. EX2003 ¶¶291. The Petition lacks evidence as to why a POSITA would integrate LaMarche’s discrete collimated lenses per array of light emitting devices into Lemoff’s optical signal emitter over each aperture.

Finally, as explained below, even if Lemoff and LaMarche were combinable in the way Petitioner argues, the references fail to disclose claimed features of the challenged claim.

2. Claim 1: Elements [1.0]-[1.2]

Petitioner only cites to Lemoff for these elements. Petition p.39-40. Neither Lemoff nor Lemoff plus LaMarche disclose elements [1.0]-[1.2]. EX2003 §IX.C.4.a.

Ground 3

Lemoff does not disclose the claimed optical combiner.

First, Lemoff teaches away from using an optical multiplexer for short distances because of the cost associated with typical optical multiplexers used in WDM. Instead, Lemoff geometrically positions spots (emission apertures) so that different wavelengths can enter the fiber and create a WDM fiber. EX2003 §IX.C.1. Petitioner cites EX1006 1:52-56, but this confirms that Lemoff does not teach that the light is combined—the entire quote states that Lemoff can be used to *emulate* WDM because it can be used in a WDM communication system “without using an

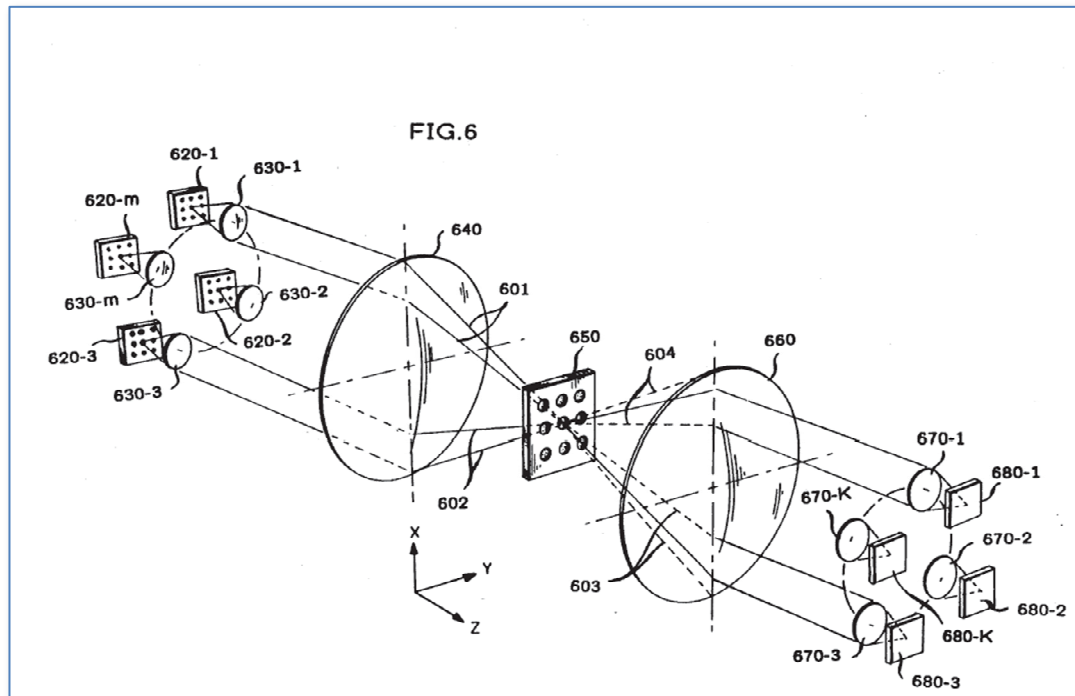
optical multiplexer or other device external to the emitter.” EX1006 1:52-56; Petition p.50; EX2003 ¶¶295-298.

Second, Lemoff does not disclose that its optical signal emitter multiplexes the light onto a single spot of a fiber. Instead, Lemoff discloses the light is butt coupled into the fiber, which means the light enters the fiber at multiple distinct locations. EX1006 3:26-33. Even when an imaging lens is used, Lemoff does not teach “combining” the light signals onto a single spot. EX2003 ¶¶299-300, 305.

Nor does Lemoff disclose an integrated, pre-aligned connector with a stop. Lemoff’s ferrule is pluggable and removable without a stop; the fiber is flush with the end of the ferrule and does not come into contact with a surface. EX1006 5:65-6:2, FIG. 2. Because Lemoff’s ferrule does not disclose a stop, the light is not transmitted into and through a stopped single optical fiber. EX2003 ¶¶301-307.

Ground 4

Petitioner has not relied on LaMarche as an optical combiner. EX1003 ¶¶247-248. Further, there is absolutely no physical integration of the components and no optical combiner. EX2003 ¶¶308-310; EX1005 FIG. 6.



Additionally, LaMarche is not a WDM system—it does not teach combining multiple wavelengths onto a single fiber.

3. Claim 1: Elements [1.3] and [1.4]

Ground 3

Lemoff does not disclose “a plurality of n collimating lenses.” The Board recognized that “Petitioner relies solely upon Dr. Willner’s opinion evidence as

support for the argument that Lemoff would have suggested, to [a POSITA], use of a collimating lens with each of the light emitting apertures (120).” Decision p.22.

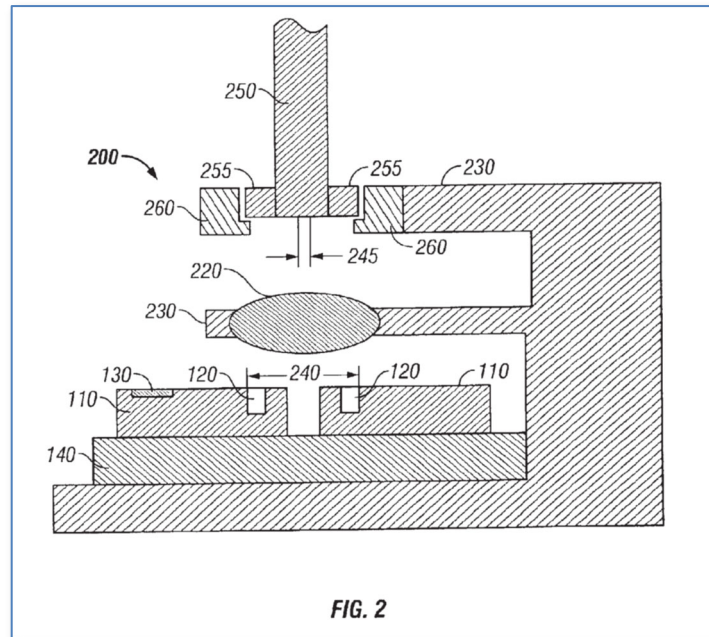
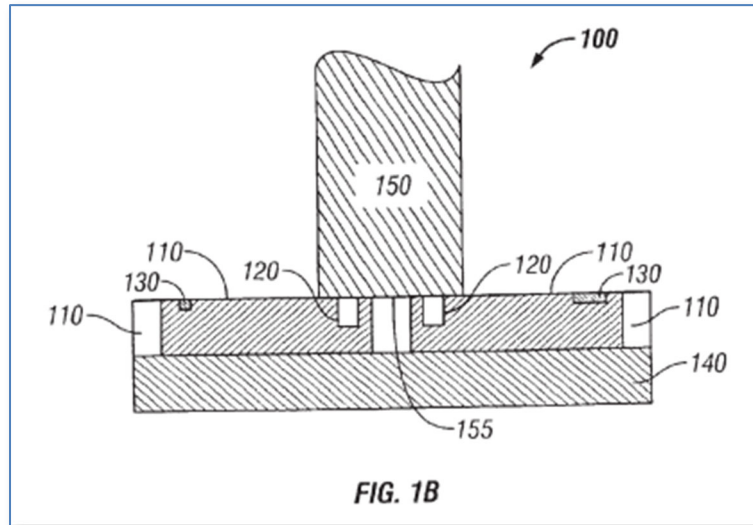
Petitioner cites to various types of imaging lenses disclosed in Lemoff that may be used to image the optical signals to the fiber (EX1006 6:16-23), but none of these are collimating lenses. EX2003 ¶¶313-314. *In re Warner*, 379 F.2d at 1017 (cannot resort to hindsight reconstruction to supply deficiencies in the factual basis). Tellingly, Petitioner relies on the same disclosure in Lemoff—imaging element 220—for two claim elements—the focusing means *and* collimating lenses. Petition p.27.

Dr. Willner seeks to modify Lemoff’s optical element 220 to include collimating lenses; however, when asked how a POSITA would understand the phrase “to image the optical signal,” which is contained in the paragraph that Dr. Willner relies on and a phrase he uses in his opinion (EX1003 ¶256), he said he would have to think about it and would not provide an answer beyond the four corners of his report. EX2048 163:19-168:24.

Further, there is no suggestion that even if collimating lenses were used in some capacity that they would be arranged *over each aperture*. EX2003 ¶¶311-319. “[O]bviousness concerns whether a skilled artisan not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention.” *Virtek*, 97 F.4th at 886–87. Petitioner has

provided no reason why a POSITA would have modified Lemoff to include collimating lenses *over each aperture* rather than any other arrangement. EX2003 ¶¶311-319. Petitioner is simply once again using a hindsight-driven approach to augment Lemoff to include claim elements that Lemoff simply does not disclose, nor would it have been obvious to include.

Rather than collimating light to be multiplexed onto the fiber, Lemoff discloses that the aperture corners 115 of die 110 all point toward the center of signal-emitting area 125, causing the signals to point to different parts of the core fiber.



Modifying Lemoff to collimate and combine the light onto a single spot of the fiber defeats the intended purpose of Lemoff's aperture arrangement. *See Tec Air, Inc. v. Denso Mfg. Mich. Inc.*, 192 F.3d 1353, 1360 (Fed. Cir. 1999) (where proposed

modification would render the prior art invention unsatisfactory for intended purpose, proposed modification would not have been obvious). EX2003 ¶316.

Further, there is no evidence that adding collimating lenes to Lemoff would lead to an improvement of coupling efficiency, and maximize efficiency, or that a POSITA would even make this modification considering the required physical complexities of such design. EX2003 ¶¶317-319. Lemoff teaches an imaging element can be eliminated for circular arrangements. EX1006 3:54-65, 4:28-29, FIG. 1B. Petitioner also fails to explain why the imaging element would be arranged exactly to match this claim element instead of any other arrangement actually disclosed in Lemoff.

In sum, a POSITA would not have modified Lemoff's optical signal emitter to incorporate a plurality of n collimating lenses being spaced apart and positioned over each aperture. EX2003 ¶¶311-319.

Ground 4

Petitioner further compounds its impermissible hindsight-driven approach in Ground 4. As discussed, a POSITA would not have combined a modified Lemoff with LaMarche. *See* §V.C.1

There is no evidence that adding collimating lenses to Lemoff would improve the coupling efficiency or maximize efficiency. EX2003 ¶¶282, 285-291. Collimating lenses would not only modify the principal operation of Lemoff, they

would render Lemoff unsatisfactory for its intended purpose. *In re Gordon*, 733 F.2d at 902; *In re Ratti*, 270 F.2d 810, 813 (CCPA 1959); EX2003 ¶¶276-285. Petitioner also fails to explain why a POSITA would be motivated to arrange the aperture in a circle with an imaging element that includes both a focusing lens and collimating lenses per aperture, when Lemoff teaches no imaging element when the apertures are arranged circular. EX1006 3:-63-65, 4:28-29, FIG. 1B.

LaMarche teaches one radially aligned collimating lens *per array* of laser emitters. EX1005 4:43-49, 5:27-38, EX2003 ¶321. Moreover, the collimated light does not enter into separate radial sectors of the pupil lens. EX2049 ¶¶72-76.

Finally, neither reference discloses collimating lenses integrated into an optical combiner. Petitioner has provided no evidentiary support as to why a POSITA would have integrated LaMarche's discretely placed collimating lenses into Lemoff's optical signal emitter. EX2003 ¶324.

4. Claim 1: Elements [1.5] and [1.6]

Grounds 3

Lemoff does not perform the identical function specified in the claim; thus, it cannot be an equivalent for the purposes of §112 ¶6. *See* MPEP §2183 (prior art must perform the “specified function in the claim” and equivalent structures must perform “the identical function specific in the claim...”); *Abiomed, Inc. v. Maquet Cardiovascular LLC*, No. CV 16-10914-FDS, 2023 WL 4034268, at *17 (D. Mass.

June 15, 2023). In Lemoff, the light that enters into the imaging lens *has not been collimated by collimating lenses*. Further, Lemoff does not disclose that the imaging lens causes the light to focus “onto a single spot at said stopped single optical fiber.” EX2003 ¶¶325-330. Because the claimed function is not performed or disclosed in Lemoff, Petitioner has not met its burden under Grounds 3.

Petitioner attempts to modify Lemoff’s structure to perform the claimed function. However, Petitioner’s reliance on modifying Lemoff’s imaging element 220 to include collimating lenses based on FIG. 1A (EX1003 ¶¶268-269), is misguided because Lemoff teaches away from using any imaging element 220 with this arrangement and is structurally not capable of housing an imaging element with or without collimating lenses. EX1006 3:26-34, FIGS. 1A-1B; EX2003 ¶¶328-338. Lemoff further teaches that an imaging element can be eliminated all together in circular arrangements. EX1006 3:54-65, FIG. 1B. Further, Petitioner fails to explain why a POSITA would modify the imaging lens to focus light “onto a single spot at said stopped single optical fiber” rather than imaging the light emitted into the fiber at different locations. EX2003 ¶¶325-330.

Ground 4

Because a POSITA would not have modified Lemoff to include collimating lenses, Lemoff and LaMarche do not disclose a “focusing means having n separate

radial sectors on its surface, and each of said *n collimated beams* passes through a separate one of said *n* sectors....” See §§V.C.1 and V.C.3; EX2003 §IX.C.3.

Further Lemoff does not disclose “separate radial sectors” *on the surface of the imaging lens*. For this limitation, Petitioner relies on FIG. 1A, but this embodiment of Lemoff does not include an imaging lens. EX1006 at 3:26-34, FIGS. 1A-1B. Lemoff teaches away from using an imaging lens in this embodiment, and teaches eliminating the imaging element all together in circular arrangements of apertures. EX1006 3:26-34, 3:54-65; EX2003 ¶¶340-341. To the extent Petitioner relies on FIG. 2 of Lemoff, the emitting apertures form an inner and outer circle. This means that the light hitting the imaging lens would not form pie-shaped sectors, even if the light was collimated. EX2003 ¶338. Moreover, because the signals in Lemoff are imaged into the fiber at different locations, the signals would not enter the fiber in a single spot as claim [1.5] requires. EX2003 ¶330.

To the extent Petitioner relies on LaMarche, the pupil lens focuses the light from the collimating lenses to an array of ball lenses—which means that the individual laser beams are not focused onto a single spot. *E.g.*, EX1005 FIGS. 6-8; EX2003 ¶¶344-347. Moreover, because LaMarche discloses one collimating lens *per array* of laser emitters, the collimated beams do not pass through a separate sector of the pupil lens. EX1005 4:43-49, 5:27-38; EX2003 ¶321. Instead, there are nine lasers per collimating lens that form the coincident pattern 801 at the focal plane

of the pupil lens. EX1005 6:2-14, 6:68-7:7, FIG. 8. Petitioner provides no reason why a POSITA would choose an array of $n=1$ instead of $n=3$ as shown in FIG. 6 in combining LaMarche and Lemoff. *Virtek*, 97 F.4th at 886. Petitioner also fails to explain why a POSITA would be motivated to modify the imaging element to include both a focusing lens and collimating lenses per aperture, instead of any other arrangement actually disclosed in Lemoff—other than hindsight bias to exactly match the claims.

5. Claim 2

Because Lemoff and/or LaMarche are not combinable and do not disclose all elements of claim 1 from which claim 2 depends (*see* §§V.C.1-4, claims [1.0]-[1.6]), this combination does not disclose claim 2.

Ground 3

Lemoff does not disclose collimating lenses, nor would a POSITA have found it obvious to incorporate Lemoff. *See* §§V.C.1, V.C.3. Lemoff does not disclose an optical combiner of claim 1 with the additional limitation of claim 2. EX2003 ¶¶349-352.

Ground 4

Petitioner further relies on LaMarche for certain aspects of claim 2; however, because LaMarche does not disclose an optical combiner; it does not disclose an optical combiner of claim 1 with the additional limitation of claim 2. LaMarche

discloses discrete optical elements that are not integrated into an optical combiner. *See* §V.C.2; EX2003 ¶¶353-354.

Further, a POSITA would not have combined Lemoff and LaMarche. *See* §V.C.1; EX2003 §IX.C.3. Even so, combining Lemoff and LaMarche does not cure these deficiencies. *See* §V.C.2-4; EX2003 ¶355. Moreover, Petitioner fails to explain why a POSITA would have been motivated to combine Lemoff and LaMarche to arrive at pie-shaped quadrants on the imaging element over any other arrangement that would image the light onto the core of the fiber. EX2003 ¶¶349-355.

6. Claim 6

Because Lemoff or Lemoff and LaMarche are not combinable and do not satisfy all elements of claim 1, these references do not disclose or render obvious claim 6. *See* §§V.C.1; EX2003 §IX.C.6.

7. Claims 7 and 9

Petitioner contends that claim 7 is substantially the same in scope as claim 2. Because Lemoff or Lemoff and LaMarche are not combinable and do not satisfy the claim elements of claims 1-2, these references do not disclose or render obvious claims 7 or 9. *See* §§V.C.1-5; EX2003 §IX.C.7.

D. Ground 5: Bhandarkar Is Not Prior Art – Invention Date Is July 17, 2003

Because each Challenged Claim has an invention date of July 17, 2003, Bhandarkar is not prior art as it has a priority date no earlier than September 29,

2003. Petition p.52. The provisional application leading to the '416 Patent was filed on February 4, 2004. During prosecution, applicants established an invention date of July 17, 2003. *See* EX1002 p.22.

Petitioner argues that the '416 Patent should not have a July 17, 2003, priority date, because (1) conception and diligence in reducing to practice are not sufficiently corroborated; and (2) the provisional application does not provide adequate written description for some of the claims. Each of these arguments fails.

1. Conception and Diligent Reduction to Practice

During prosecution, Inneos' predecessor successfully swore behind Bhandarkar. The inventors submitted several documents evidencing conception by July 17, 2003 followed by diligent efforts to reduce to practice, with constructive reduction to practice occurring upon the February 4, 2004 filing of the provisional application. Consequently, the Examiner issued a NOA for the '416 Patent, finding they had sworn behind Bhandarkar. EX1002 p.22.

a. Notebooks Establish July 17, 2003 Conception.

Inneos' documentary evidence—namely inventor notebooks—establish a July 17, 2003 conception. Petitioner incorrectly contends that Inneos is relying solely on inventor *declarations* to establish conception, and further incorrectly contends that Inneos cannot rely on inventor notebooks to corroborate that

testimony. Petition p.54. But Petitioner’s argument is backwards. Inneos is relying on documentary evidence that does not require corroboration.

Inventor notebooks—witnessed or not—can establish conception. *Mahurkar v. C.R. Bard, Inc.*, 79 F.3d 1572, 1577 (Fed. Cir. 1996). Accordingly, Petitioner’s reliance on the quoted portion of *Brown v. Barbacid*, 276 F.3d 1327, 1335 (Fed. Cir. 2002) is misplaced. Petition p.53. In *Brown*, the Federal Circuit drew a distinction between inventor testimony and documentary evidence: “This court does not require corroboration where a party seeks to prove conception through the use of physical exhibits.” *Id.* (quoting *Mahurkar*, 79 F.3d at 1577). The problem in *Brown* was that the notebooks (and photographs) did not “encompass all limitations of the claimed invention” necessary to establish conception. *Id.* at 1336. Their only evidence of the missing claim element’s conception was the inventor’s *oral testimony*, which *did* require corroboration. *Id.* at 1334–35. That is, the Federal Circuit relied on the unwitnessed notebooks for the disclosed elements, but that was insufficient to establish conception of *all* elements.

To be sure, the *Brown* court further found that the Board erred in not relying on the inventor’s notebook to establish conception as of a later date when the later notebook pages and other physical evidence supported all claim elements. *Brown*, 276 F.3d at 1337.

Petitioner relies on several other cases concerning *inventor's testimony* to argue that *inventor notebooks* corroborating such testimony are insufficient corroboration, but these cases are off-point because Inneos does not rely on inventor testimony for conception. Petition p.54; *Curt Mfg., LLC v. Horizon Global Ams. Inc.*, IPR2019-00625, Paper 31, 13–18 (PTAB Aug. 11, 2020) (determining whether inventor testimony sufficiently corroborated); *Procter & Gamble Co. v. Teva Pharms. USA, Inc.*, 566 F.3d 989, 999 (Fed. Cir. 2009) (proving conception through *oral testimony* cannot be corroborated by unwitnessed lab notebook); *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1169 (Fed. Cir. 2006) (issue on appeal is “whether Medichem provided adequate corroboration of the *inventors' testimony* regarding the alleged actual reduction to practice,” and clarifying that “no similar condition of ‘corroboration’ is imposed on an inventor’s notebook, or indeed on any documentary or physical evidence...”).

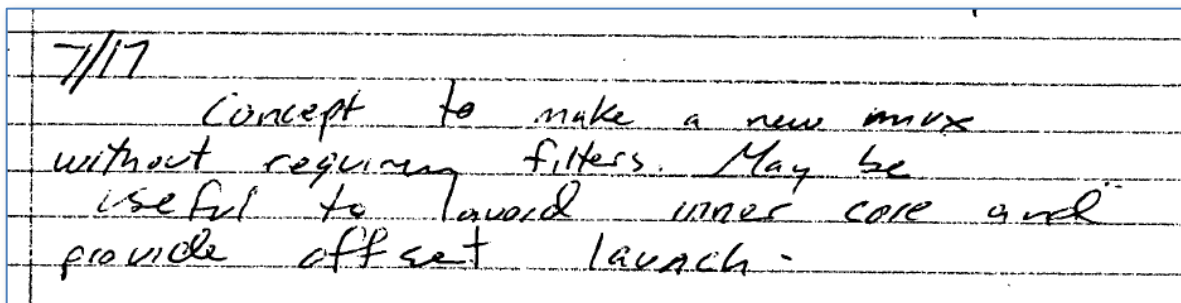
Concerning conception, Petitioner takes issue with corroboration of only the “dates of the notebooks.” Petition p.54. The inventor notebooks themselves do not require further independent corroboration, including the dates in the notebook. *Brown*, 276 F.3d at 1335 (“[inventor’s] notebooks and autoradiographs, do not require corroboration to demonstrate the content of the physical evidence itself, namely that FT assay experiments took place on September 20 and 25”).

During prosecution, the Examiner found that the notebooks established conception of all elements. EX1002 p.35-37; EX2018; EX2003 ¶¶363-364. Further, Inneos submits inventor notebooks which show dated, chronological entries from the notebook to further establish when the inventor conception occurred. EX2009; EX2010.

In a further attack on Inneos' evidence of priority date, Petitioner misconstrues the notebooks as "unwitnessed." In fact, each of the notebooks is signed and dated by co-inventors. EX1002 p.79-81. Petitioner does not otherwise dispute that the notebooks provide all limitations of the claimed invention.

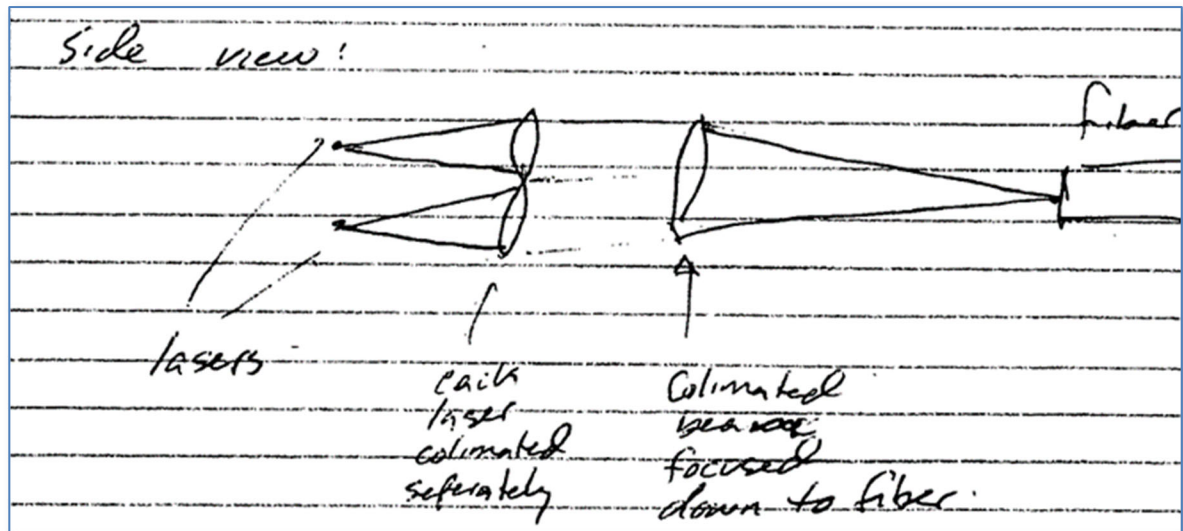
As discussed in the file history (EX1002 p.21-141), and charted below, the notebooks establish July 17, 2003 conception. EX2003 ¶¶365.

1. Limitations [1.0]-[1.2]



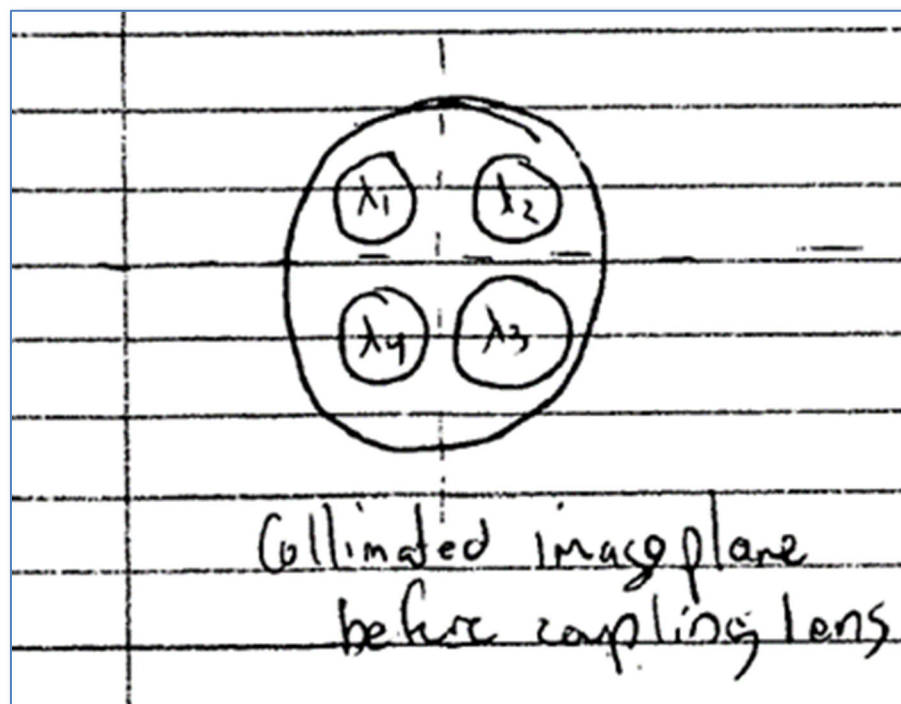
7/17
Concept to make a new mux
without requiring filters. May be
useful to launch inner core and
provide offset launch.

EX1002 p.79

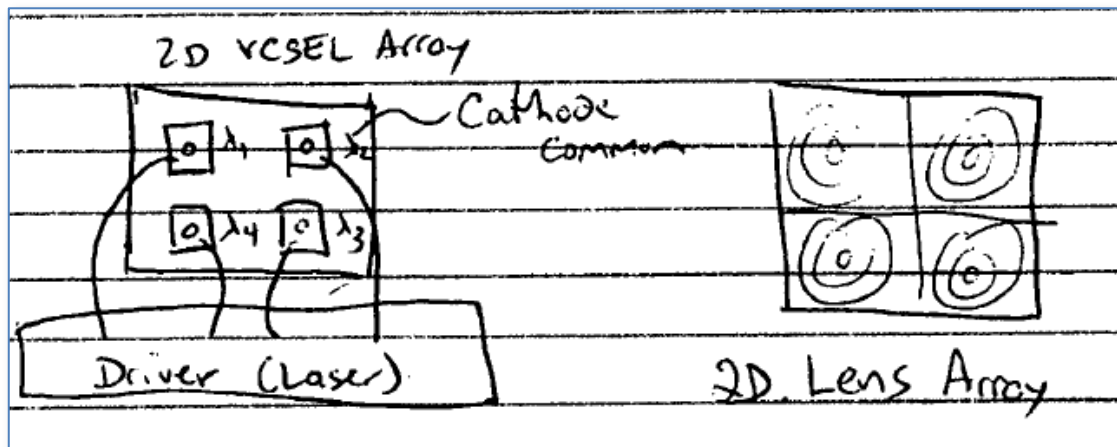


EX1002 p.79

Limitations [1.3]-[1.4]

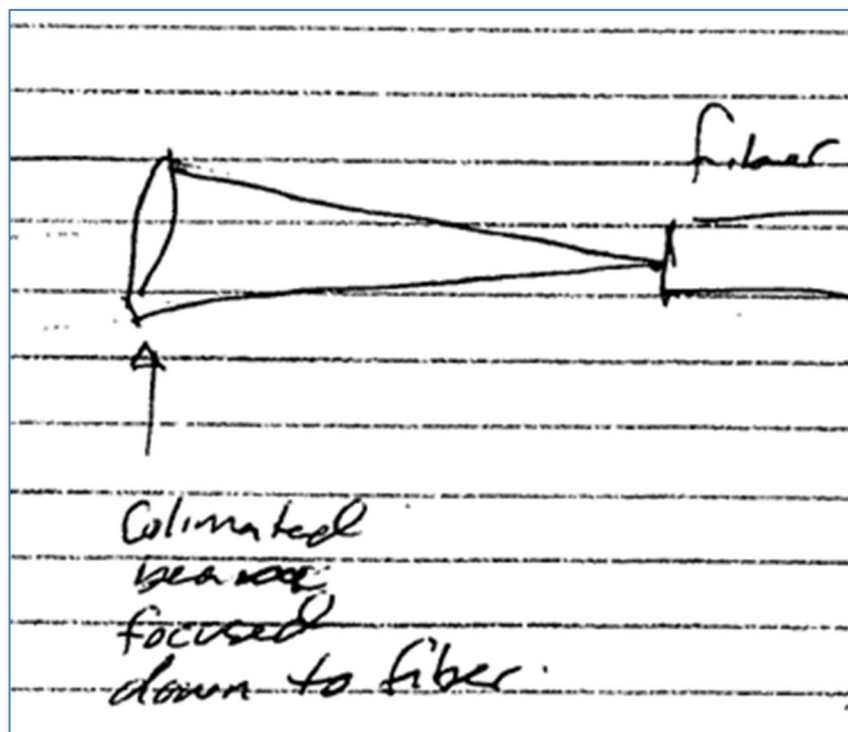


EX1002 p.126

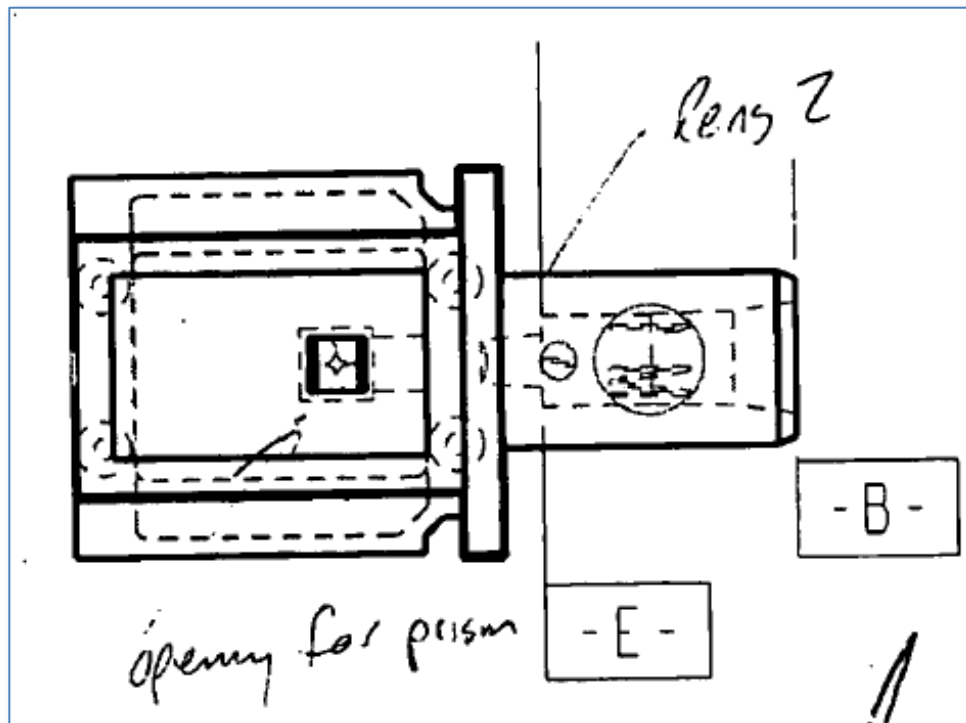


EX1002 p.126

Limitations [1.5]-[1.6]

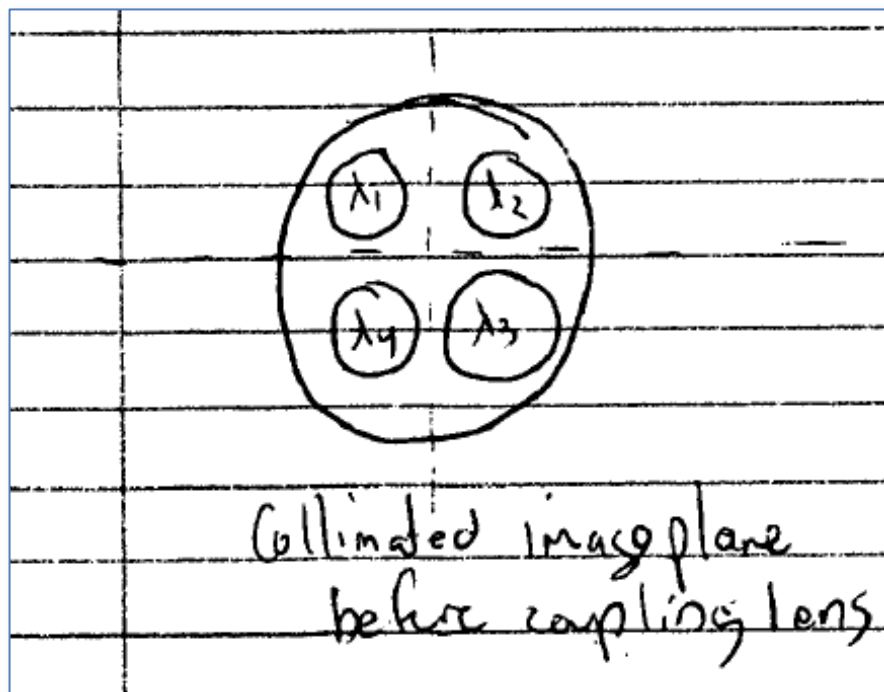


EX1002 p.79

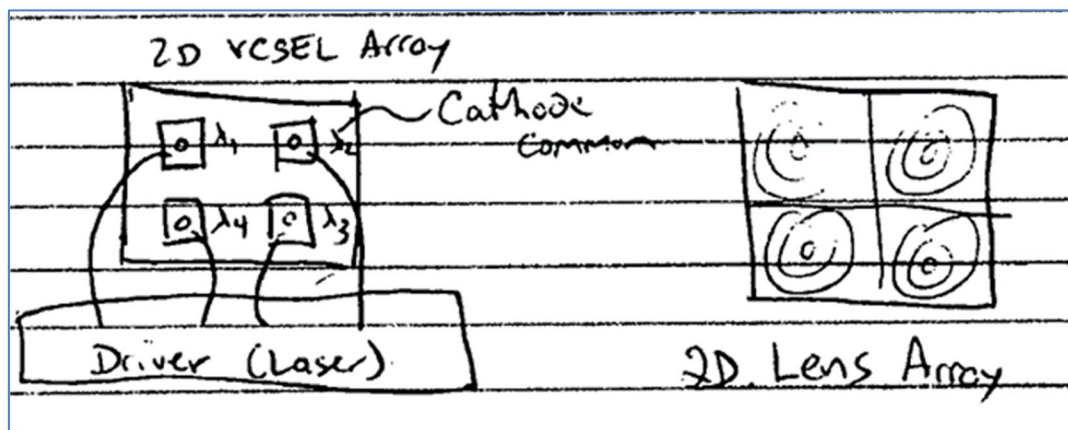


EX1002 p.80

2. Claim 2



EX1002 p.126



EX1002 p.126

Claims 6 and 9 (claimed invention does not use dielectric filters or waveguides). See EX1002 pp.74-128.

Claim 7 (see Claims 1 and 2, above)

b. Reasonable Diligence

To establish diligence in reduction to practice, the inventor must show diligence throughout the entire critical period, here, from September 29, 2003 to February 4, 2004. The Board acknowledged that Inneos “has provided some evidence to show diligence,” from November 10, 2003 to January 15, 2004, but had “not explained why, under the facts of this case, the evidence is sufficient to establish reasonably continuous diligence...” and that Inneos “must provide an explanation that is satisfactory to indicate that the relied-upon computer modeling and prior art search update show reasonably continuous diligence from November 10, 2003 to January 15, 2004.” Decision, p.26.

In determining diligence, “[o]ne must weigh the collection of evidence over the *entire* critical period to make such a determination,” “not to scour the patent owner’s corroborating evidence in search of intervals of time where the patent owner has failed to substantiate some sort of activity.” *Perfect Surgical Techniques, Inc. v. Olympus Am., Inc.*, 841 F.3d 1004, 1009 (Fed. Cir. 2016). The point of the diligence analysis “is to assure that, in light of the evidence as a whole, the invention was not abandoned or unreasonably delayed.” *Id.* at 1009 (citation omitted).

Evidence as a whole supports the inventors’ diligence.

First, during prosecution, the inventors’ prior declarations identify various date ranges during which the inventors prepared and revised invention disclosure forms, from October 2003 through January 2004, ***which ultimately formed the basis of the provisional application for the ’416 Patent.*** EX1009, EX1002 p.74–116. Patent applications amount to constructive reduction to practice. Inneos additionally submits metadata for the electronic Word files, verifying the last-saved dates of these forms during the relevant period. EX2011 ¶¶1–11.

Second, the inventors’ declarations indicate they were conducting prior art searches during the relevant time period. EX1002 p.118–122; EX2046 ¶¶11, 19. Prior art searching is sufficient activity for diligence. *See, e.g., Correge v. Murphy*, 705 F.2d 1326, 1330 (Fed. Cir. 1983) (inventor’s two-month response to prior art search results did not result in abandonment); *cf. In re Enhanced Sec. Rsch., LLC*,

739 F.3d 1347, 1358–59 (Fed. Cir. 2014) (counting attorney’s prior art searches toward diligence analysis). The revised invention disclosure forms reflect the impact of the prior art search results, as seen in updates to the relevant art. EX1002 p.74–76, 84–116. The Lee reference found during these searches appears in the the ’416 Patent’s specification background section and explains how the invention differs from Lee. EX1002 p.109; EX1001 1:65-2:10. Understanding how the invention is intended to work against the backdrop of the state of the art is important to preparing a patent application intended to be read from the view of a POSITA and amounts to constructive reduction to practice.

The financial constraint of being a small start-up limited physical prototyping, so the inventors relied on modelling, analysis, and simulations to understand the contours of the invention. EX2046 ¶¶5, 6; EX2036. In mid-July, inventor Ray pasted initial mechanical models into his notebook signed and dated by co-inventors Grann and Peters. EX1002 p.80–81. Also in July, inventor Grann ran initial optical models showing how the light would pass through the optical components. EX2037–2039. By mid-October, the inventors circulated mechanical models of how the optical combiner module could house the optical components. EX2045 ¶11; EX2027–2031; EX2033; EX2044. These computer models helped confirm whether the invention worked as intended. EX2027–2031; EX2037; EX2038. In mid-November, they continued to work out the design and development. EX2046 ¶¶15–18, 20; EX2034.

In mid-January, they debated the merits and feasibility of two embodiments based on the models. EX2046 ¶¶22–23; EX2035. Further, inventors presented corroborating evidence of computer-generated models that correspond to FIGS. 1–6 of the eventual ’416 Patent. EX1002 p.74–76, 80–83; EX2043; EX2045 ¶¶4–9.

Any lull in activity does not indicate abandonment. Indeed, gaps in activity during the holiday season are reasonable under the facts. *Unified Pats., LLC v. Flexiworld Techs., Inc.*, No. IPR2022-00775, Paper 41, 19 (P.T.A.B. Nov. 1, 2023) (finding reasonably continuous diligence during a holiday-filled period bookended by drafts and discussions). Inventors conducted prior art searches over the holiday-filled period and Aduro was closed part of the time. EX1002 p.121 ¶10; EX2046, ¶19; EX2041; EX2046 ¶21. Moreover, given that Inneos at the time was a three-man crew further underscores the inventors’ reasonably diligence over the short four-month diligence period. EX2036; EX2046 ¶5.

This evidence is summarized below:

Dates	Evidence
July 18–22, 2003	Initial optical modeling. EX2037–2039; EX2046 ¶¶7–10. Initial mechanical modeling. EX2029–2030; EX2044; EX2045 ¶10; EX2047 ¶11.

Dates	Evidence
August–September, 2003	Initial prior art searches. EX1002 p.118–122 (¶8); EX2046 ¶11.
October 7–16, 2003	First draft of “Report of Possible Subject Invention” (“Rev 0”), which references the prior art and computer models. EX1002 p.74–76, 84–94, 118–122 (¶8); EX2046 ¶13. Rev 0 was last saved and emailed on October 16, 2003. EX2011, ¶¶6–7 (metadata); EX2032 (email). Inventors perform computer modeling of the optical combiner. <i>Id.</i>; EX2027–2028; EX2031; EX2033; EX2045 ¶¶10–12; EX2047 ¶11.
October 16, 2003	Inventors meet to discuss prior art and invention. EX1002 p.121 ¶¶8–9; EX2045 ¶11.
October 24–November 10, 2003	Second draft of the invention disclosure (“Rev 1”). EX1002 p.74–76, 95–105. EX2011, ¶¶8–9 (metadata); EX2045 ¶13

Dates	Evidence
	Rev 2 identifies updated prior art from Rev 1. EX2011 ¶¶8–11 (metadata).
January 27, 2004	Attorney receives Rev 2. EX1002 p.107–108.
January 29, 2004	Grann’s last revision of optical model. EX2040; EX2046 ¶24.
January 28 through February 4, 2024	Applicant’s attorney prepares and files provisional application. EX1002 p.129–130.

As a whole, Inneos has established reasonably continuous diligence for the relevant four-month period. Together, efforts related to the invention disclosure forms, the prior art searching, and the optical and mechanical modeling do not show abandonment or unreasonable delay.

Thus, the Challenged Claims have a priority date of July 17, 2003.

2. The ’416 Provisional Application Provides Adequate Written Description and Enables Full Scope Invention.

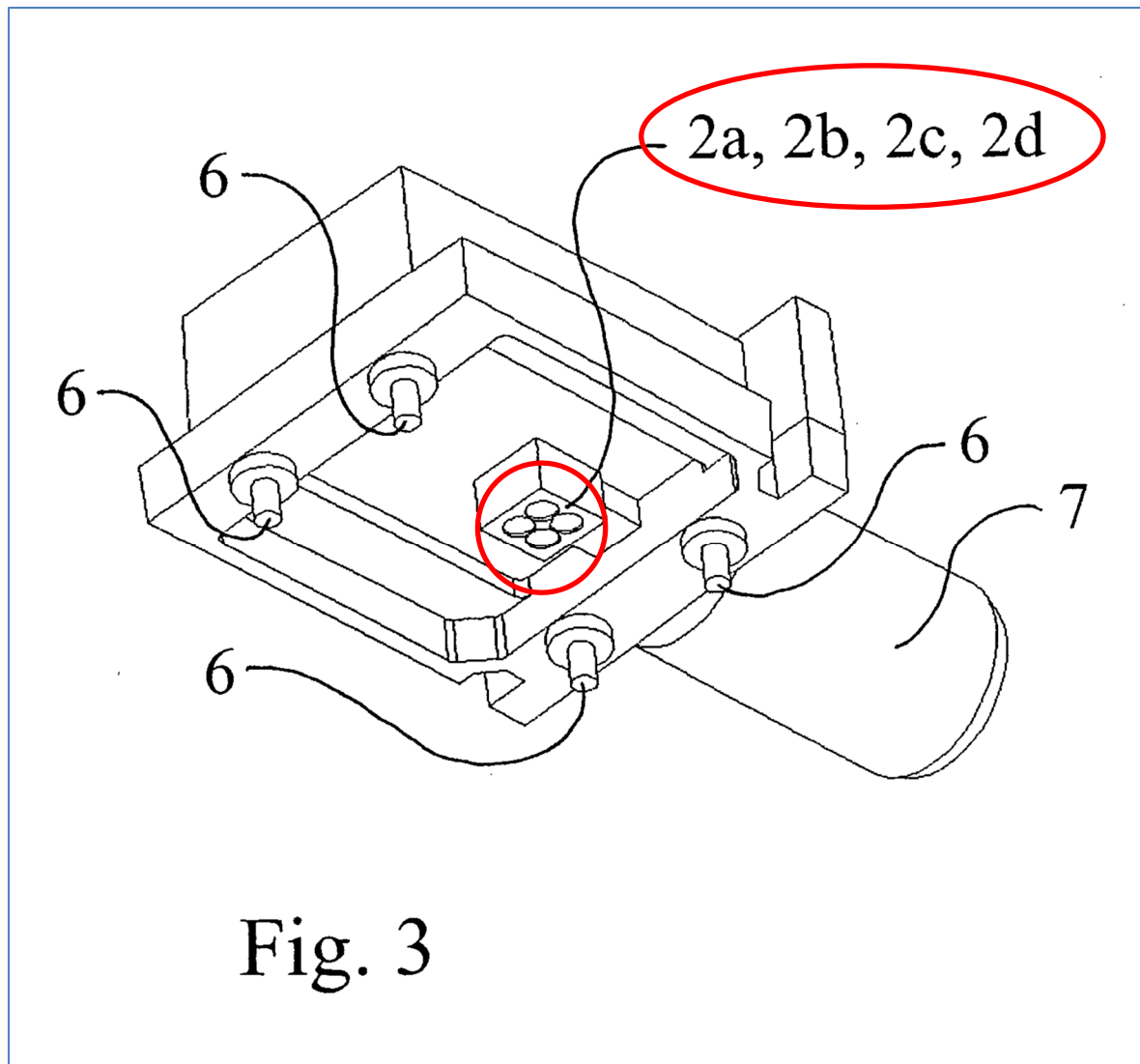
Petitioner further argues the ’416 Patent’s priority date should not be based on the filing date of its provisional application because the provisional: (i) does not meet the written description requirement; and (ii) only discloses a device with four lasers and collimating lenses, so it does not enable the full scope of “*n*” lasers and collimating lenses.

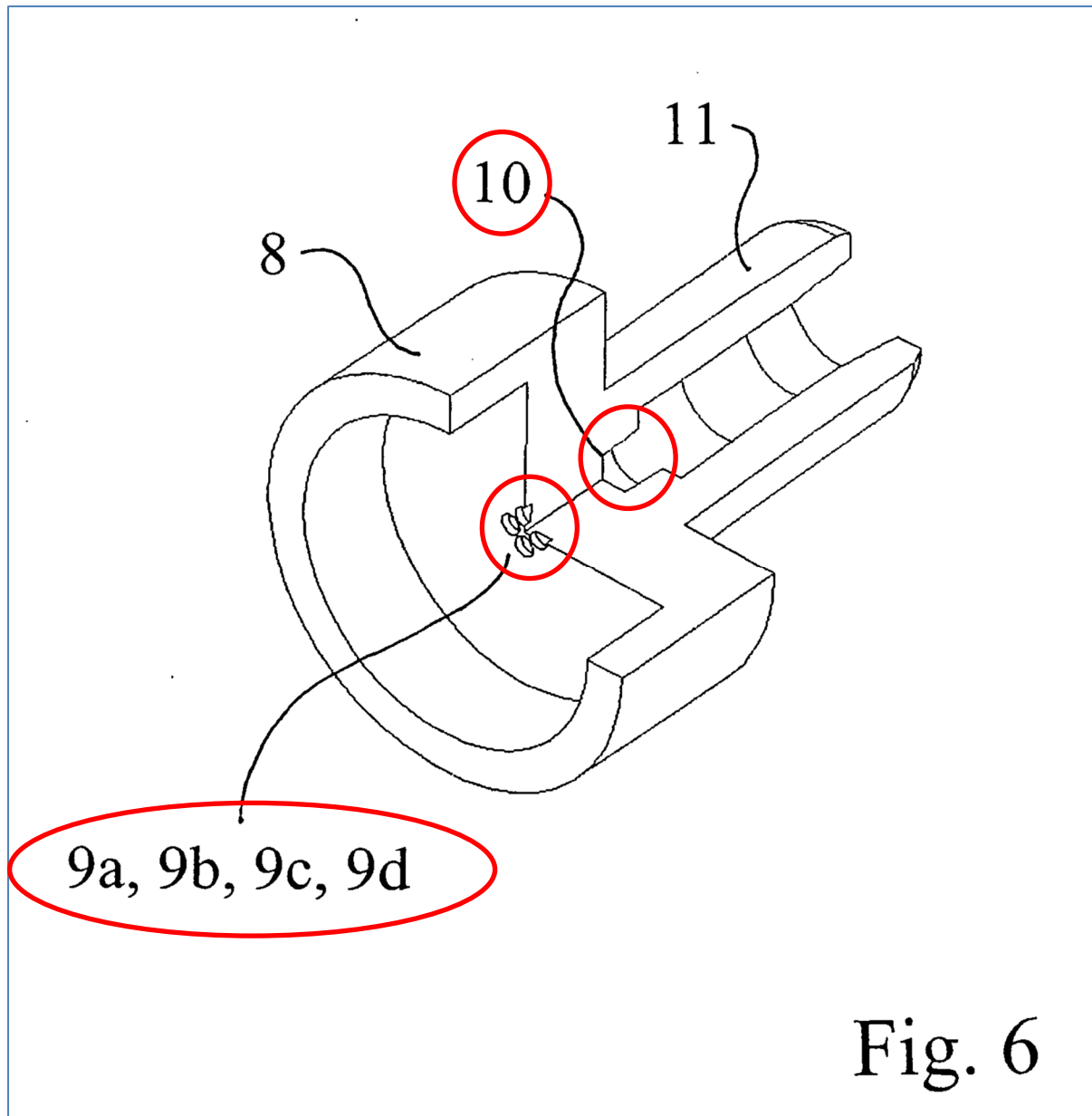
a. Petitioner Fails to Show Any Challenged Claim Lacks Written Description in Provisional Application

A provisional application satisfies the written description requirement when “the description clearly allows persons of ordinary skill in the art to recognize that the inventor invented what is claimed.” *See Bd. of Trs. of Leland Stanford Junior Univ. v. Chinese Univ. of Hong Kong*, 860 F.3d 1367, 1375 (Fed. Cir. 2017) (cleaned up) (noting it is a fact intensive inquiry). Possession of the invention is conveyed “by such descriptive means as words, structures, figures, diagrams, formulas, etc., that fully set forth the claimed invention[,] [a]lthough the exact terms need not be used *in haec verba*.” *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997).

Concerning a focusing means having “separate radial sectors on its surface” and the collimated beams passing “through a separate one of said n sectors,” the provisional application specifically states that the invention comprises an optical combiner that includes “one lens for focusing several *geometrically placed* collimated beams onto the fiber and one or more lenses for collimating light from lasers or fibers and a means for *geometrically arranging* the plurality of collimated beams for maximum coupling efficiency into the fiber.” EX1009, at 2 (emphasis added). It discloses that one such embodiment utilizes “a two-dimensional array of lenses 9a, 9b, 9c, 9d for collimating the input light signals...” EX1009, 3 (e.g., “arranging four (in this embodiment) collimating lenses 2a, 2b, 2c, 2d”), followed

by the focusing lens 10. This is shown in several figures of the provisional application, including FIGS. 3 and 6, shown below:



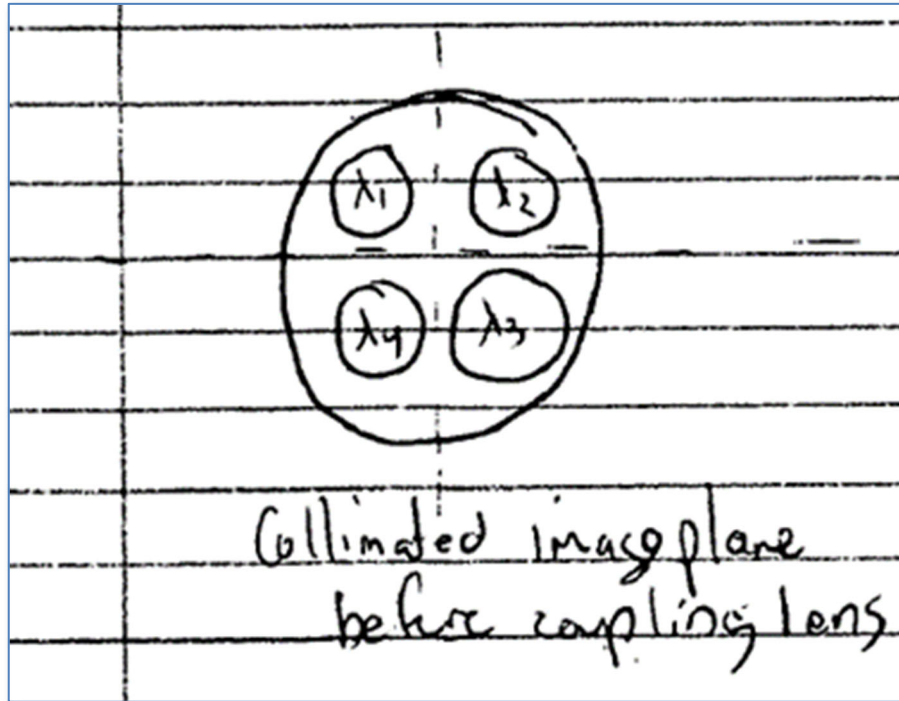


EX1009 at 4, 7.

Based on the Figures and corresponding descriptions, a POSITA would recognize that the outputs of the two-dimensional array of collimating lenses will

intersect with the integrated focusing means in pie-shaped segments, or radial sectors. EX2003 ¶¶368-372. This is illustrated in the inventors' notebooks.

EX1002 p.126. Thus, the inventors clearly had possession of the claimed invention at the time of the provisional application. EX2003 ¶¶367-374.



b. Petitioner Fails to Show that Any Challenged Claim Lacks Enablement

The Petition fails to establish that it is more likely than not that the provisional application does not enable any Challenged Claim, because the provisional discloses four lasers and collimating lenses, but does not expressly generalize to n . To establish non-enablement, a challenger must show that a skilled artisan would be unable to practice the claimed invention without “undue experimentation.” *Alcon Rsch. Ltd. v. Barr Labs., Inc.*, 745 F.3d 1180, 1188 (Fed. Cir. 2014).

Concerning enabling the full scope of claim 1's n lasers and collimating lenses, the specification does not have to "describe with particularity how to make and use every single embodiment within a claimed class." *Amgen Inc. v. Sanofi*, 143 S. Ct. 1243, 1254 (2023). A claim can satisfy the enablement requirement of §112 if one skilled in the art, after reading the specification, could practice the claimed invention without undue experimentation. *In re Wands*, 858 F.2d 731, 736–37 (Fed. Cir. 1988). "[T]he artisan's knowledge of the prior art and routine experimentation can often fill gaps, interpolate between embodiments, and perhaps even extrapolate beyond the disclosed embodiments, depending on the predictability of the art." *AK Steel Corp. v. Sollac & Ugine*, 344 F.3d 1234, 1244 (Fed. Cir. 2003).

Petitioner contends that a POSITA would not be capable of understanding n radial sectors based on the disclosures. Petition p.56-57. Petitioner is incorrect because the '416 Patent fully enables using collimating lenses in a radial arrangement to a POSITA. EX2003 ¶¶375-380. How many radial sectors simply depends on the number of collimated lenses placed radially around the center axis. *Id.* Moreover, Petitioner itself argues that the POSITA would recognize a four lens radial arrangement can be extrapolated to n lenses based on what was known in the art at the time of the invention. Petition p.32 ("LaMarche teaches this radial arrangement for an arbitrary number of M input probe lenses 630-1 thorough 630-

M”). Petitioner cannot have it both ways. The full scope of the Challenged Claims is enabled by the provisional application.³

VI. DR. WILLNER’S TESTIMONY SHOULD BE HEAVILY DISCOUNTED

Petitioner has the burden of proof; yet its expert, Dr. Willner, repeatedly exhibited an inability to answer basic questions on claim construction and the prior art references, often giving nonresponsive answers. *E.g.*, EX2048 at 64:25-69:15, 72:22-74:8, 169:17-175:22, 138:18-1143:11, 150:3-152:15, 27:9-36:5, 37:2-39:17, 159:6-160:25. Dr. Willner simply would not engage beyond the four corners of his report.

He struggled to answer straightforward questions, taking an inordinate amount of time to respond. *E.g.*, *id.* at 53:7-15 (four-minutes), 97:10-21 (five-minute lapse), 112:4-113:2 (five-minute lapse to read FIG. 4 in EX1004), 123:7-126:3 (four minutes pause); 131:13-20 (three-minute pause to locate optical combiner in Kurita), 132:4-25 (after 90 seconds, requesting more time to look in more detail), 146:2-15 (two-minutes to flip to LaMarche FIG. 6). He used extremely vague language and

³ Petitioner does not contend any other limitations of the Challenged Claims are missing from the provisional. All limitations are supported by the provisional. *Compare* Claim [1.0]-[1.2] *with* EX1009 FIGS. 1-6, 8:5-9; claim [1.3]-[1.4] *with* EX1009 p.10:11-12, claim [1.5]-[1.6] *with* EX1009, p.9:18-22. EX2003, ¶381.

drew out his answers, which is reflected in the transcript by dashes, requiring excessive follow up. *E.g., id.* at 23:25-24:9, 44:9-45:16, 47:15-49:4, 61:25-62:13, 119:18-120:3, 132:17-25. Further, Dr. Willner evaded answers with a promise to “think more deeply” about a topic later, failing to recognize that he should already have an understanding. *Id.* at 101:5-103:6, 139:16-142:11, 67:13-14, 68:4-69:16, 110:4-112:1.

VII. CONCLUSION

For the foregoing reasons, Inneos respectfully requests that the Board find each of the Challenged Claims not invalid under Grounds 1-5.

Date: April 26, 2024

Respectfully submitted,

/s/ Barry J. Herman

Barry J. Herman (Reg. No. 51,254)
Christian E. Mammen (*pro hac vice*)
Carrie Richey (*pro hac vice*)

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. §42.24(d), the undersigned certifies that this Patent Owner's Response to Institution of *Inter Partes* Review complies with the type-volume limitation of 37 C.F.R. § 42.24(b). The word count application of the word processing program used to prepare this Patent Owner's Response to Institution of *Inter Partes* Review indicates that the Patent Owner's Response contains 13,972 words.

Dated: April 26, 2024

/s/ Barry J. Herman

Barry J. Herman (Reg. No. 51,254)

CERTIFICATE OF SERVICE

The undersigned certifies that on April 26, 2024, that a true and correct copy of the foregoing was served on Counsel for Petitioner via filing through the P-TACTS, as well as by delivering a copy via electronic mail to the following email address(es):

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