

Petitioner's Demonstratives

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

OPTICIS CO., LTD.,

Petitioner,

v.

INNEOS LLC,

Patent Owner.

Case IPR2023-01256

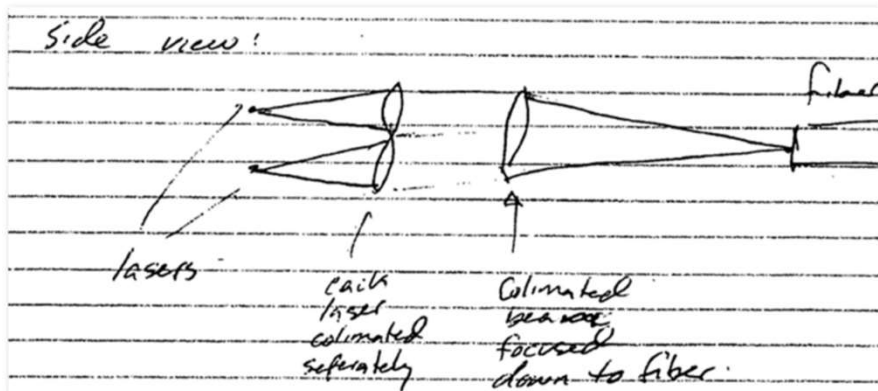
Patent 7,198,416

Three Different Ways the '416 Patent is Invalid

- By rejecting Patent Owner's narrowing constructions
 - Patent Owner reads-in limitations to distinguish the prior art
 - Without the added limitations, Patent Owner's arguments for validity fail
- By finding that the added limitations do not distinguish the prior art
 - There was nothing new or non-obvious about basic concepts such as integration, alignment, or using standard connectors
- By rejecting Patent Owner's swear-behind attempt
 - Patent Owner has not developed a record that could support an earlier effective filing date
 - No dispute that Bhandarkar teaches all claim elements (Ground 5)

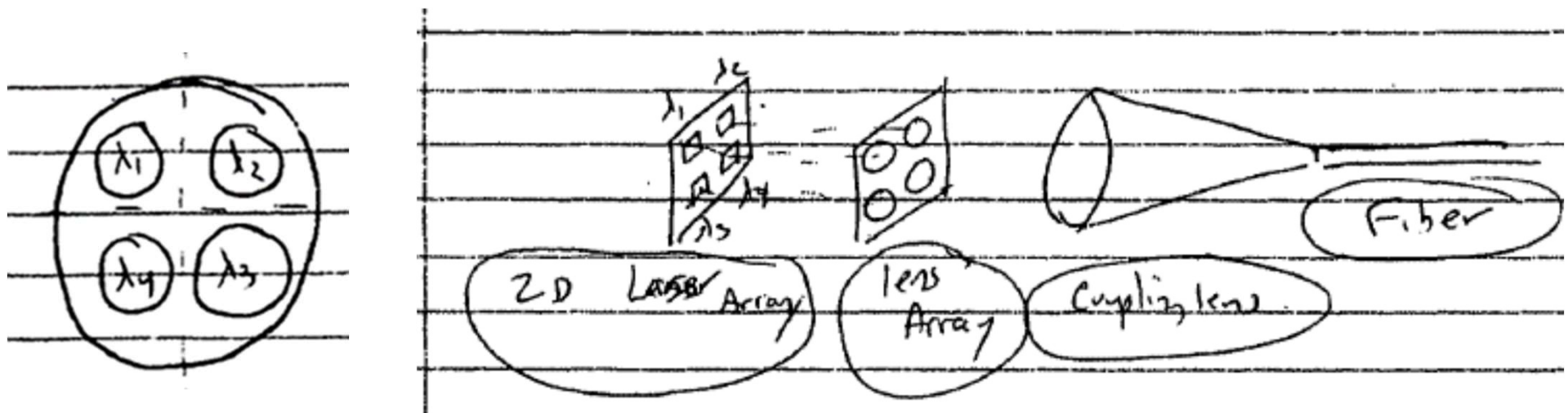
Summary of the '416 Patent

Initial Conception



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

Ex. 1002 at 36, 79, 126



- Explaining these diagrams from the lab notebooks, Mr. Ray noted that the collimated beams would impinge on the focusing lens “in the same pattern as what you see on the lens array.”

Ex. 1017, 51:2-52:31

Claim 1

1. An optical combiner 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, for transmission into and through a stopped single optical fiber, comprising:

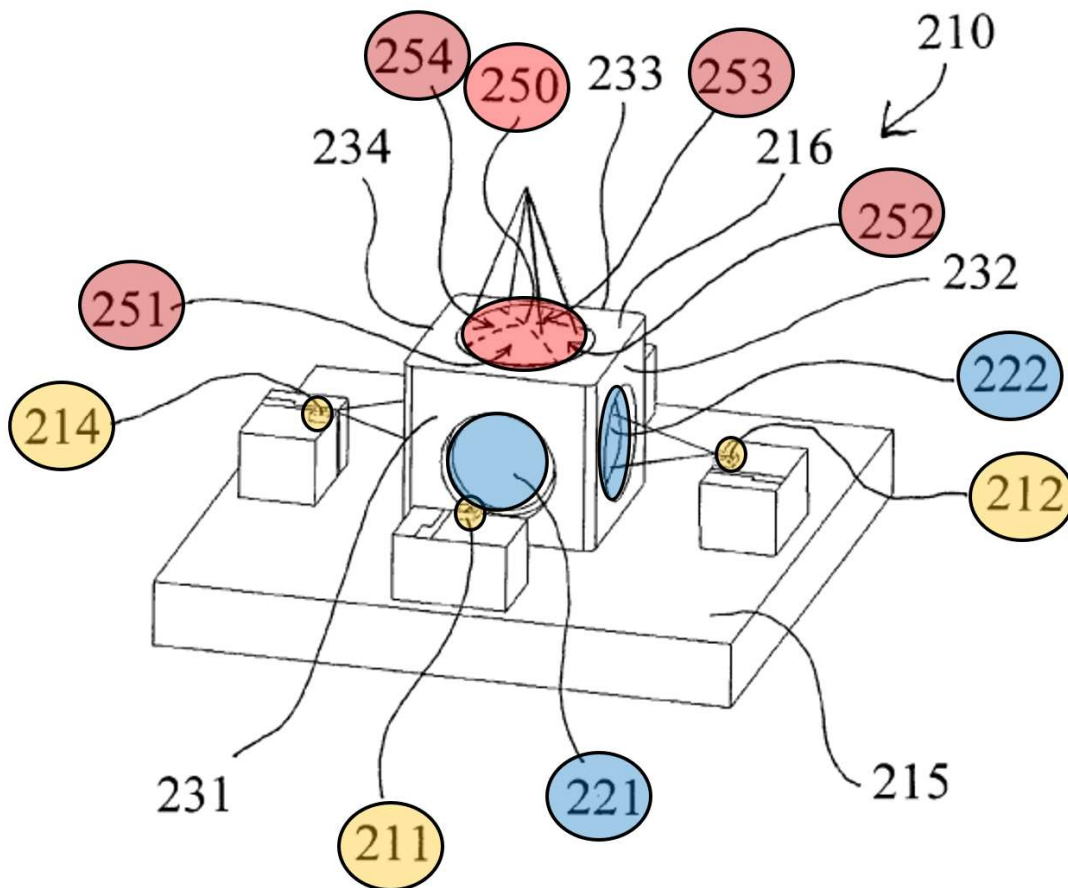
a plurality of n collimating lenses, said lenses being spaced apart and positioned to receive and collimate the output of said n laser output beams, said n laser output beams have n different output wavelengths, and focusing means for focusing said n collimated output beams onto a single spot at said stopped single optical fiber, said 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 of said focusing means whereby said n output beams having n different wavelengths are coupled into said single fiber.

Ex. 1001 at 5:23-40

Purported Advancement Over the Prior Art

- The '416 Patent distinguishes its device from the prior art (Lee) by explaining that it “uses a separate radial sector of the focusing lens to focus each separate laser output.”

Ex. 1001 at 1:65-67



- Four **lasers 211-214** direct their output beams towards **collimating lenses 221, 222**
- They direct the output towards **focusing lens 250**
- It has four pie-shaped **radial quadrants 251-254**
- The focused output of the lens can be directed, for example, into an optical fiber (not shown)

Ex. 1001 at 3:61-4:9

Four Different Embodiments

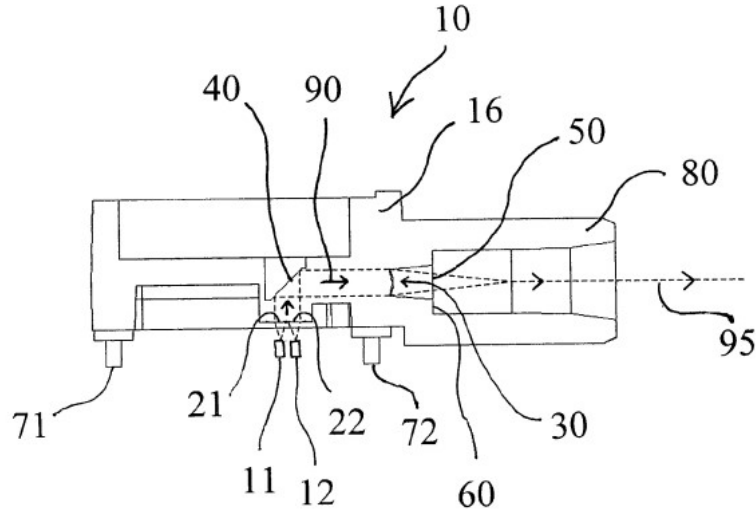


FIG. 1 (First Embodiment)

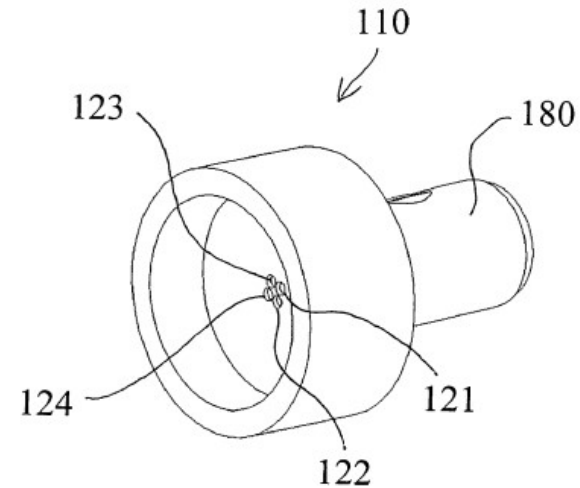


FIG. 5 (Second Embodiment)

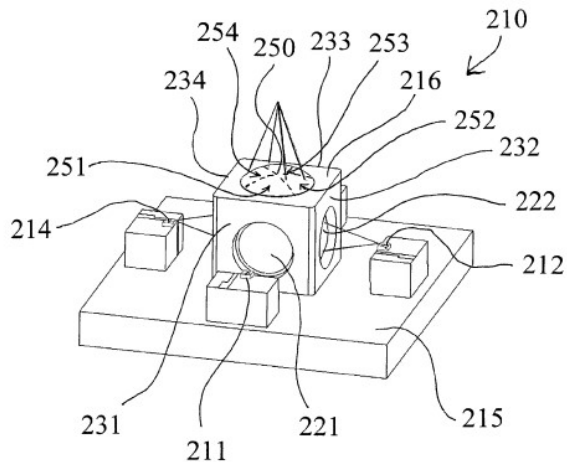


FIG. 7 (Third Embodiment)

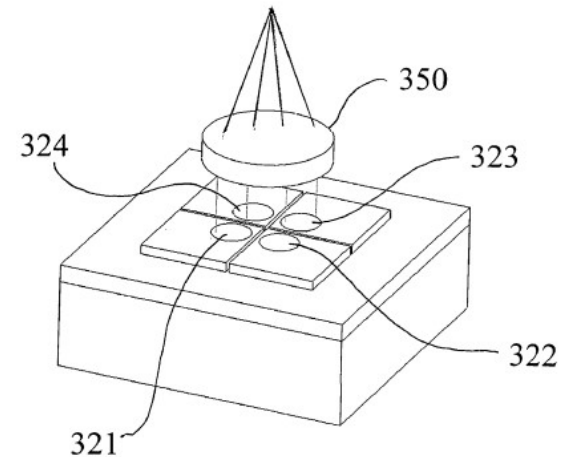


FIG. 10 (Fourth Embodiment)

Dependent Claims

2. The optical combiner of claim 1 wherein $n=4$ and wherein said four lasers and four collimating lenses are each formed in a two-dimensional, two by two array, wherein said focusing means is a single focusing lens, and wherein each radial sector is a pie-shaped quadrant.

3. The optical combiner of claim 2 wherein a prism is positioned between each of said collimating lenses and said focusing lens, and wherein said collimating lenses, said prism and said focusing lens are formed as a single, monolithic molded block.

6. The optical combiner of claim 1 wherein said optical combiner does not require the use of dielectric filters or waveguides.

Claim 7

7. An optical combiner usable in data communication systems for multiplexing the outputs of a plurality of lasers wherein each of said outputs has a different wavelength, for transmission into and through a stopped single optical fiber, comprising:

an array of four lasers, formed in a two-dimensional, two by two array, each of said lasers having an output beam with a different wavelength,

an array of four collimating lenses, said lenses being formed in a two-dimensional, two by two array and positioned to receive and collimate the output of said laser output beams, and

focusing means for focusing said collimated output beams onto a single spot at said stopped single optical fiber, said focusing means having four separate quadrants on its surface, and each of said four collimated beams passes through a separate one of said quadrants of said focusing means whereby said output beams of said four lasers are coupled into said single fiber.

Ex. 1001 at 6:19-39

Claim Construction

Claim Construction Disputes

Term	Patent Owner's Construction	Petitioner's Construction
"optical combiner"	"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"	"a device that combines multiple optical inputs into an output"
"stopped single optical fiber"	"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"	stopped means "fixed"

- *Patent Owner now agrees that the "focusing means" is a focusing lens*
- *Other portions of the preamble are not disputed with respect to the prior art*

“Optical Combiner” – Plain Meaning

“a device that combines multiple optical inputs into an output”

Intrinsic Evidence

1. An optical combiner 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, for transmission **into and through a stopped single optical fiber**, comprising:

Claim 1

ters requiring alignment or expensive waveguides. The combiner/WDM device described herein utilizes plastic-mold injection to create a compact device capable of **combining multiple optical signals into a single optical fiber**, and

Ex. 1001 at 1:46-51

This combiner device has the ability to **combine individual light signals into an optical path 90** that can be

Ex. 1001 at 3:19-21

“Optical Combiner” – Plain Meaning

“a device that combines multiple optical inputs into an output”

Extrinsic Evidence

An optical combiner, in the context of optics and display technologies, refers to a device or component that combines multiple optical signals or images into a single output. The purpose of an optical combiner is often to overlay or merge different images or information sources, creating a unified visual experience. Optical combiners are commonly used in various applications, including augmented reality and head-up display systems.

Ex. 1019 (Photonics Dictionary)

https://www.photonics.com/EDU/optical_combiner/d5774). This definition is in agreement with the one I have provided, and it is consistent generally with how the term is used in the relevant field, and how it was used by a POSITA as of the priority date of the '416 Patent.

Ex. 1016, ¶ 14 (Willner)

“Optical Combiner” – No Clear Redefinition

The '416 Patent uses permissive language with respect to integration and alignment

expensive waveguides. While 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, and may be necessary to achieve certain environmental conditions.

Ex. 1001 at 1:51-55

Passive Alignment All of the optical components within the multiplexer could utilize passive alignment mechanisms.

Monolithic Coupling Optics Each optical coupling and redirection component is integrated within a single monolithic plastic-molded device in most embodiments.

Ex. 1001 at 4:58-63

**** No words or expressions of manifest exclusion or restriction ****

Paper 24, p. 7; see also Liebel-Flarsheim Company v. Medrad, Inc., 358 F.3d 898, 906 (Fed. Cir. 2004)

(DEMONSTRATIVE EXHIBIT - NOT EVIDENCE)

Statements Regarding “The Invention”

Patent Owner *selectively* parses the specification’s discussion of “the invention,” which undercuts its position

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. The invention includes optional passive alignment pins molded into the combiner.

Ex. 1001 at 2:11-16

ters requiring alignment or expensive waveguides. The combiner/WDM device described herein utilizes plastic-mold injection to create a compact device capable of com-

Ex. 1001 at 1:46-48

- Other Examples:

- 1:51-55 (“molded device”), 3:32-34 (“plastic molded”), 3:39-44 (“plastic molded”), 4:61-63 (“plastic-molded device”).

“Stopped” Means “Fixed”

<u>Term</u>	<u>Patent Owner’s Construction</u>
“stopped single optical fiber”	“a single optical fiber <i>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</i> ”

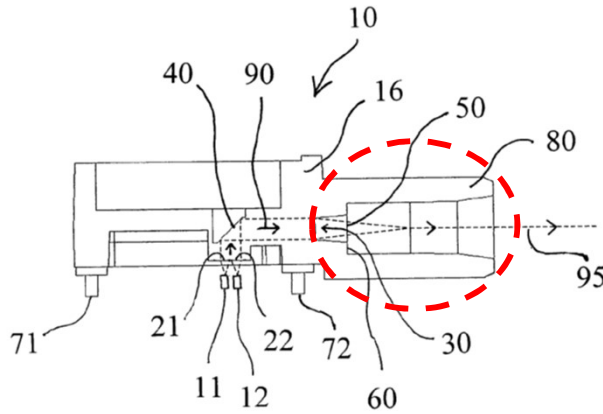
As explained in the Institution Decision:

pre-aligned connector” (*id.* at 3:17–18). The ’416 patent’s Figure 1 appears to indicate that the fiber optic cable’s connector can be inserted into the integrated ferrule (80) until it reaches the fiber stop or seat (60). The ’416 patent’s specification, however, does not appear to limit the claim term “stopped single optical fiber” 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 that enable the collimated output beam to be focused onto a single spot on the optical fiber. In

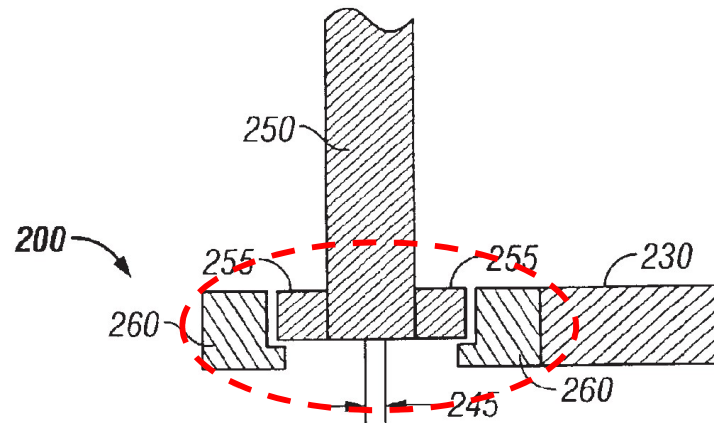
During trial the parties can further address the meaning of “stopped single optical fiber” and address methods for stopping an optical fiber.

Paper 15, p. 11; see also Paper 24, p. 8

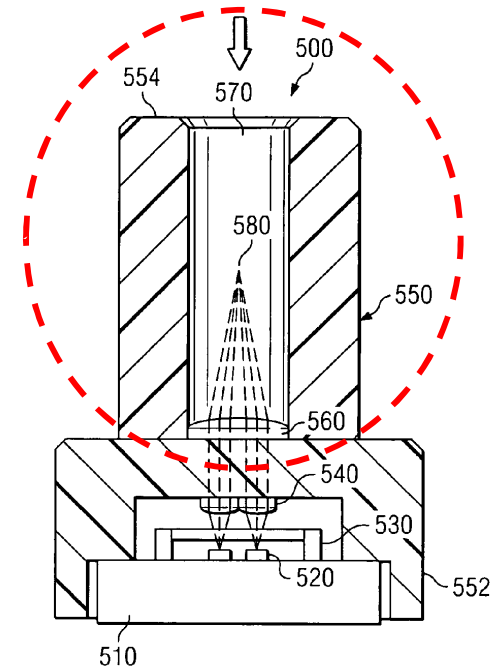
Known Methods for Stopping Optical Fibers



Ex. 1001, FIG. 1



Ex. 1006, FIG. 2



Ex. 1013, FIG. 5

etching might be used to fix a fiber.”). Examples of such other methods of stopping or fixing the optical fiber include clamping and v-grooves, among other possibilities.

Ex. 1016, ¶¶ 53-56 (Willner)

“Stopped” – Patent Owner’s Further Narrowing

Dr. Lebbby:

“receptacle 260 in Lemoff’s **Figure 2** certainly **has a stop**”(Ex. 1018, 272:18-273:21)

“I would agree with you that **the fiber is stopped on 260**...” (Ex. 1018, 260:15-17)

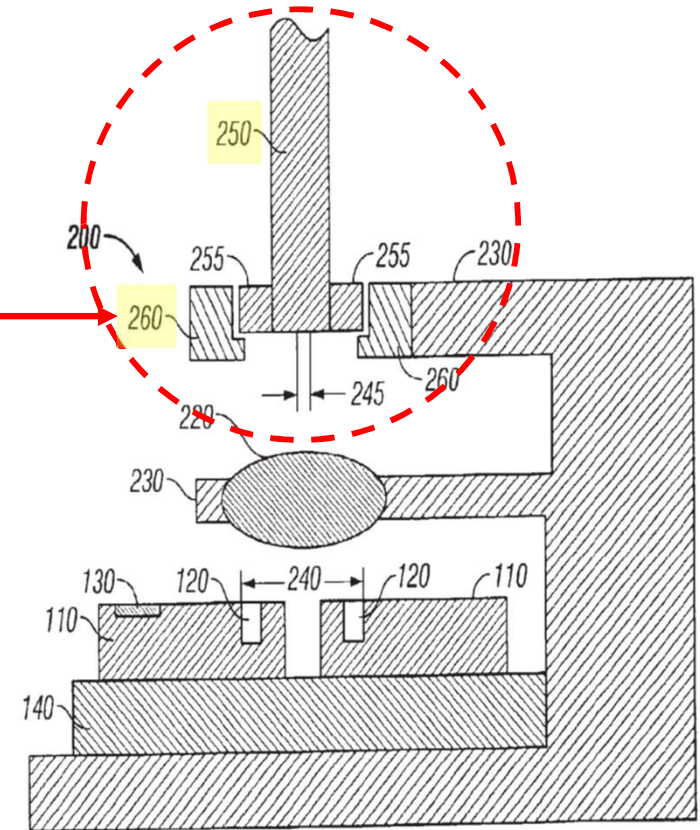
However, Patent Owner argues:

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.



Ex. 1006, FIG. 2 (Lemoff)

Paper 18, p. 49

Paper 24, pp. 8-9

“Stopped” Means “Fixed”

What matters is that the “stopped optical fiber” is stopped, or “fixed”

What matters is that the light beams are focused to a single spot, not that the connector in which an optical fiber is inserted has any particular form. The connector described with respect to the first embodiment could be used here, but so could other connectors known in the art. The '416 Patent does not limit the connector that may be used in these embodiments to achieve a “stopped single optical fiber.”

Ex. 1016, ¶ 52 (Willner)

to be fixed in place. An optical fiber being spatially fixed was well known to be important in optical systems since light needed to be coupled into a very small waveguiding fiber core, and any non-negligible movement could cause significant optical power loss and performance degradation. A “stopped” single optical fiber would not be free or otherwise able to significantly move about.

Ex. 1003, ¶ 118 (Willner)

Patent Owner’s dictionary definition:

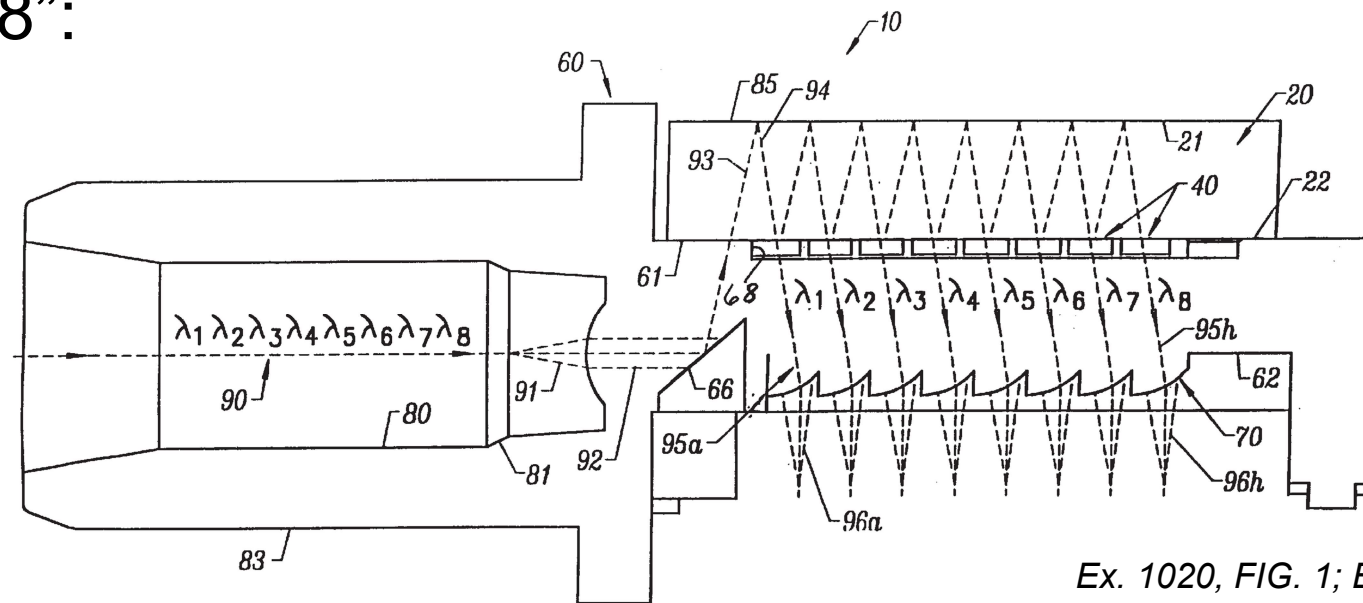
“Stopped” means “to arrest the progress or motion of; cause to halt.” (Ex. 2004, p. 1161)

Paper 24, p. 9; Paper 18, p. 30; Paper 1, pp. 13-14

(DEMONSTRATIVE EXHIBIT - NOT EVIDENCE)

Grann Patents and Ray Testimony

- When designing the '416 Patent's optical combiner, the inventors decided to re-use the “pre-existing mechanical design” for a housing that was “used in U.S. Patent Number 6,396,978”:



Ex. 1020, FIG. 1; Ex. 2018, FIG. 1

A This type of a ferrule would be standard,
yes.

A Yes. Those ferrules are common.

Grann Patents and Ray Testimony

More particularly, this invention relates to an optical multiplexing device with **passively aligned molded optics** which

Ex. 2018, 1:8-11

One of the key features and a primary object of the present invention is to provide a **compact and cost effective optical multiplexer** and demultiplexer for both single-mode or multi-mode fiber optic communication systems wherein the device includes preformed and premolded passively aligned optics.

Ex. 2018, 2:51-56

Another feature 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.

Ex. 2018, 2:65-67

The molded coupling module **60** in the embodiment illustrated in FIG. 1 includes a fiber optic cable **receptacle 80** **integrally molded** therein for receiving the end of a fiber optic cable (not shown) so that the end of the cable engages **receptacle seat 81**.

Ex. 2018, 3:66-4:3

Summary of Grounds

The Grounds

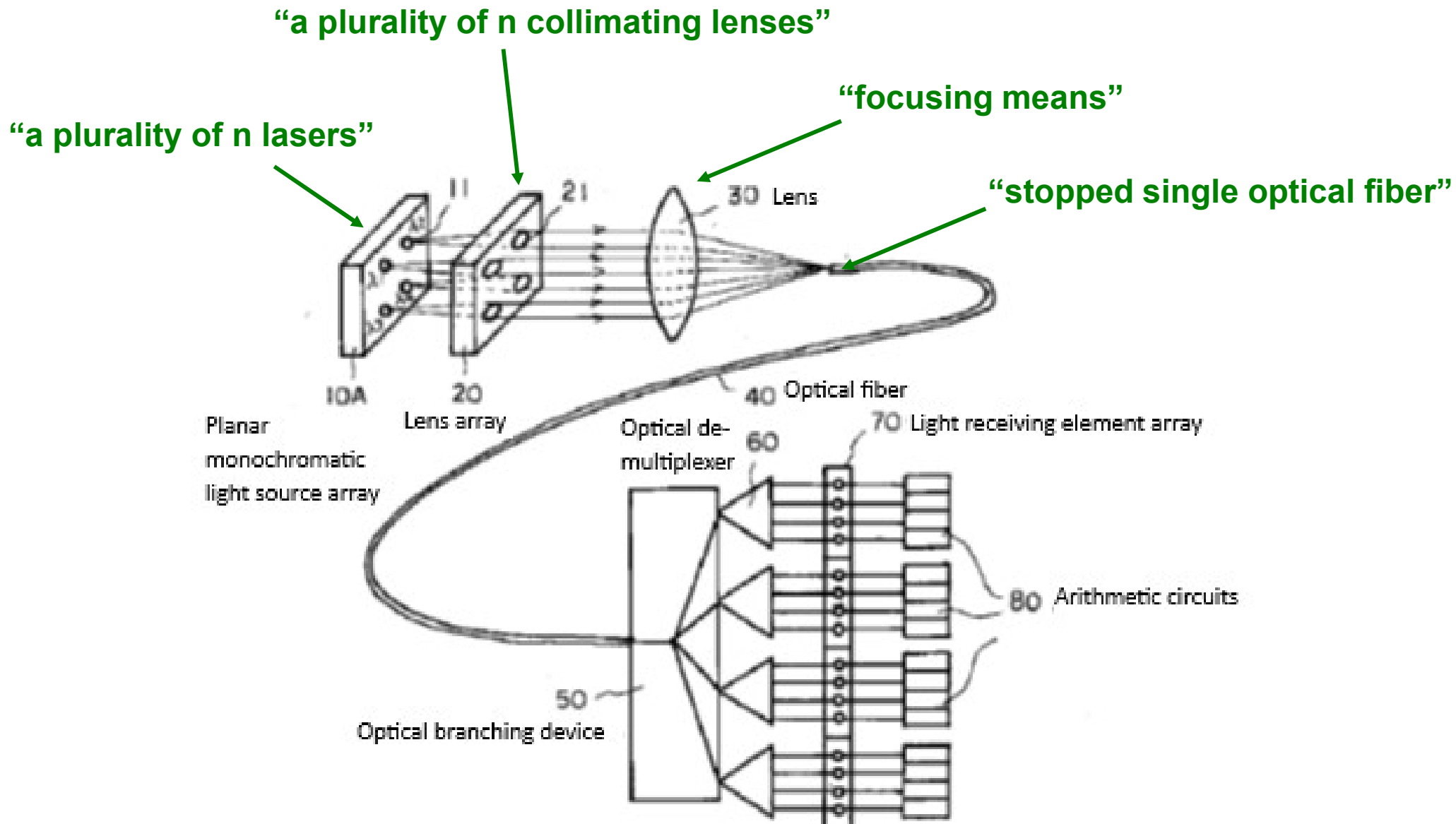
- All grounds based on obviousness (§103)

<u>Ground</u>	<u>Reference(s)</u>	<u>Basis</u>	<u>Claim(s)</u>
Ground 1	Kurita	§ 103	1, 2, 6, 7, and 9
Ground 2	Kurita in view of Lemoff and/or LaMarche	§ 103	1, 2, 6, 7, and 9
Ground 3	Lemoff	§ 103	1, 2, 6, 7, and 9
Ground 4	Lemoff in view of LaMarche	§ 103	1, 2, 6, 7, and 9
Ground 5	Bhandarkar	§ 103	1, 2, 6, 7, and 9

Ground 1

Obvious over Kurita

Kurita's Optical Combiner



Ex. 1004 (Kurita), FIG. 3; Paper 1, pp. 18-24

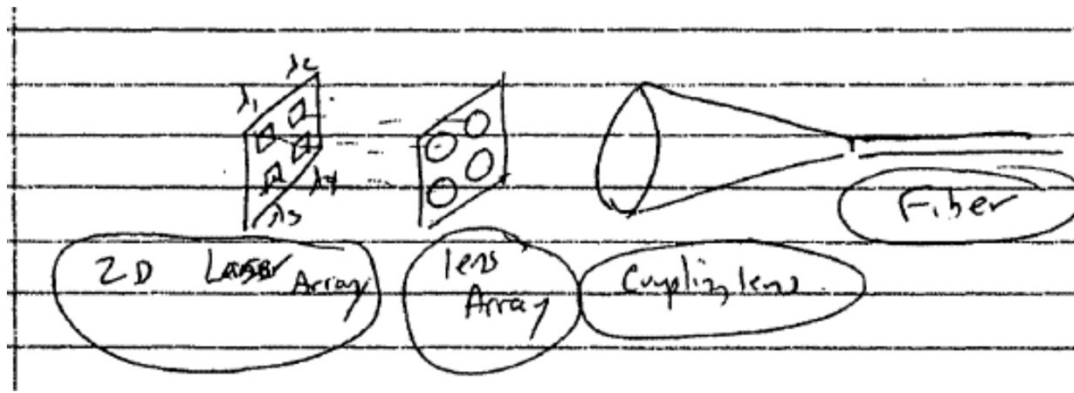
(DEMONSTRATIVE EXHIBIT - NOT EVIDENCE)

Limited Disputes Under Petitioner's Constructions

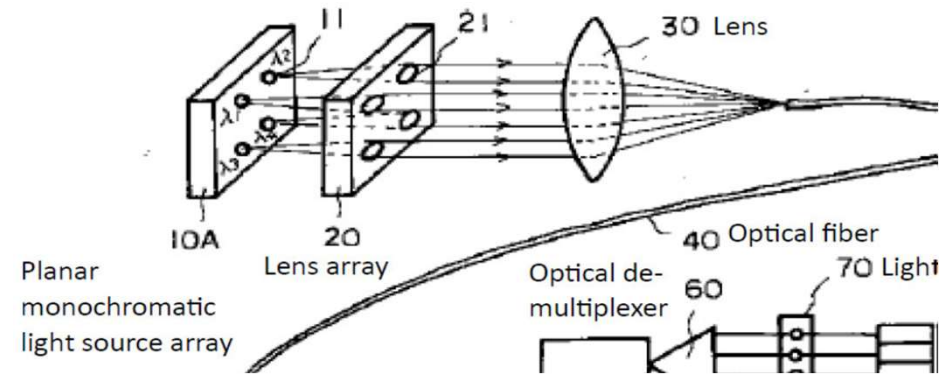
Claim Element	Dispute?
[1.0] An optical combiner	No dispute
[1.1] usable in data communication systems for multiplexing the outputs of a plurality of n lasers wherein each of said n outputs has a different output wavelength, [1.2] for transmission into and through a stopped single optical fiber, comprising:	No dispute
[1.3] a plurality of n collimating lenses, [1.4] said lenses being spaced apart and positioned to receive and collimate the output of said n laser output beams, said n laser output beams have n different output wavelengths, and	No dispute
[1.5] focusing means for focusing said n collimated output beams onto a single spot at said stopped single optical fiber,	No dispute
[1.6] said 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 of said focusing means whereby said n output beams having n different wavelengths are coupled into said single fiber.	Disputed

- *No disputes unique to dependent claims or claim 7*

Same Design as Lab Notebooks



Ex. 1002 at 36 (Inventor Notebook)

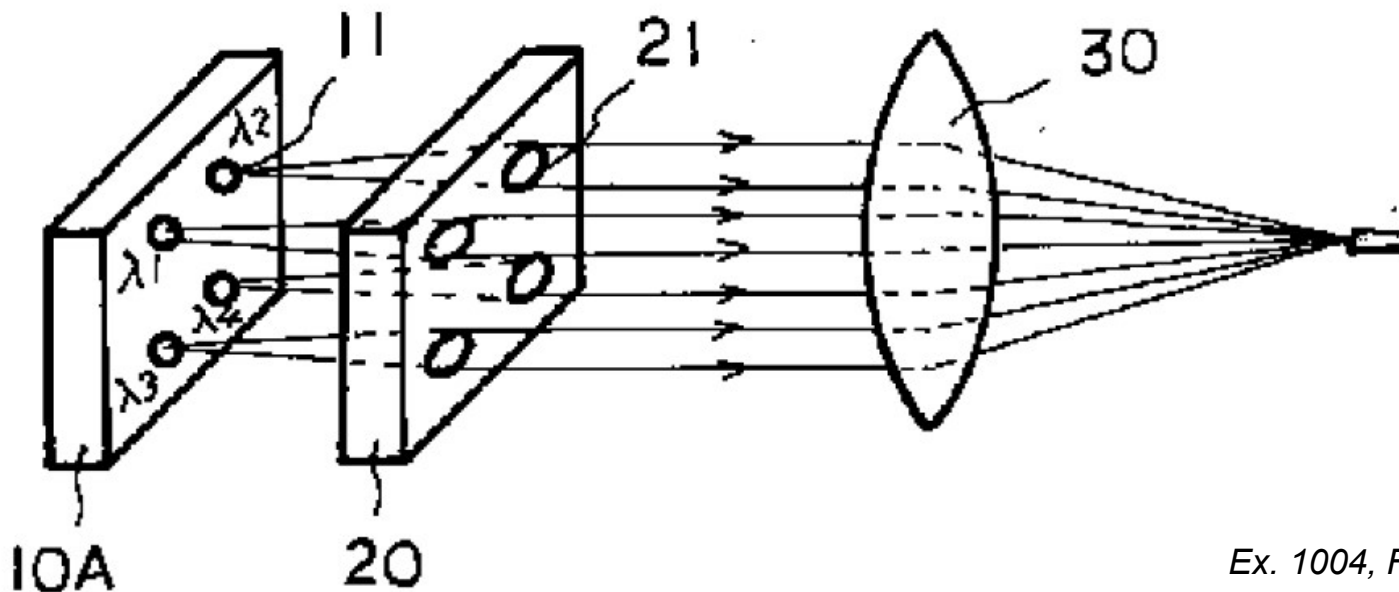


Ex. 1004, FIG. 3 (Kurita)

- Explaining the diagrams from the lab notebooks, Mr. Ray noted that the collimated beams would impinge on the focusing lens “in the same pattern as what you see on the lens array.” (Ex. 1017, 51:2-52:31)
 - Ex. 1017, 51:22-53:10 (Mr. Ray explaining it would be “obvious” that the four collimated beams would be in separate quadrants on the focusing lens);
 - EX1018, 156:9-157:8 (Dr. Lebby stating this is “certainly a radial design”)

“Separate Radial Sectors”

- Kurita teaches the same two-by-two layout of the laser array and collimating lenses, next to the focusing lens, as the '416 Patent.
 - ***The “separate radial sectors” requirement follows directly from this layout***
 - Because the collimated beams output from the collimating lenses form a pattern on the focusing lens based on their arrangement, the two-by-two arrangement in Kurita results in separate quadrants (radial sectors) of the focusing lens being impinged by each collimated beam.

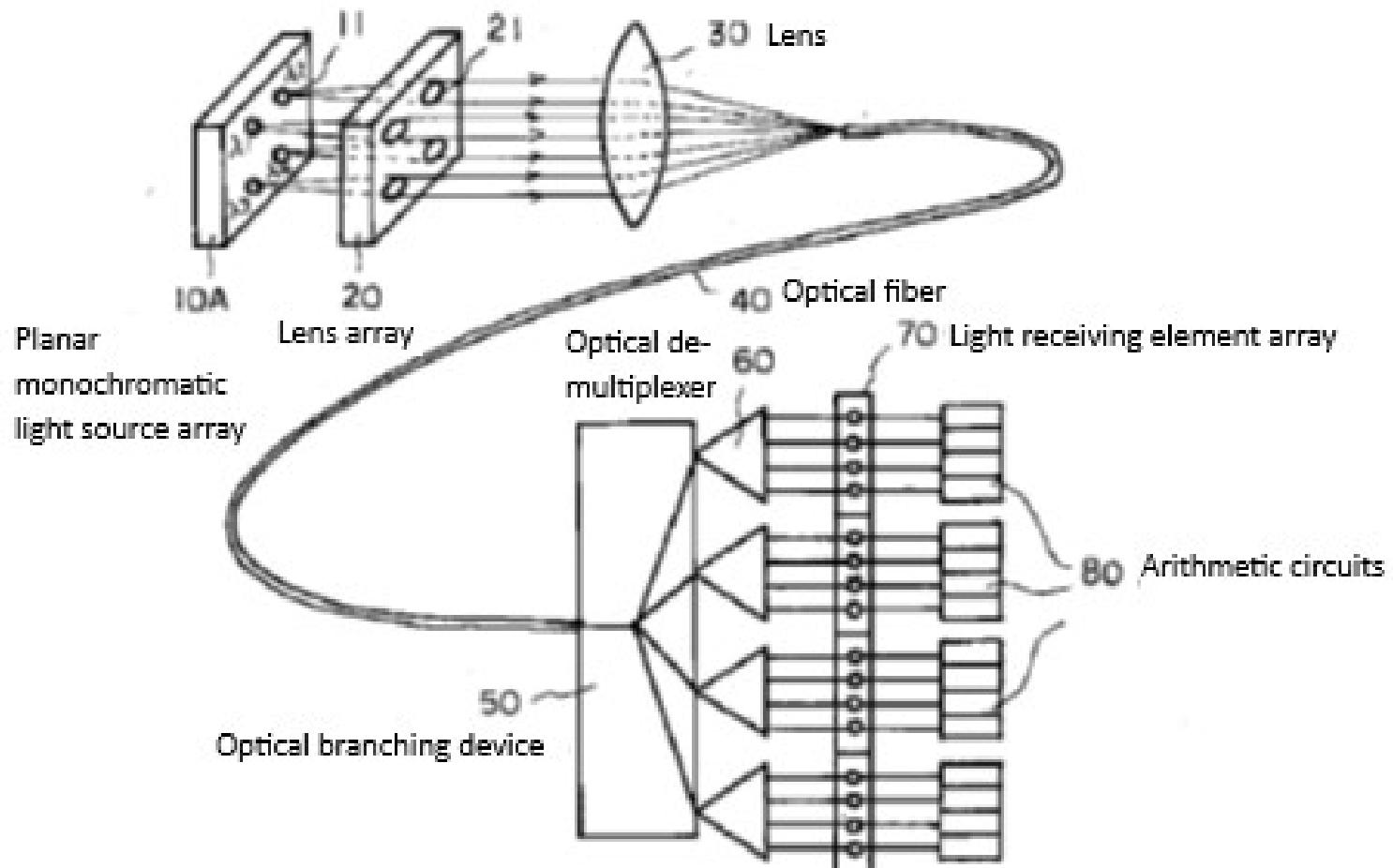


Ex. 1004, FIG. 3 (cropped)

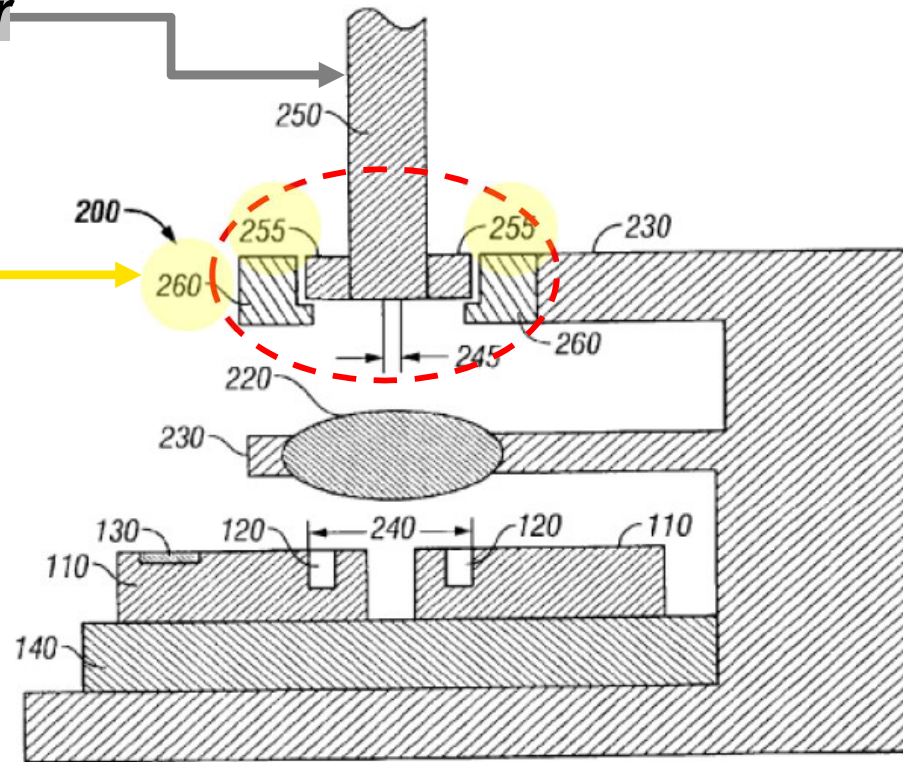
Ground 2

Obvious over Kurita
in view of Lemoff and/or LaMarche

As in Ground 1



receptacle and ferrule arrangement for securing an optical fiber



- To the extent that Kurita does not teach or suggest a “stopped optical fiber,” the receptacle and ferrule arrangement of Lemoff satisfies this claim requirement.
- Integrated, pre-aligned connectors were known; it was in a POSITA’s toolbox to use them; and this is taught by Lemoff.

Ex. 1006 (Lemoff) at FIG. 2; Paper 1, pp. 27-28; Paper 18, pp. 17-18

Kurita and Lemoff Would Have Been Combined

- Lemoff's teachings of a ***receptacle and ferrule arrangement for securing an optical fiber*** are combined with Kurita's light connection element (Ground 2)
 - Motivation = Securing the optical fiber would improve the coupling efficiency, as it would help ensure the light would be focused into the optical fiber. See Ex. 1003, §VIII(C)(iii).
 - Motivation = Lemoff teaches that the receptacle and ferrule arrangement form a connector that supports improved installation and maintenance of the optical device and allows optical fibers to be plugged into or out of the optical device based on changing circumstances. See Ex. 1006, 5:63-6:2.
- Purported size differences do not make references incompatible
 - Kurita is silent with respect to size – entire argument is premised on (incorrect) assumption that Kurita can only be implemented on a workbench.
- Lemoff **does not** discourage using optical wavelength multiplexers
 - Rather than using an *external* optical multiplexer, Lemoff instead teaches an optical multiplexer that is part of the emitter (e.g., optical signal emitter 200 of FIG. 2).

Lemoff is Wavelength Division Multiplexing (WDM)

- As explained by Dr. Willner, “Lemoff teaches... package[ing] together the light source (lasers) and other components (such as optical imaging element 220).” See Ex. 1016, ¶¶ 107-114.

The invention provides a multi-channel optical signal emitter for a wavelength division multiplexed (WDM) communication system that combines multiple signal components into a multi-channel optical signal without using an optical multiplexer or other device external to the emitter.

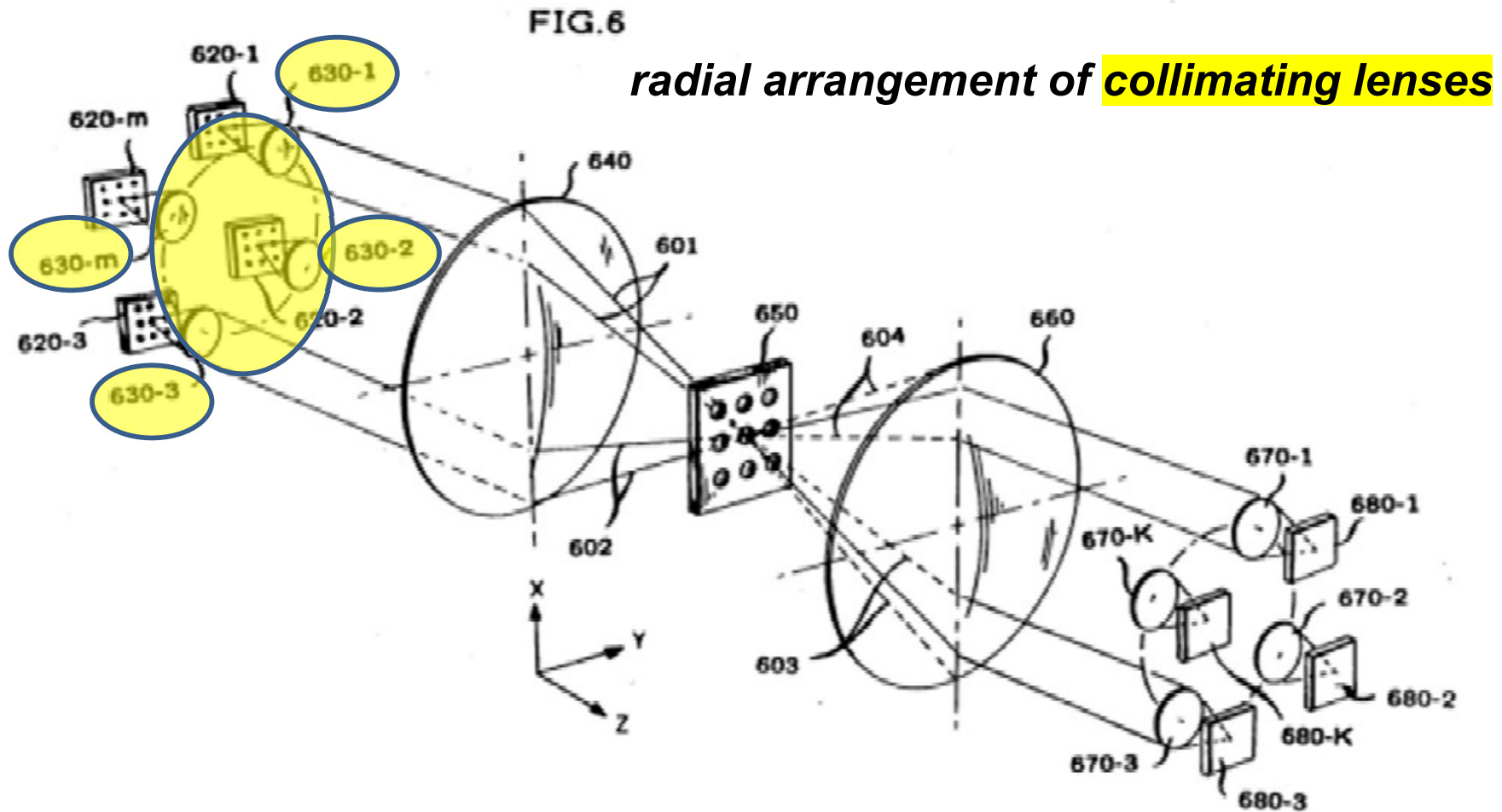
Ex. 1006, 1:51-56

An optical signal emitter for a multi-channel, wavelength division multiplexed (WDM) optical communication system is disclosed. This optical signal emitter does not require an optical multiplexer, or other device, to combine components of an optical signal. Semiconductor die attached to a sub-

Ex. 1006, Abstract

This drawback to the use of WDM is particularly problematic in applications requiring only relatively short distance links. Such applications of optical communication systems are typically more cost sensitive than other applications. If a complex optical multiplexer is required then an optical communication system may not be cost effective for such links.

Ex. 1006, 1:42-48



Ex. 1005 (LaMarche) at FIG. 6; Paper 1 at pp. 26-27

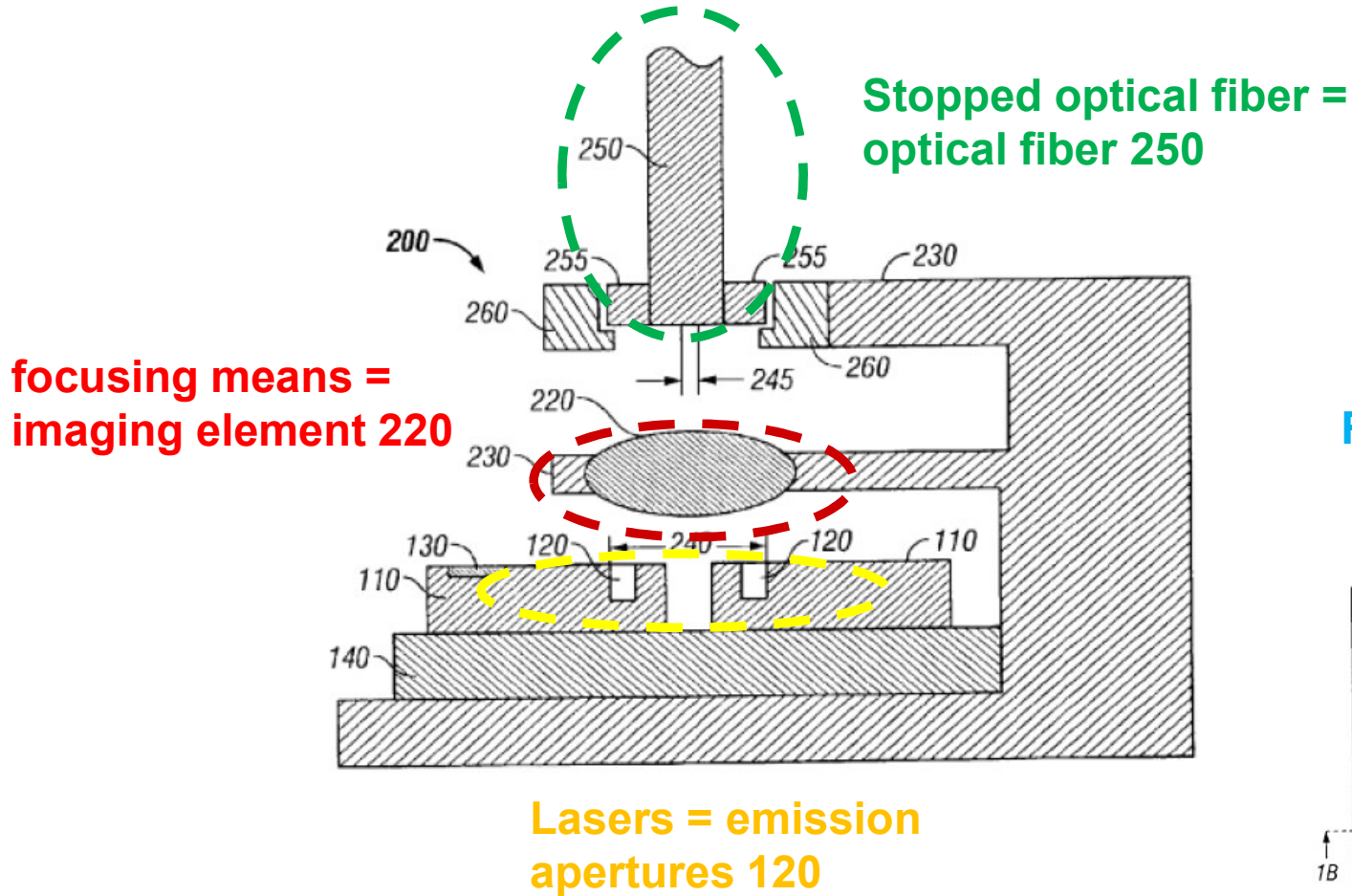
(DEMONSTRATIVE EXHIBIT - NOT EVIDENCE)

Kurita and LaMarche are combinable

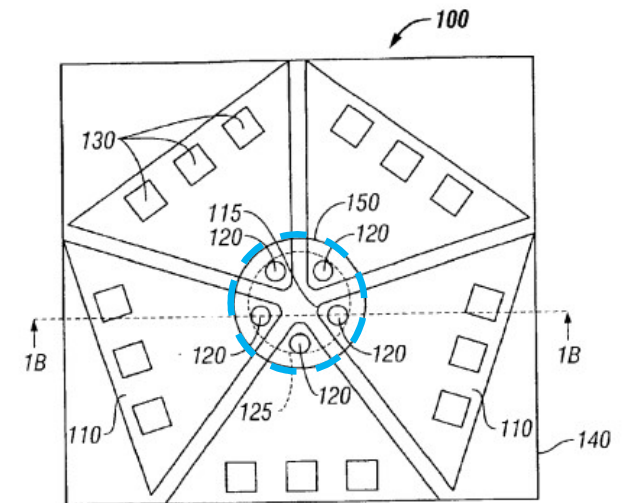
- LaMarche is analogous art
 - References are in the same field (i.e., optical technologies)
 - Each teach optical devices utilizing similar components, such as light sources, collimating lenses, and a focusing lens
- Argument that this combination is complex, or would require extensive reconfigurations of the devices, ignores the actual combinations used in the Petition
- No requirement of “bodily incorporation”

Grounds 3 and 4

Obvious in view of Lemoff
Alone or in Combination with LaMarche



Radial arrangement of light sources (120)

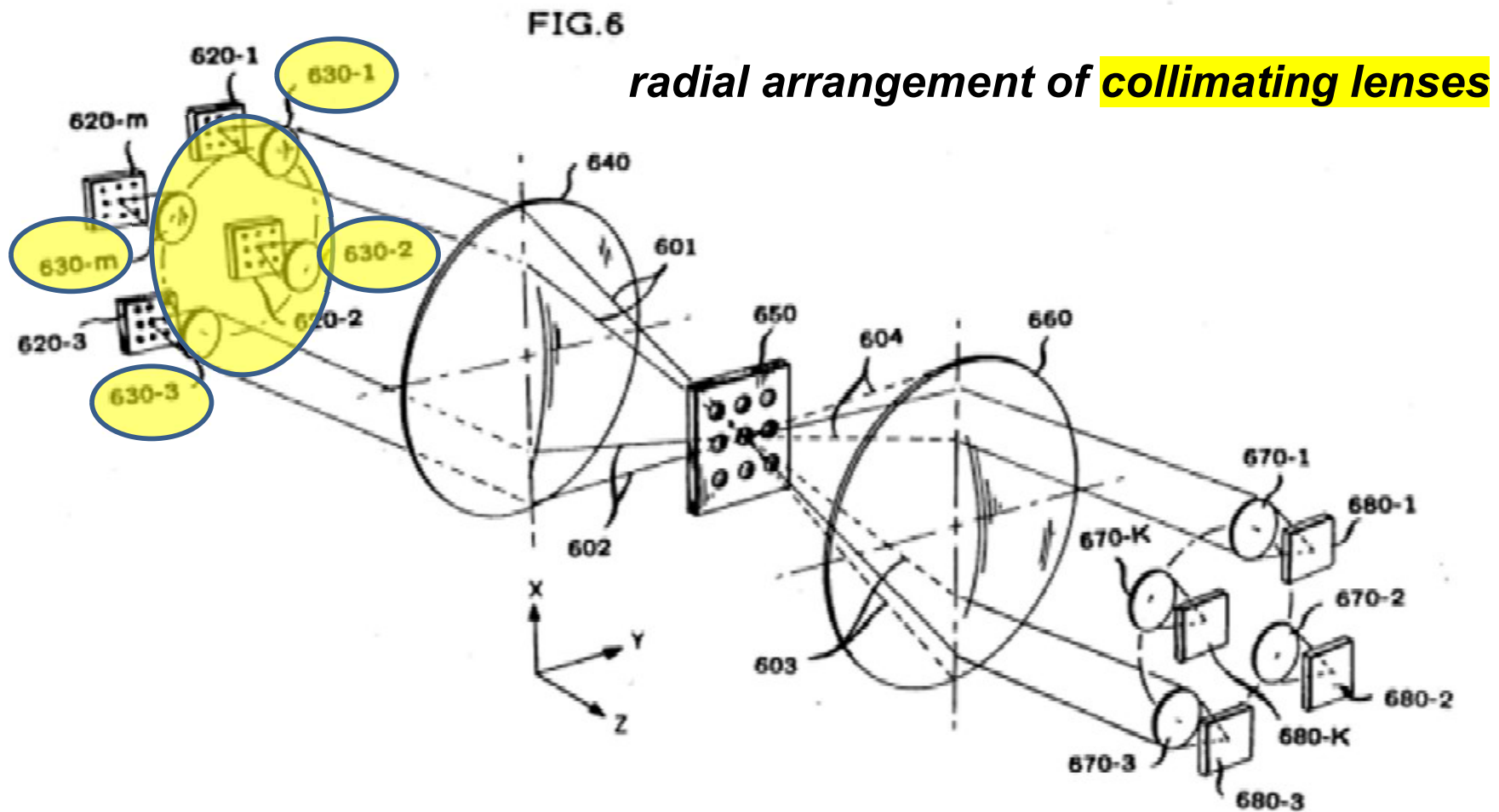


Ex. 1006 (Lemoff), FIG. 2 and FIG. 1A; Paper 1, pp. 36-47

(DEMONSTRATIVE EXHIBIT - NOT EVIDENCE)

Lemoff Suggests Collimating Lenses as Claimed

- The optical imaging element 220 may include “any arrangement of **one or more optical components** functioning to image the optical signal components from the signal-emitting area onto the signal-receiving area.” Ex. 1006, 6:16-23.
- A POSITA would have been motivated to include as part of the “one or more optical components” of optical imaging element 220 “a plurality of *n* collimating lenses.” Ex. 1003, ¶¶ 256-261 (Willner).
- The use of collimating lenses in conjunction with a focusing lens was well known to a POSITA, and in particular, was known to be advantageous, e.g., in terms of coupling efficiency. Ex. 1003, ¶ 257; see *also id.*, Section VI(C) (describing background technology).



Ex. 1005 (LaMarche) at FIG. 6; Paper 1 at pp. 26-27

(DEMONSTRATIVE EXHIBIT - NOT EVIDENCE)

Combination

- LaMarche's teachings of a ***radial arrangement of collimating lenses*** combined with Lemoff's optical signal emitter
 - Motivation = improved coupling efficiency, reduced physical complexity, and has other advantages such as being able to achieve high-bandwidth connections. See Ex. 1005, 1:11-2:20 and 2:17-23; Ex. 1003, §VIII(C)(i).
 - Lemoff teaches that you would want efficient coupling. Ex. 1006, 4:66-5:2.
 - Lemoff teaches that the optical imaging element 220 may include “**any arrangement of one or more optical components** functioning to image the optical signal components from the signal-emitting area onto the signal-receiving area.” Ex. 1006, 6:16-23.

Lemoff and LaMarche Would Have Been Combined

- LaMarche is analogous art
 - References are in the same field (i.e., optical technologies)
 - Each teach optical devices utilizing similar components, such as light sources, collimating lenses, and a focusing lens
- Argument that this combination is complex, or would require extensive reconfigurations of the devices, ignores the actual combinations used in the Petition
- No requirement of “bodily incorporation”
- Degree of modification is simple
 - Collimating lenses well known in art and taught by LaMarche
 - Lemoff already teaches imaging lens 220 can be multiple optical components

Claims Invalid Even Under Patent Owner's Constructions

Passive Alignment, Integrated Packaging Obvious

- Passive alignment and integration were well known tools.
 - Known from Lemoff and Bhandarkar
 - Known from prior Grann patents and admitted state of the art
 - Dr. Lebby admits that these are known tools with known advantages
- Connector for stopping an optical fiber was well known tool.
 - Known from Lemoff and Bhandarkar
 - Known from prior Grann patents and admitted state of the art
 - Obvious choice for fixing the fiber to make sure it is not free floating in space
 - Obvious to try
 - Connectors for an optical combiner can be chosen based on a given application
 - Connectors are also commonly standardized
 - A finite number of available connectors that are interchangeable

Ex. 1016, ¶ 80 (Willner)

Passive Alignment, Integrated Packaging Obvious

■ Ground 1

- Integrated, passively aligned components are less costly and labor intensive compared to active alignment, and would have been valuable in commercial implementation. Ex. 1016, ¶¶ 65-67 (Willner).
- Passive alignment important for commercial applications – saves a lot of time and cost – want to avoid “as much as possible” optical bench scenarios. Ex. 1018, 84:13-15; 84:16-22; 85:1-4 (Lebby).
- Easy to make Kurita integrated, passively aligned, and have a stop.

■ Ground 2

- As above – and Lemoff has integrated, passively aligned housing with a stop.

■ Grounds 3 and 4

- As above – and Lemoff has integrated, passively aligned housing with a stop.

Summary of Lebbly Admissions (Ex. 1018)

- Lemoff has a stopped optical fiber:
 - “[R]eceptacle 260 in Lemoff's Figure 2 certainly has a stop” (272:18-22)
 - “[Lemoff's] fiber is stopped on 260....” (260:15-17)
- Passive alignment has known advantages:
 - “And if you want to have something practical for commercial applications, you want to use passive alignment.” (84:13-15)
 - Passive alignment “saves a lot of time and it saves a lot of cost” (84:16-22)
 - “[Y]ou want to, as much as possible, avoid the optical bench scenarios....”. (85:1-4)
 - “[A] [POSITA] could actually apply ... passive alignment to Kurita.” (280:14-16)
 - “[P]assive alignment, as well as active alignment, was certainly aware as tools to try and help engineers design systems that use optics and light.” (32:10-15)

Ground 5

Bhandarkar and No Swear-Behind

Nothing Changed Since Institution

Institution Decision:

Inc., 261 F.3d 1356, 1369 (Fed. Cir. 2001). Thus, Patent Owner 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.

Patent Owner has provided some evidence to show diligence from November 10, 2003 to January 15, 2004, but Patent Owner has not explained why, under the facts of this case, the evidence is sufficient to establish reasonably continuous diligence for the period before Bhandarkar's effective filing date to the date of constructive reduction to practice.

- *Patent Owner did not identify new activities during the critical period that would constitute reasonably continuous diligence.*
- *Patent Owner continues to rely exclusively on inventor prior art searching for the entirety of the 60-day period from November 10, 2003 to January 9, 2004.*

Background Regarding Priority Date

■ Summary of Patent Owner's Diligence Evidence

- July 18-22, 2003: Initial modeling
- **August-September, 2003**: Initial prior art searches
- **October 7-16, 2003**: Modeling, first draft of invention disclosure, and inventor meeting
- October 24-November 10, 2023: Second draft of invention disclosure and an inventor meeting re prior art
- **November 10, 2003-January 15, 2004**: "Inventors update prior art searches"
- January 9-29, 2004: Revise models, inventor meeting, and finalize invention disclosure
- January 27-February 4, 2024: Attorney receives invention disclosure, prepares application, and files

■ Date of Bhandarkar reference – September 28, 2004

Paper 18, pp. 76-81; Paper 24, pp. 22-27; Ex. 1013 (Bhandarkar)

(DEMONSTRATIVE EXHIBIT - NOT EVIDENCE)

Prior Art Searching – A Lack of Diligence

19. Following the November meeting, I conducted prior art searches **several days** from November 10, 2003, through January 15, 2004. My prior art

Ex. 2046, ¶ 19

- Patent Owner does not allege that other work was done during this period
- Patent Owner glosses over first prior art search (August-September)
 - Four months of prior art searching in total
 - *First search result was just list of patents copied from an earlier patent, issued in 2001*
- **How was the search used?**
 - No changes to the “Problem the Invention Overcomes,” “Description of the Related Art,” or “Unique Features” sections in the next draft of the invention disclosures
 - *No reference to the identified patents in the provisional application filed in February 2004 – the “Description of Related Art” was identical to the draft from October 16, 2003.*

Drafts of Disclosures Show Lack of Diligence

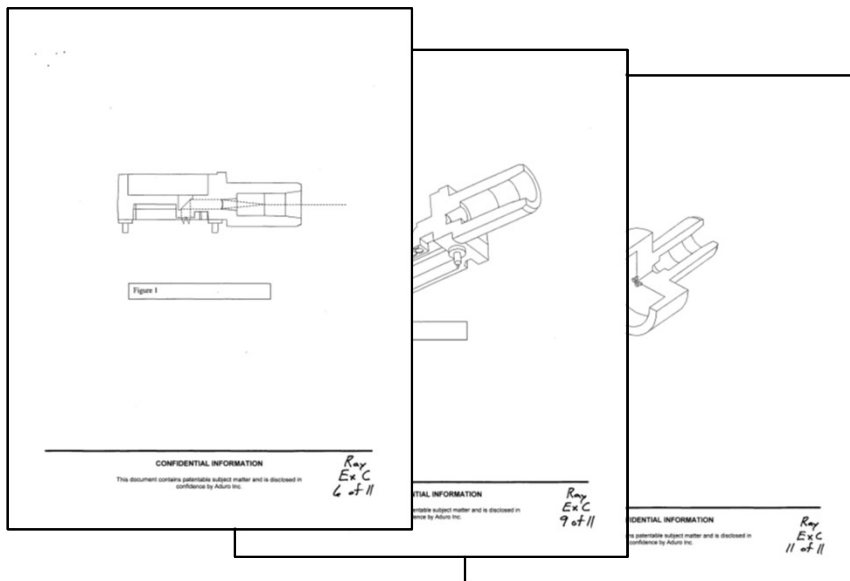
- The lack of progress towards a constructive reduction to practice is evident from the three drafts of the invention disclosures.
 - Ex. 1002 at 84-94 (first draft), 95-105 (second draft), 106-116 (third draft)
- Nearly all of the disclosures were completed by the first draft - October 16, 2003
 - The November 10th and January 27th revisions were little more than rephrasing terms and adding a few lines of description

***The October 16th draft included all of the figures
used in the provisional application***

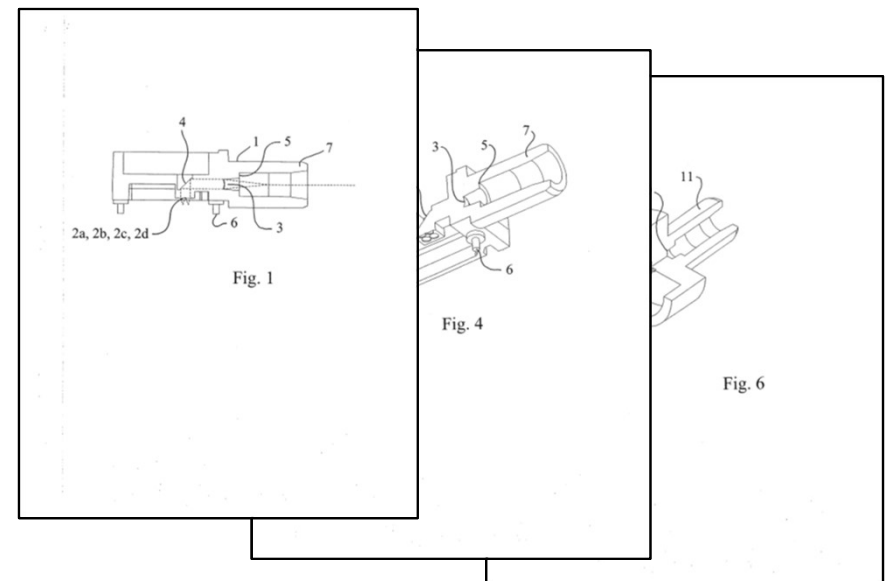
The “Modeling” Does not Show Diligence

Patent Owner did not identify any specific work or corroborating evidence relating to modeling performed in the November 10, 2003 to January 9, 2004 window

- “The [models] were generated on July 17, 2003 and are essentially the same images that were carried forward into the '475 patent application....” (Ex. 1002 at 75)
- The computer-generated models from October 2003 were identical to those used in the provisional application



Ex. 1002, 89-94 (October)



Ex. 1009, pp. 2-6 (February)

APPENDIX

Swear-Behind Cases

- To establish that “[p]rior art searching is sufficient activity for diligence,” Patent Owner relies on two cases: *Correge v. Murphy*, 705 F.2d 1326 (Fed. Cir. 1983) and *In re Enhanced Sec. Research., LLC*, 739 F.3d 1347 (Fed. Cir. 2014).
- *Correge*:
 - Post-reduction abandonment (a prototype was completed 1.5 years before filing)
 - After the prototype was finalized, a prior art search was approved, the inventor “responded to the search results,” and two months later the invention was disclosed.
 - These activities were sufficient to “rebut any inference ... of abandonment.”
 - ***Correge* does not address prior art searching performed by inventors, or diligence towards a constructive reduction to practice** – it does not address any activities occurring before reduction to practice. See *id.* at 1328 (“Without an actual reduction to practice there is no invention in existence which can be abandoned.”).
- *ESR*:
 - Relates to the diligence of an attorney
 - Prior art searching is addressed only in passing, and the Court held that the **attorney was not diligent**.
 - Does not support argument that prior art searching by an inventor, without other activities, is a legally-recognized or sufficient form of diligence.

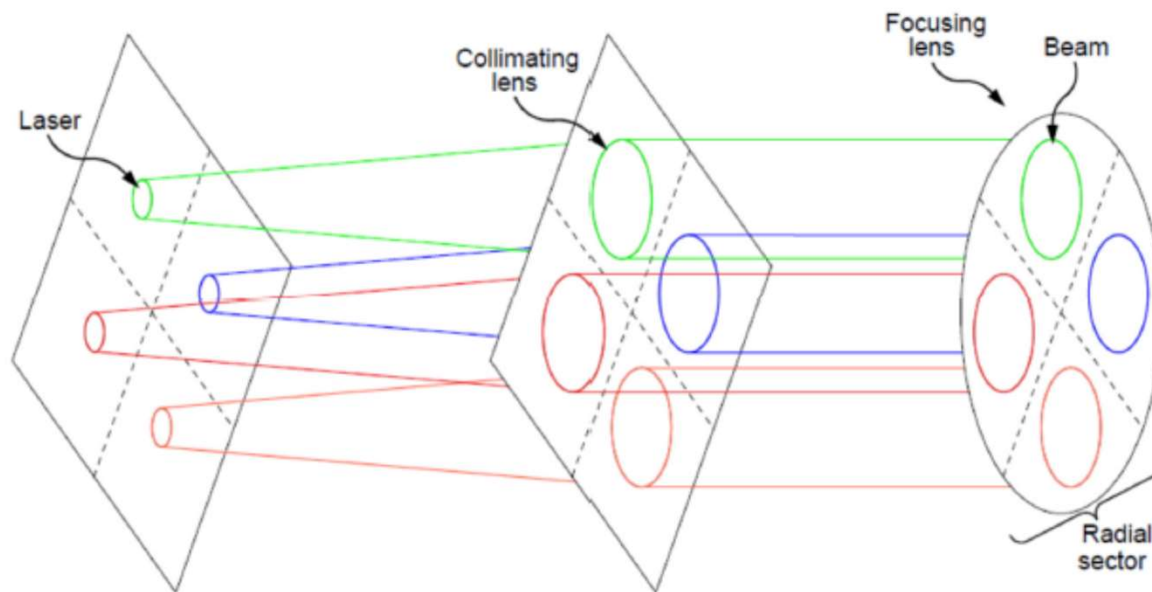
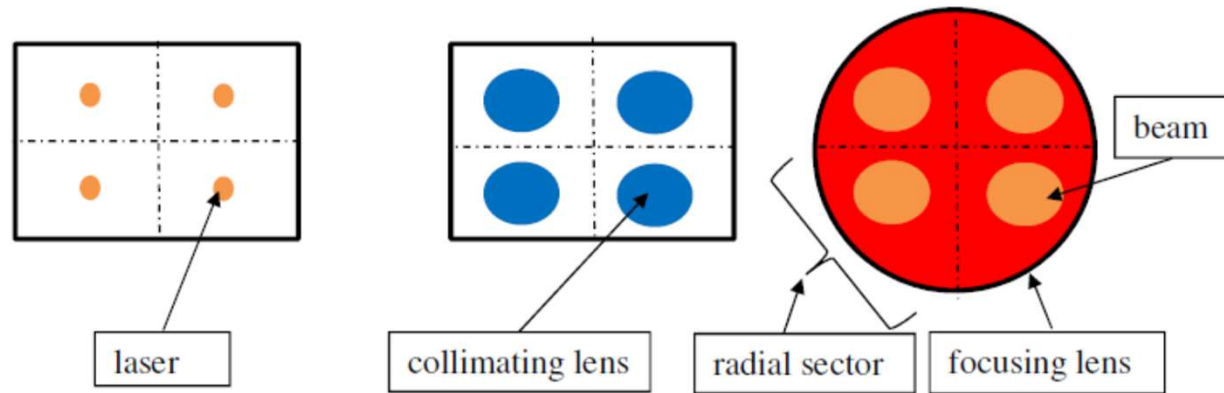
Corning Glass Works v. Sumitomo Elec. U.S.A

- Invention involved optical waveguide fibers
- Conventional optical fibers not suited for waveguide
- Claim preamble of Corning patent required “waveguide,” and prior art reference taught an optical fiber
 - Testimony that fiber “inherently” could function as a waveguide “at most for a few meters”
 - Specification: “[T]ransmitting media [for frequencies around 10[15] hz] are **hereinafter referred to as “optical waveguides.”** . . . [A]n optical waveguide should allow only preselected modes of light to propagate along the fiber.”
 - Specification also contained precise equations for when transmitting media would transmit preselected modes of light
- Key to decision
 - Invention focused on effective optical communication, not conventional fibers
 - Invention restricted to fibers that work as waveguides **as defined in the specification**

Lebby Relies on Novel Packaging (Ex. 1018)

- “[T]he ’416 patent ... has ... a **novel and inventive package**.” (27:19-20)
- “[T]he ’416 patent ... has ... **innovative and inventive packaging**.” (28:21-29:2)
- “[W]hen you start looking at the ’416 patent and ... how ... **[the] package** has been designed, ... certainly that was **novel** at the time.” (31:15-32:6)
- “[T]he inventiveness of the ’416 to use **passive alignment with a stop** for the fiber to allow the optics to be aligned without turning the lasers on was actually **novel** at the time.” (33:2-5)
- “[O]ne of the **key design features** of the ’416 patent is that it has an optical combiner, for example, it **has a package**, to use your term, that utilizes passive alignment with a fiber stop....” (40:2-8)
- “But certainly when we look at the ’416 and put in all these tools together to form an integrated **package** ... was **certainly novel** at the time.” (45:22-46:5)
- See *also* 42:19-43:1; 63:18-64:3, 87:7-88:15, 96:7-98:4, 99:9-18, 212:1-3, 261:1-262-2, 263:2-264:3, 265:14-266:9, 268:12-18, 269:10-16, 271:7-12.

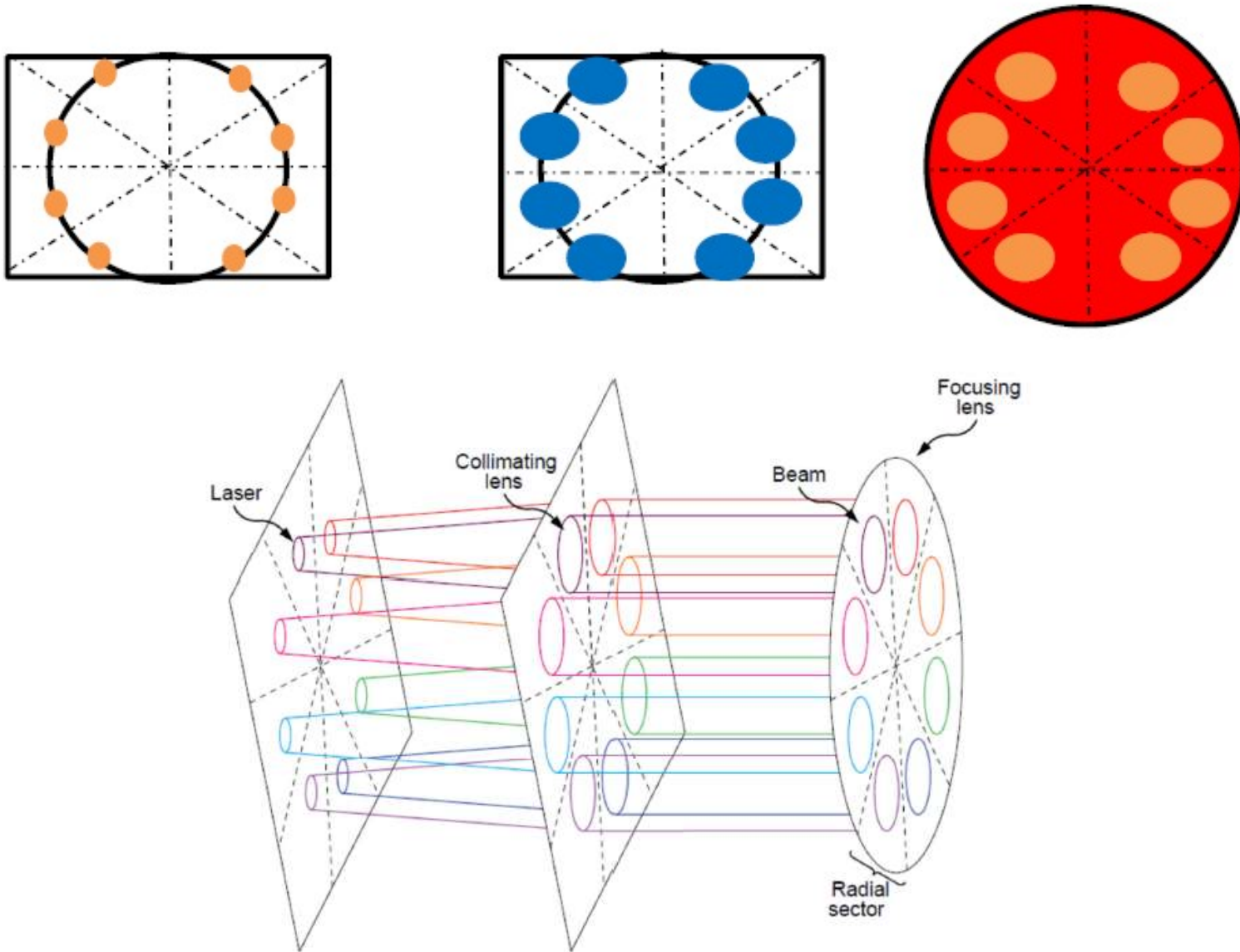
Arrays and “Radial Sectors”



Ex. 1003, ¶¶ 87-91 (Willner); Paper 1, p. 10

(DEMONSTRATIVE EXHIBIT - NOT EVIDENCE)

Arrays and “Radial Sectors”



Ex. 1003, ¶¶ 87-91 (Willner); Paper 1, p. 10

(DEMONSTRATIVE EXHIBIT - NOT EVIDENCE)

“Separate Radial Sectors” – On-axis Alignment

As explained by Dr. Willner:

First, a POSITA would understand, e.g., based on the drawing of FIG. 3, and the various refraction angles of the different light rays out of lens 30, that the arrays of lasers and collimating lenses are **arranged on-axis, i.e., with a center axis of the focusing lens 30**. Second, Kurita discloses that an aperture of lens 30 is of area equal to or greater than the area encompassing each of the light emitting portions 11 and lens portions 21. EX1004, ¶[0010] (“As for the lens 30, that having an aperture equal to or greater than the area encompassing the individual light emitting portions 11 of the above-mentioned planar monochromatic light source array 10 and the individual lens portions 21 of the lens array 20 is used.”), claim 1 (“a lens having an aperture equal to or greater than the area encompassing the above-mentioned lens array”). In the case where the aperture is specifically equal to the area encompassing the light emitting portions 11 and lens portions 21, a POSITA would understand that the collimated light passes through a separate radial sector of the focusing lens, because **otherwise (i.e., if the array of lenses is offset from the center of the focusing lens), collimated light would be lost**.

(Ex. 1003, ¶ 183)

“Separate Radial Sectors” – On-axis Alignment

As explained by Dr. Willner:

In addition to a POSITA understanding that Kurita discloses this arrangement, it also would have been obvious. **Alignment of the collimating lenses around the center focal axis of the focusing lens was typical as of the time of the invention, it would have improved efficiency** of the system by limiting signal losses, *e.g.*, through efficient low-angle (*i.e.*, relative to the fiber end face normal) optical coupling into fiber (*i.e.*, high angle coupling typically has higher coupling loss than low-angle coupling), and at any event would have been a known technique that would have improved the device. For example, a POSITA would have known that coupling can be improved when the angle of light relative to the fiber normal from the focusing lens into the fiber end-face is small, *e.g.*, based on the numerical aperture. Furthermore, a POSITA would have known that **if the alignment of the beams were not around the center focal axis of the focusing lens, then the coupling efficiency could be decreased** since the refractive angle of the outer beams relative to the fiber would be larger.

(Ex. 1003, ¶ 184)

Lemoff and Radial Arrangement of Collimating Lenses

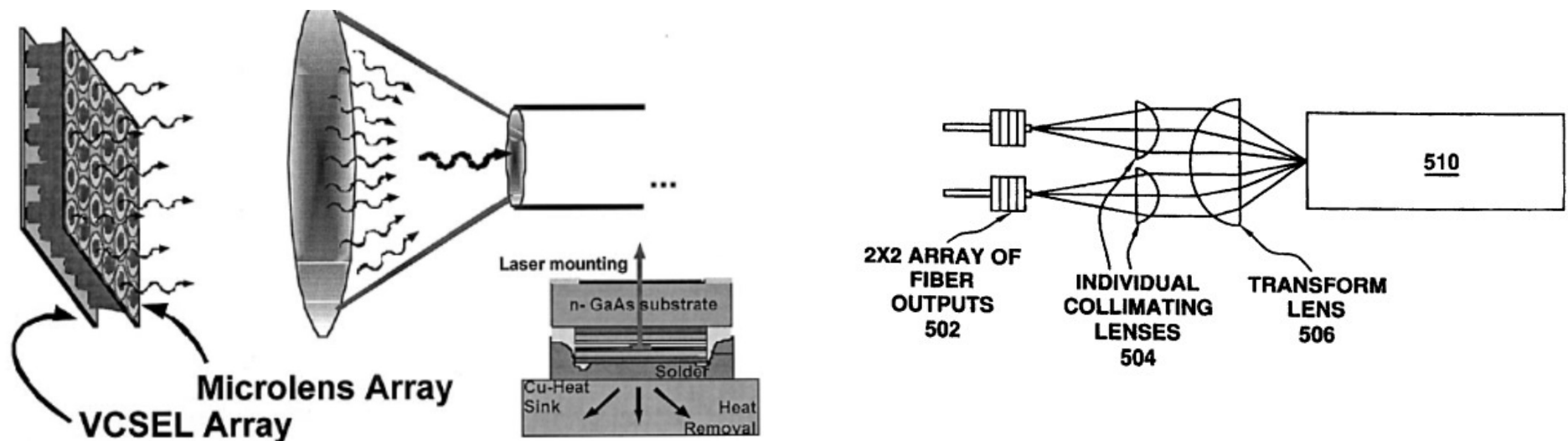
- To the extent it is argued that Lemoff does not teach or suggest the use of a plurality of collimating lenses, the teachings of LaMarche disclose this claim requirement.
- At the time of the invention a **POSITA would have been motivated to modify the optical combiner taught by Lemoff to include a collimating lens above for each of the emission apertures 120 in FIG. 2 of Lemoff**, in order to achieve the predictable result of ensuring that the light from the emission apertures 120 reach the optical imaging element 220 in the same direction such that the optical imaging element 220 focuses the light at the same point. See, e.g., Ex. 1005, 5:60-62 (“All collimated beamlets propagating through pupil lens 640 having the same propagation direction are focused to the same spatial coordinates.”); see *also* Ex. 1003, ¶ 263 (Willner).

Known That Collimating Lenses Improve Efficiency

- “[C]ollimating lenses were used in conjunction with a focusing lens because, for example, it was known that such use promoted improved coupling efficiency, i.e., increasing the amount of the input signal that reaches the optical fiber.”
- Examples provided by Dr. Willner (Ex. 1003, ¶¶ 67-69):
 - “[T]he optical literature describes that coupling efficiency may be improved with a two-lens system: ‘Couplers with two lenses show a higher coupling efficiency than one lens coupler, because the necessary refraction of the laser diode beam is divided between both lenses....’” (citing Ex. 1010)
 - “[A]nother article from an optical journal confirms that providing a microlens array and a focusing lens to cause the light from a vertical-cavity surface-emitting laser (VCSEL) array to converge onto a fiber results in high coupling efficiency.” (citing Ex. 1011)

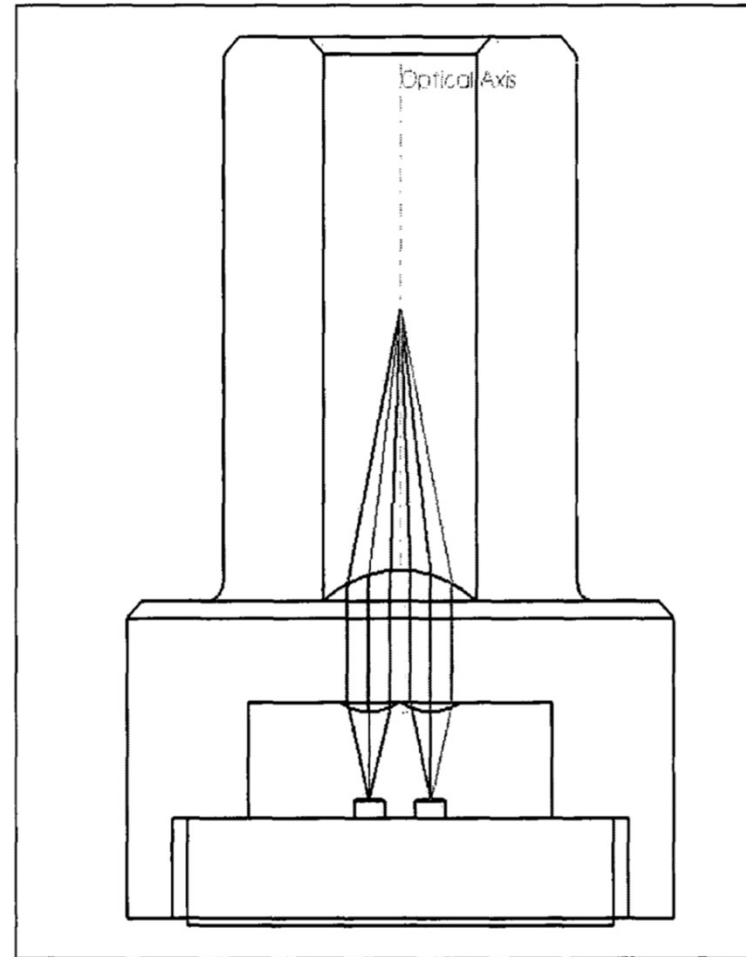
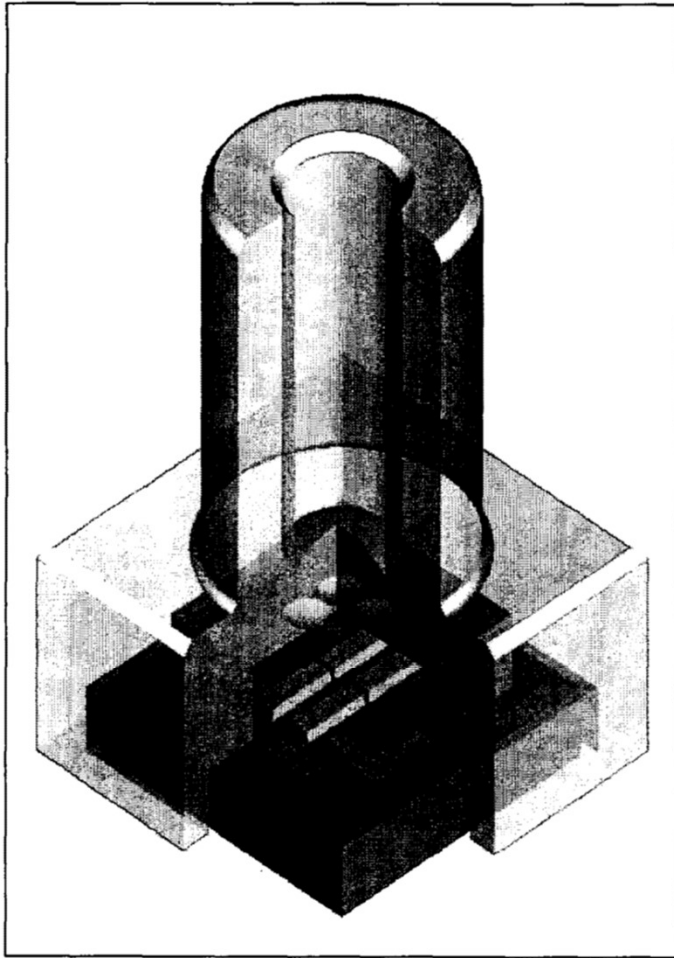
Collimating Lenses with a Focusing Lens

- The device described in Lee et al U.S. Pat. No. 5,377,287 “combines the outputs of, for example, 19 passive optical fibers arranged concentrically together with 19 collimating lenses and a Fresnel focusing lens.” Ex. 1001, :1:59-62 (Background).
- “[T]he article ‘Collimating Diode Laser Beams from a Large-Area VSCEL-Array Using Microlens Array,’ by Chen et al., had the same laser-collimating-focusing-fiber setup as that described in the ’416 Patent.” Ex. 1003, ¶ 58 (citing Ex. 1011)
- “U.S. Patent No. US 5,715,270 ... is another example of the same laser-collimating-focusing-fiber setup described in the ’416 Patent.” Ex. 1003, ¶ 59 (citing Ex. 1007)



Paper 1, pp. 7-8, 43; Paper 24, p. 19; Ex. 1016, ¶ 142

Bhandarkar is Prior Art Based on its Provisional



Paper 1, pp. 62-63; Ex. 1015, p. 9

(DEMONSTRATIVE EXHIBIT - NOT EVIDENCE)

Bhandarkar is Prior Art Based on its Provisional

Bhandarkar (EX1013), claim 1	Bhandarkar Provisional Application (EX1015)
1. A laser-enabled multiplexing system, comprising:	Claim 1 (“a laser-enabled multiplexing system”); Title (“GSE Laser Enabled WDM Mux”); pp. 1-17 (providing further details); p. 18 (“The WDM Mux proposed in this disclosure....”).
a plurality of grating-outcoupled surface emitting (GSE) lasers;	Claim 1 (“a first plurality of lasers”); Claim 3 (“wherein said first plurality of lasers comprises a plurality of Grating-outcoupled Surface Emitting (GSE) lasers”); Title (“GSE Laser Enabled WDM Mux”); pp. 1-17 (providing further details); p. 18 (“The WDM Mux proposed in this disclosure consists of an array of GSE lasers....”).
a plurality of lenses, each lens of the plurality of lenses being positioned so as to collimate a beam of light emitted by a GSE laser of the plurality of GSE lasers; and	Claim 1 (“a second plurality of lenses, each lens of said plurality of lenses positioned so as to collimate a beam of light emitted by a laser of said first plurality of lasers”); Claim 3 (“wherein said first plurality of lasers comprises a plurality of Grating-outcoupled Surface Emitting (GSE) lasers”); pp. 1-17 (providing further details); p. 18 (“The WDM Mux proposed in this disclosure consists of an array of GSE lasers attached to a substrate, a matching array of collimating lenses, and a single focusing lens. The divergent laser beam emitted by each laser is collimated by the corresponding collimating lens. The multiple collimated beams are then focused by the single focusing lens into a single spot that is suitable for coupling into an optical fiber.”).
a focusing lens positioned to focus a plurality of collimated beams of light received from the plurality of lenses into substantially a point of light.	Claim 1 (“a third lens, said third lens positioned to focus a plurality of collimated beams of light received from the second plurality of lenses into substantially a point of light”); pp. 1-17 (providing further details); p. 18 (“The WDM Mux proposed in this disclosure consists of an array of GSE lasers attached to a substrate, a matching array of collimating lenses, and a single focusing lens. The divergent laser beam emitted by each laser is collimated by the corresponding collimating lens. The multiple collimated beams are then focused by the single focusing lens into a single spot that is suitable for coupling into an optical fiber.”).

CERTIFICATE OF SERVICE

I hereby certify that on November 6, 2024, I electronically served the document described as **PETITIONER'S DEMONSTRATIVE EXHIBITS** on the following counsel of record for Patent Owner:

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