UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

EOPTOLINK TECHNOLOGY USA INC.,

Petitioner,

v.

APPLIED OPTOELECTRONICS, INC.,

Patent Owner.

Case IPR2026-00123
Patent No. 11,177,887

PATENT OWNER'S RESPONSE

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I. INTRODUCTION

Patent Owner Applied Optoelectronics, Inc. ("AOI") submits this Patent Owner Response to the petition ("Petition") of Eoptolink Technology USA Inc. ("Petitioner" or "Eoptolink") challenging the patentability of claims 1–3 and 8–12 (the "Challenged Claims") of U.S. Patent No. 11,177,887 (the "'887 Patent") (Exhibit 1001).

In the Petition, Petitioner asserts three grounds of invalidity, including: (1) asserting that Claims 1–3 are anticipated by Kuhara (U.S. Patent No. 7,366,367, Exhibit 1004); (2) asserting that Claims 8, 10, and 12 are obvious over Kuhara; and (3) asserting that Claims 8–12 are obvious over U.S. Patent No. 10,509,184 to Ho (Exhibit 1005) in view of Kuhara.

As set forth below, Petitioner fails to show that the prior art references anticipate or render obvious any of the Challenged Claims.

II. BACKGROUND

A. '887 Patent

The '887 Patent is generally directed to optical communication devices, and more particularly, to a substrate with a stepped profile for simplifying mounting and alignment of transmitter optical subassemblies (TOSA) modules, e.g., via edge

mounting. The stepped profile enables mounting TOSA modules to the substrate in a recessed orientation to reduce the overall distance between terminals of the substrate and associated components of the TOSA, e.g., between RF terminals of the substrate and an LDD of the TOSA. The stepped profile further simplifies mounting and optical alignment of TOSA modules by providing at least one mechanical stop to engage surfaces of the TOSA modules and limit travel by the same along one or more axes. *See* Exhibit 1001, Abstract; *see also* Exhibit 2001 at ¶ 57.

In the ’887 Patent, “each of the plurality of TOSA modules 205-1 to 205-4 mount, e.g., edge mount, to the first end 203 of the substrate. The transceiver substrate 202 further includes a stepped profile, with the stepped profile being at least partially defined by a step/shoulder 211 proximate the first end 203.” *See id.* at col. 6:16–21; *see also* Exhibit 2001 at ¶ 58.

This is shown in Figures 2 and 3 of the ’887 Patent; *see also* Exhibit 2001 at ¶ 59.

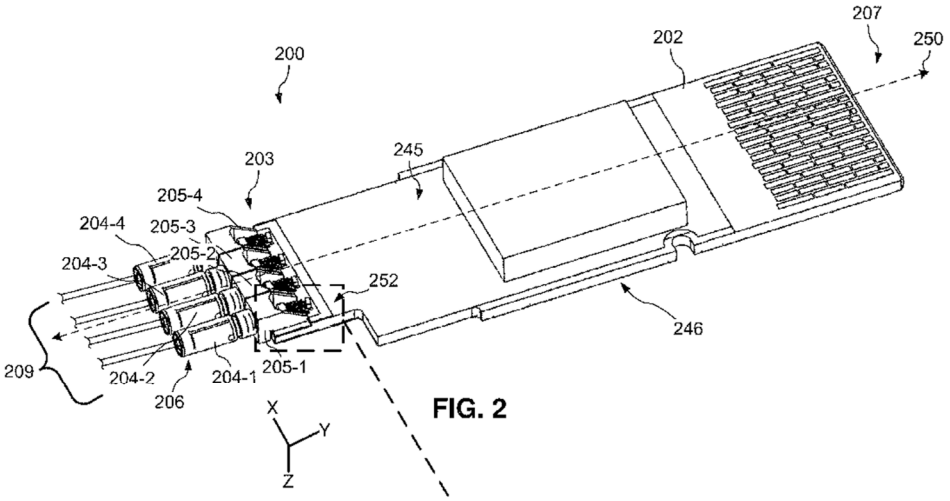


FIG. 2

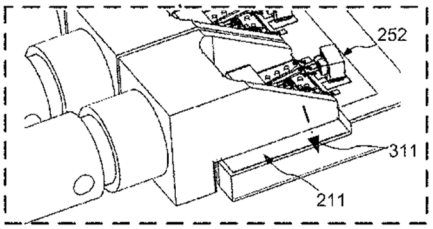


FIG. 3

Each of the TOSA modules 205-1 to 205-4 can include a base with a plurality of sidewalls that define a generally L-shaped profile that corresponds with the step 211. The profile of the base may therefore advantageously align along at least two axes, e.g., the X and Z axis, by simply engaging and bottoming out against surfaces of the step 211 that operate as an alignment guide by providing mechanical stops and limits to limit travel along at least one axis. Alignment along the remaining axis, e.g., the Y axis, may therefore be performed relatively simply by lateral movement (e.g., along the X axis) of each TOSA module 205-1 to 205-4. *See id.* at col. 6:21-34; *see also* Exhibit 2001 at ¶ 60.

Additional aspects of the stepped profile are shown below in figures 7A–7B. *See also* Exhibit 2001 at ¶ 61.

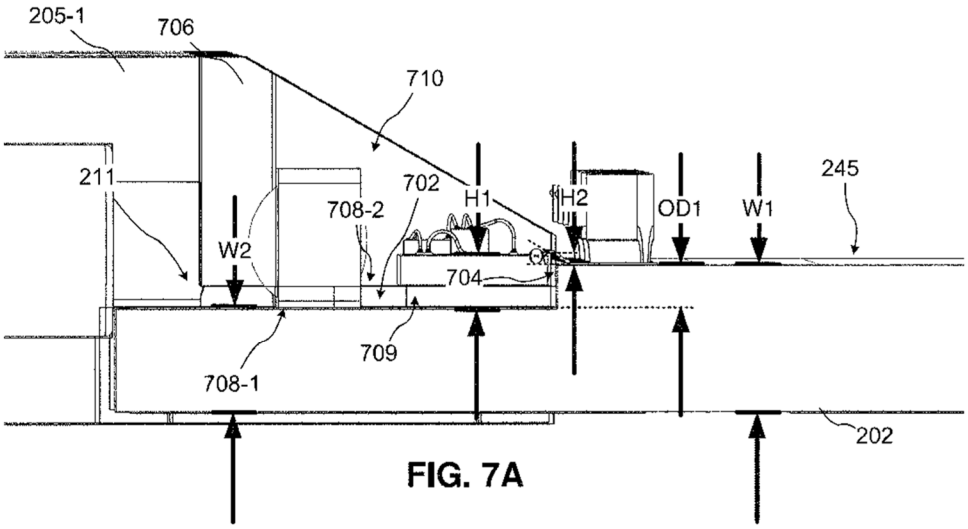


FIG. 7A

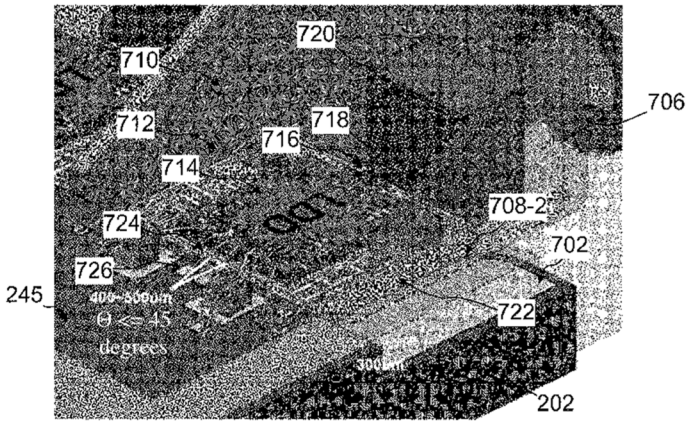


FIG. 7B

As further shown in FIG. 7A, the first TOSA module 205-1 includes a body 706 (or base) configured to securely mount, e.g., edge mount, to the second mounting region of the substrate 202. The body 706 includes a plurality of

sidewalls that provide a substrate mating surface 708-1 and a component mounting surface 708-2. *See id.* at col. 11:28–55; *see also* Exhibit 2001 at ¶ 62.

B. Relevant File History

Application no. 16/737,438 for the '887 Patent was filed on January 8, 2020, with two independent claims, claims 1 and 12. *See* "'887 Patent File History," Exhibit 1002; *see also* Exhibit 2001 at ¶¶ 63-66.

In a final office action dated February 19, 2021, the examiner rejected independent claims 1 and 12 under 35 U.S.C. § 103 as being unpatentable over Wu *et al.* (U.S. Patent Application Publication No: 2014/0105612 Al) in view of Pezeshki *et al.* (U.S. Patent Application Publication No: 2019/0278035 Al). In the office action, the examiner noted, "Wu differs from the claimed invention in that Wu does not specifically disclose the second mounting region at the optical coupling end of the substrate is configured to edge mount to the at least one TOSA module such that a portion of the at least one TOSA module extends from the optical coupling end of the substrate when the at least one TOSA module is coupled thereto. However, positioning of a TOSA module, for example, edge mounting of TOSA module, such that a portion of TOSA module extends from the

optical coupling end of a substrate, is merely a matter of design choice and a specific system requirement." *Id.* at p. 52-53.

In response, the applicant argued: "Independent claim 1 includes, *inter alia*, 'wherein the second mounting region at the optical coupling end of the substrate is configured to edge mount to the at least one TOSA module.' Independent claim 12 includes, *inter alia*, 'at least one TOSA module edge mounted to the optical coupling end of the transceiver substrate.' The Office Action correctly notes that Wu fails to teach at least the above-recited features." Applicant further argued, "an obviousness rejection based on a 'rearrangement of parts' is only applicable to reject the claims when the change does not modify the operation of the device…. to edge mount the laser diodes/optoelectronic device 12 of Wu would certainly change the operation, complicate optical alignment, *and likely prevent the use of the MT connector that Wu aims to utilize*." Applicant also amended independent claims 1 and 12 to include, *inter alia*, "wherein the vertical surface provides a mechanical stop to engage a surface of the at least one TOSA module and limit travel of the at least one TOSA module along one or more axis." *Id.* at p. 39 (all emphasis in original).

In response, the examiner issued a Notice of Allowance on August 9, 2021. *Id.* at pp. 8–12. The '887 Patent issued on November 16, 2021, with 13 claims, including two independent claims, claims 1 and 12. *See* '887 Patent (Exhibit 1001).

III. DEFINITION OF A PERSON OF ORDINARY SKILL IN THE ART

For the purposes of this Response only, AOI applies Petitioner's proposed level of skill in the art: A person of ordinary skill in the art ("POSITA") knowledgeable of the technical field of the '887 Patent would have had "(1) a Bachelor's degree in electrical or electronic engineering or an equivalent degree, and (2) 2-4 years of work experience in optoelectronics, optical networking, optical communications, or a closely-related field." Exhibit 1003 at ¶39; *see also* Exhibit 2001 at ¶¶ 37–41.

IV. CLAIM CONSTRUCTION

Petitioner asserts "[n]o claim terms of the '887 patent require claim construction to resolve any disputes in this forum." Petition at p. 13.

Yet, Petitioner apparently now realizes its Petition fails to show that its prior art references render obvious or anticipate any of the Challenged Claims and may try, albeit unsuccessfully, to save its Petition by raising claim construction arguments in its Reply. *See, e.g.,* Paper 7 at pp. 1-3. Such attempts should be

rejected because they are procedurally improper and do not remedy Petitioner's initial failure to show that the prior art references render obvious or anticipate any of the Challenged Claims.

Independent Claim 1 of the '887 Patent requires "wherein the second mounting region at the optical coupling end of the substrate is configured to edge mount to the at least one TOSA module," and Independent Claim 10 of the '887 Patent similarly requires "at least one TOSA module edge mounted to the optical coupling end of the transceiver substrate." These limitations were also one of the key points of novelty identified during prosecution. *See, e.g.,* Exhibit 1002 at pp. 39, 52-53. Yet, in its Petition, Petitioner only conclusory asserted without further support or explanation that "[a]s further shown in Figures 1A, 1B, and 2 of Kuhara, the TOSA module 5 is edge mounted to the concave portion 29 (second mounting region) at the optical coupling end 3*b* of circuit board 3." *See* Petition at p. 29. Petitioner and its expert did not explain why they argue, or believe, that mounting on the top surface 29 discloses edge mounting even though it does not match the edge mounting disclosed and claimed in the '887 Patent wherein the TOSA module is mounted to the lateral edge of the substrate at the optical coupling end, as explained further below.

Any attempts by Petitioner in its Reply to now construe edge mounting to only require the TOSA to be mounted on the top surface of the substrate should be rejected.

V. GROUND 1: PETITIONER HAS NOT SHOWN THAT CLAIMS 1–3 ARE ANTICIPATED BY KUHARA

A. Overview of Kuhara (Exhibit 1004)

Kuhara discloses an "optical data link that includes a circuit board and an optical module component. The circuit board includes first and second mounting sections. A step is formed between the first mounting section and the second mounting section. The first mounting section has the optical module component, and the second mounting section has an electron device. The optical module component includes a mounting component, a semiconductor optical device, and an optical transmission medium. The semiconductor optical device of the optical module component is electrically connected to the electron device, and is mounted on a first region of the mounting component. The optical transmission medium is supported by a second region of the mounting component, and is optically coupled with the semiconductor optical device." *See* Exhibit 1004, Abstract; *see also* Exhibit 2001 at ¶¶ 67–68.

This is shown in Figures 1A, 1B, and 2 of Kuhara.

FIG. 1 (A)

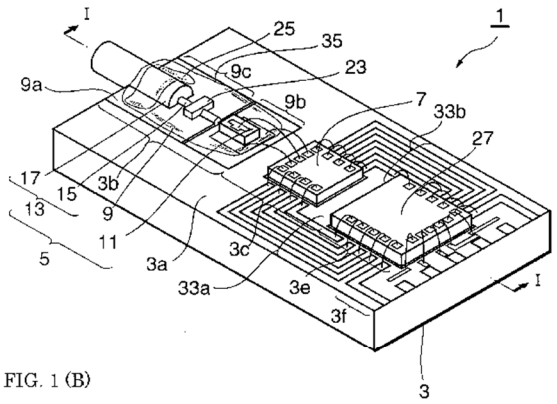


FIG. 1 (B)

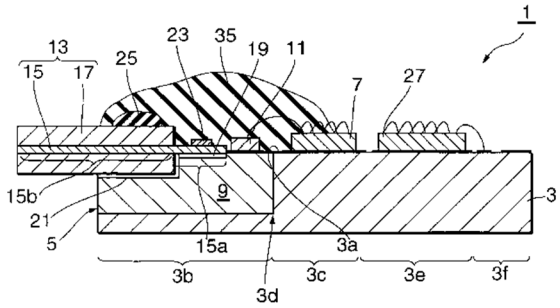
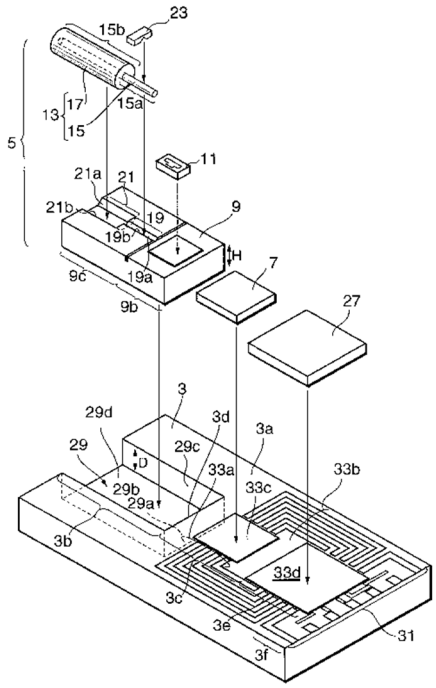


FIG. 2



B. Ground 1

Petitioner has not shown that claims 1–3 of the ’887 patent are invalid as anticipated by Kuhara. *See* Exhibit 2001 at ¶ 69.

1. Petitioner fails to show Kuhara discloses “wherein the second mounting region at the optical coupling end of the substrate is configured to edge mount to the at least one TOSA module.”

Petitioner has failed to show that Kuhara discloses “wherein the second mounting region at the optical coupling end of the substrate is configured to edge

mount to the at least one TOSA module" as required by Claim 1 of the '887 Patent. *See* Exhibit 2001 at ¶ 70.

As discussed, in the '887 Patent, each of the plurality of TOSA modules (205-1 to 205-4) is mounted to the lateral edge of a step/shoulder 211 of the substrate 202 at the optical coupling end 203. *See* Exhibit 1001 at col. 6:16-21. The TOSA modules 205-1 to 205-4 may include a base with a plurality of sidewalls that define a generally L-shaped profile that corresponds with the step 211. The profile of the base may therefore advantageously align along at least two axes, e.g., the X and Z axis, by simply engaging and bottoming out against surfaces of the step 211 that operate as an alignment guide by providing mechanical stops and limits to limit travel along at least one axis. Alignment along the remaining axis, e.g., the Y axis, may therefore be performed relatively simply by lateral movement (e.g., along the X axis) of each TOSA module 205-1 to 205-4. *See id.* at col. 6:21-34; *see also* Exhibit 2001 at ¶ 71. This is also shown below in Figures 2 and 3 of the '887 Patent, which are shown below with annotations.

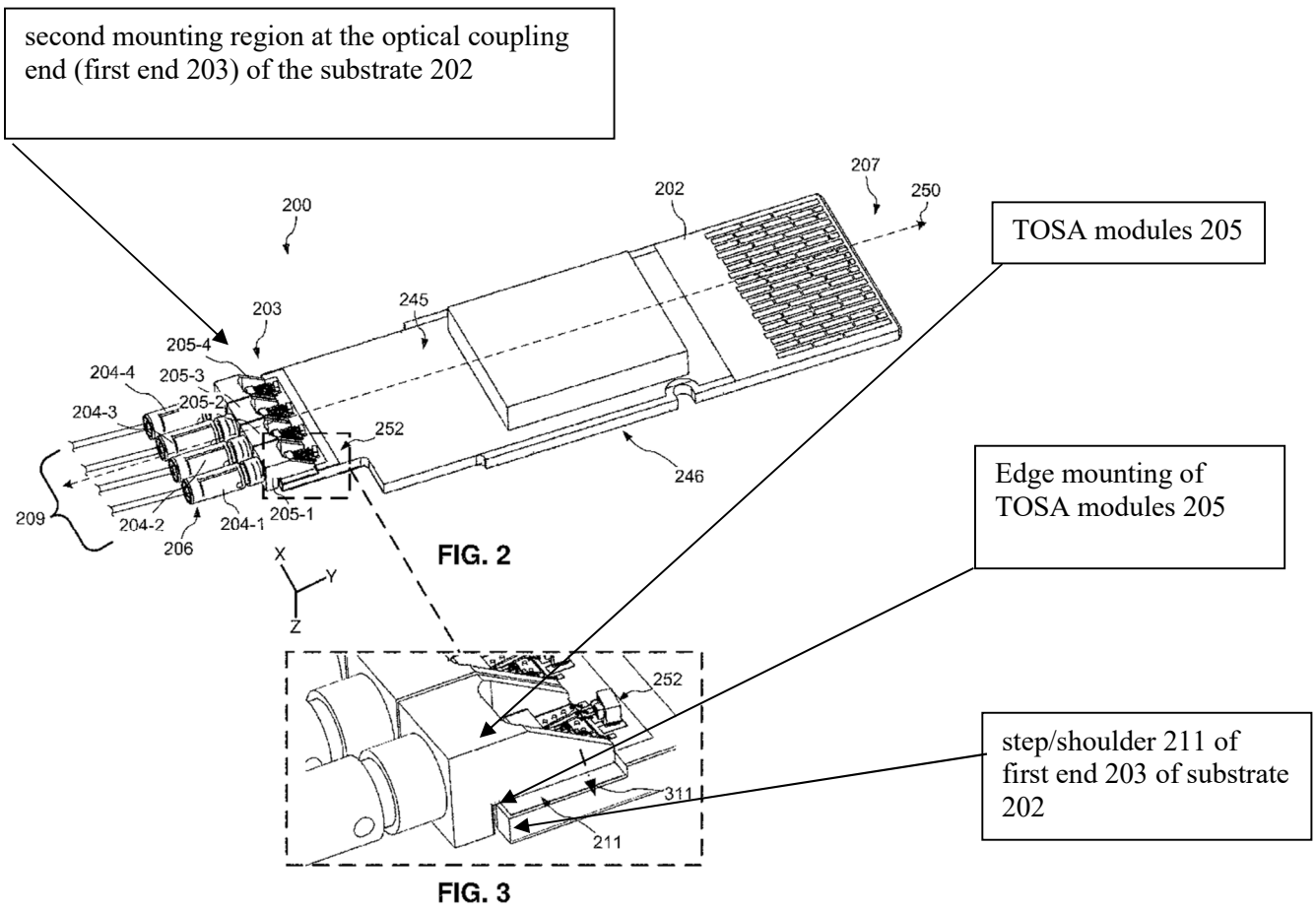
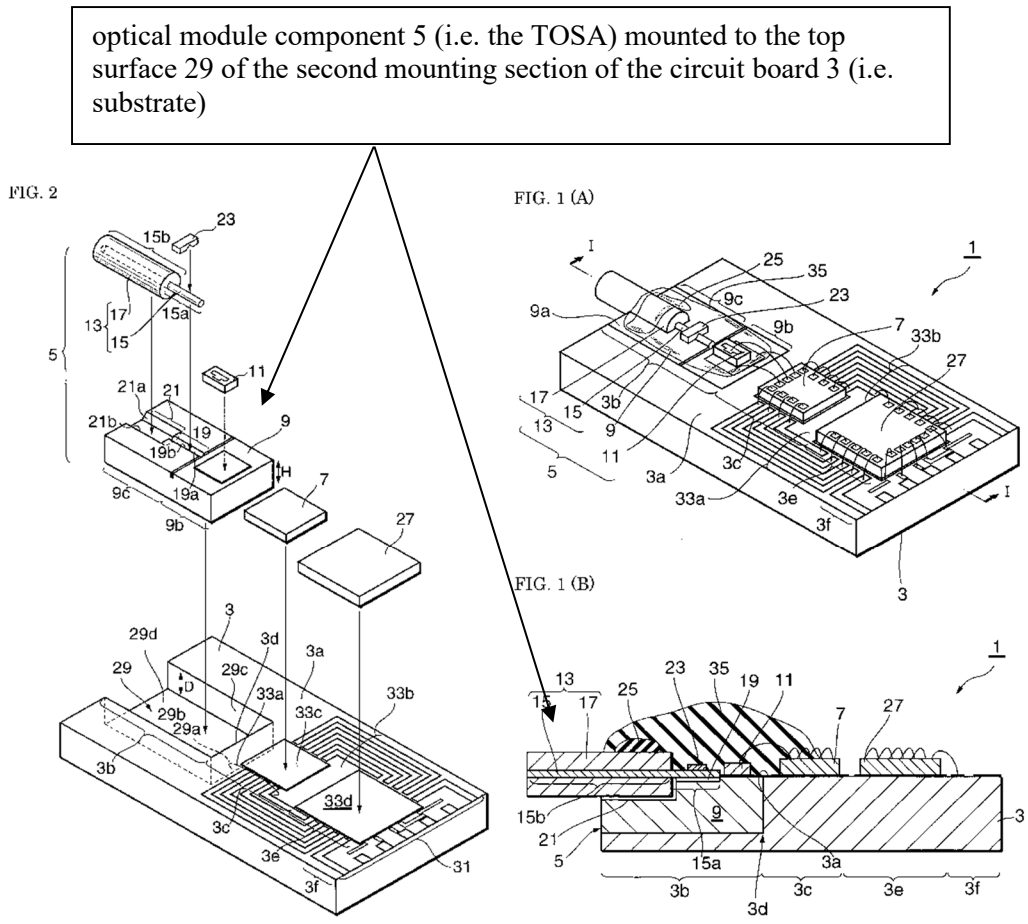


FIG. 2

FIG. 3

In contrast, in Kuhara, the optical module component 5 (the asserted TOSA module as identified by Petitioner) is not edge mounted to the circuit board 3 (the asserted substrate as identified by Petitioner) as disclosed and claimed in the '887 Patent. Instead, the optical module component 5 in Kuhara is mounted on the top surface 29 of the second mounting section of the circuit board 3. *See, e.g.,* Exhibit 1004 at 7:20-42; *see also* Exhibit 2001 at ¶ 73. This is also shown in Figures 1A,

1B, and 2 of Kuhara (Exhibit 1004), which are reproduced below with annotations added.



To explain further, the ’887 Patent discloses TOSA modules mounted to the lateral edge of a stepped mounting surface, whereas Kuhara positions the optical module (TOSA) within a concave groove and cavity using multiple guiding and supporting surfaces. *See, e.g.,* Exhibit 1004 at col. 5:33-50 (Kuhara describing the optical module (TOSA) as being placed in a concave portion or groove with

multiple defined surfaces, including positioning face 29a, guiding faces 29b and 29c, and bottom face 29d for supporting the mounting component 9). The '887 Patent describes the TOSA body 706 as "configured to securely mount, e.g., edge mount," to the substrate's second mounting region. *See* Exhibit 1001 at col. 11:28-30. Mounting of the TOSA modules 205-1 to 205-4 to the lateral edge of the substrate 202 allows the TOSA modules 205-1 to 205-4 to fix alignment along the X and Z axis using mechanical stops and limits, while simultaneously still allowing for alignment along the remaining Y axis through relatively simply lateral movement (e.g., along the X axis) of each TOSA module 205-1 to 205-4. *See id.* at col. 6:21-34; *see also* Exhibit 2001 at ¶ 71.

In contrast, the optical module (TOSA) in Kuhara is positioned and supported within a recessed cavity with sidewalls, rather than mounted to an exposed stepped edge as in the '887 Patent. The '887 Patent does not disclose sidewalls that receive, surround, or support the TOSA body within a concave cavity like Kuhara. Instead, in the '887 Patent, vertical surface 704 is described as part of the stepped profile adjoining recessed TOSA mounting surface 702 and component mounting surface 245, and its purpose is to act as a mechanical stop by

engaging the TOSA module and limiting travel along one or more axes. *See* Exhibit 1001 at col. 6:16-34; Fig. 7A; *see also* Exhibit 2001 at ¶¶ 71-72.

In short, Kuhara discloses positioning and fitting the optical module (TOSA) within a concave portion, while the '887 Patent mounts the TOSA to the stepped lateral edge of the transceiver substrate. As shown below, comparing Figures 2 and 3 from the '887 Patent with Figures 1A and 1B from Kuhara shows the difference.

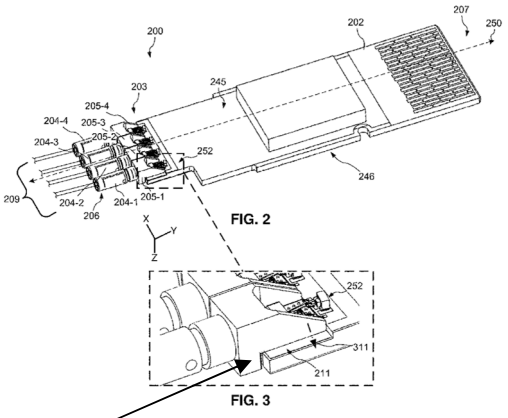


FIG. 2

FIG. 3

Edge mounting of the TOSA to the transceiver substrate in the '887 Patent

FIG. 1 (A)

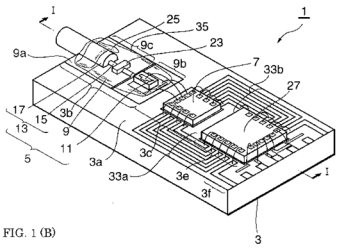
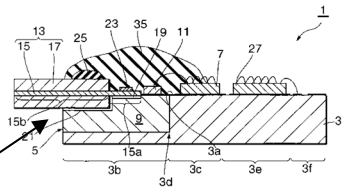


FIG. 1 (B)



No edge mounting of the asserted TOSA to the substrate in Kuhara

Moreover, Petitioner only conclusory asserts without further support or explanation that "[a]s further shown in Figures 1A, 1B, and 2 of Kuhara, the TOSA module 5 is edge mounted to the concave portion 29 (second mounting region) at the optical coupling end 3*b* of circuit board 3." *See* Petition at p. 29; Exhibit 1003

at ¶ 68. Neither Petitioner nor Dr. Lebby explain why they argue, or believe, that mounting on the top surface 29 is edge mounting even though it does not match the edge mounting disclosed and claimed in the '887 Patent.

Indeed, "[i]n an [inter partes review], the petitioner has the burden from the outset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring inter partes review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")); *see also* 37 C.F.R. § 42.104(b)(4) ("[t]he petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon"); *id.* § 42.22(a)(2) ("[e]ach petition . . . must include . . . a detailed explanation of the significance of the evidence including material facts"); *id.* § 42.104(b)(5) (the petition must "identify . . . the relevance of the evidence to the challenge raised, including identifying specific portions of the evidence that support the challenge"). The burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burden of proof in an inter partes review).

Furthermore, Petitioner cannot satisfy its burden of proving obviousness by employing "mere conclusory statements." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). Thus, to prevail in an inter partes review, Petitioner must explain how the prior art discloses the challenged claims or how the proposed combinations of prior art would have rendered the challenged claims unpatentable. Thus, at a minimum, Petitioner has failed to meet its burden to show that Kuhara discloses edge mounting as disclosed and claimed in the '887 Patent.

Finally, any attempts by Petitioner to rely on its expert's general knowledge of the use of "edge mounting" prior to the filing of the '887 Patent should be disregarded. *See, e.g.,* Exhibit 1003 at ¶¶ 48-50 ("edge-mounting of TOSA modules on a substrate was well known and conventionally used in optoelectronic applications long before the effective filing date of the '887 patent. I was personally implementing this type of component mounting in the 1990s during my time at AMP, Tyco, and Motorola"); ("edge mounting optical components to a substrate—for better alignment and utilization of substrate space and for reducing length of wire bonds—is routine and commonly used in the optoelectronics industry"). Indeed, such an approach using "general knowledge"—a broad category encompassing AAPA, expert declarations, common sense, and other non-

patent or non-printed publication evidence—*cannot be used* to supply a missing claim limitation in an IPR. *See* Exhibit 2002 at p. 1, July 31, 2025 Memorandum from Acting Director Stewart (emphasis added). Thus, as here, if a prior art reference admittedly lacks a specific element, petitioners can no longer argue that a person of ordinary skill in the art (POSITA) would inherently understand or fill that gap based on background knowledge, and the IPR should be denied. *See id.* ("As a practical matter, enforcement of Rule 104(b)(4) means that applicant admitted prior art (AAPA), expert testimony, common sense, and other evidence that is not 'prior art consisting of patents or printed publications' (collectively, 'general knowledge') may not be used to supply a missing claim limitation. Per 35 U.S.C. § 312(a)(4), the Board shall deny an IPR petition that fails to comply with Rule 104(b)(4).").

Thus, Petitioner has not shown that Kuhara discloses "wherein the second mounting region at the optical coupling end of the substrate is configured to edge mount to the at least one TOSA module" as required by Claim 1 of the '887 Patent. *See* Exhibit 2001 at ¶ 74.

VI. GROUND 2: PETITIONER HAS NOT SHOWN THAT CLAIMS 8, 10, AND 12 ARE OBVIOUS OVER KUHARA

Claim 10 of the ’887 Patent requires, “at least one TOSA module edge mounted to the optical coupling end of the transceiver substrate.” As discussed above for Claim 1, Petitioner has failed to show that Kuhara discloses “at least one TOSA module edge mounted to the optical coupling end of the transceiver substrate” as similarly required by Claim 10 of the ’887 Patent. *See* Exhibit 2001 at ¶ 75.

Claims 8 and 12 of the ’887 Patent depend from Claims 1 and 10, respectively. Because Petitioner has not shown that Kuhara anticipates Claim 1 and renders obvious Claim 10, Petitioner has also not shown that Kuhara renders obvious Claims 8 and 12. *See* Exhibit 2001 at ¶ 76.

VII. GROUND 3: PETITIONER HAS NOT SHOWN THAT CLAIMS 8–12 ARE OBVIOUS OVER HO IN VIEW OF KUHARA

Claim 10 of the ’887 Patent requires, “at least one TOSA module edge mounted to the optical coupling end of the transceiver substrate.” As discussed above for Claim 1, Petitioner has failed to show that Kuhara discloses “at least one TOSA module edge mounted to the optical coupling end of the transceiver substrate” as similarly required by Claim 10 of the ’887 Patent. Petitioner does not argue or assert that Ho discloses this limitation. *See* Exhibit 2001 at ¶ 77.

Claims 8–9 and 11–12 of the ’887 Patent depend from Claims 1 and 10, respectively. Because Petitioner has not shown that Kuhara anticipates Claim 1 and renders obvious Claim 10, Petitioner also has not shown that Kuhara renders obvious Claims 8–9 and 11–12. *See* Exhibit 2001 at ¶ 78.

VIII. CONCLUSION

For the reasons set forth above, Patent Owner AOI respectfully requests that the Board deny Petitioner’s request to cancel the Challenged Claims of the ’887 Patent.

Dated: August 17, 2026

/s/ Jo Dale Carothers

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CERTIFICATE OF WORD COUNT

Under the provisions of 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the Microsoft Office word count including all footnotes for the foregoing Patent Owner's Response, excluding the table of contents, table of authorities, certificate of word count, appendix and certificate of service, totals 3,468 words, which is less than the 14,000 words allowed under 37 C.F.R. § 42.24(b)(1).

Dated: August 17, 2026

/s/ Jo Dale Carothers

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CERTIFICATE OF SERVICE

The undersigned hereby certifies service on the Petitioner, pursuant to 37 C.F.R. § 42.6(e) and by agreement of counsel, by electronic (e-mail) delivery of a true copy of the foregoing **PATENT OWNER'S RESPONSE**, which was served on August 17, 2026 to the following Counsel for Petitioner via e-mail:

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