IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re *Ex Parte* Reexamination of:	)	
	)	
U. S. Patent No. 8,952,405	)	Control No.: *To be assigned*
	)	
Issue Date: Feb. 10, 2015	)	Group Art Unit: *To be assigned*
	)	
Inventor: Mordehai Margalit	)	Examiner: *To be assigned*
	)	
Appl. No. 13/413,293	)	Confirmation No.: *To be assigned*
	)	
Filing Date: Mar. 6, 2012	)	
	)	
For: LIGHT EMITTING DIODE PACKAGE AND METHOD OF MANUFACTURE	)	

Mail Stop *Ex Parte* Reexam
Attn: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Commissioner:

REQUEST FOR *EX PARTE* REEXAMINATION OF U.S. PATENT NO. 8,952,405

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I. Introduction

An *ex parte* reexamination is requested on claims 1-17 ("the challenged claims") of U.S. Patent No. 8,952,405, which issued on November 22, 2016, to Margalit ("the '405 patent," Ex. PAT-A), for which the U.S. Patent and Trademark Office ("Office") files identify LED Wafer Solutions LLC ("LED Wafer" or "Patent Owner") as the assignee. In accordance with 37 C.F.R. § 1.510(b)(6), Requester Samsung Electronics Co., Ltd. ("Requester") hereby certifies that the statutory estoppel provisions of 35 U.S.C. § 315(e)(1) and 35 U.S.C. § 325(e)(1) do not prohibit it from filing this *ex parte* reexamination request.

This request raises substantial new questions of patentability based on prior art that the Office did not have before it or did not fully consider during the prosecution of the '405 patent, and which discloses or suggests the features recited in the challenged claims. Requester respectfully urges that this Request be granted and that reexamination be conducted with "special dispatch" pursuant to 35 U.S.C. § 305. The Office should find the claims unpatentable over this art.

In accordance with 37 C.F.R. § 1.20(c), the fee for *ex parte* reexamination (non-streamlined) is submitted herewith. If this fee is missing or defective, please charge the fee as well as any additional fees that may be required to Deposit Account No. 50-2613.

II. Related Proceedings

On March 25, 2021, Patent Owner filed suit against Requester asserting, *inter alia*, infringement of the '405 patent in *LED Wafer Solutions LLC v. Samsung Electronics Co., Ltd.*, No 6-21-CV-00292 (W.D. Tex.). (Ex. LIT-1.) Thereafter, on August 22, 2022, the case was transferred to *LED Wafer Solutions LLC v. Samsung Electronics Co., Ltd.*, No 3-22-CV-04809 (N.D. Cal.). (Ex. LIT-4.)

Requester filed an *inter partes* review petition against the '405 patent on September 3, 2021. IPR2021-01491, Paper 1. The Patent Trial and Appeal Board ("the PTAB") denied that petition on March 15, 2022. IPR2021-01491, Paper 9. Seoul Semiconductor Co, Ltd. separately filed an *inter partes* review petition against the '405 patent on September 7, 2021. IPR2021-01479, Paper 1. The PTAB denied that petition on March 15, 2022. IPR2021-01479, Paper 11. Seoul Semiconductor Co, Ltd. also filed an ex parte reexamination request (Control No. 90/015,090) with respect to the '405 patent on August 11, 2022. That request was denied September 27, 2022.

This request, however, does not raise "the same or substantially the same prior art or arguments" previously presented, including in IPR2021-01491 and IPR2021-01479. 35 U.S.C. § 325(d). This request is based on prior art that the Office did not have before it or did not fully consider during the prosecution of the '405 patent, that the PTAB did not have before it or did not fully consider in IPR2021-01491 and IPR2021-01479, and which discloses or suggests the features recited in the challenged claims, especially under the broadest reasonable interpretation standard applicable to this request. This request also presents new combinations of references that were not before the Office or the PTAB. The references used in this request are substantially different than those considered by the Examiner during prosecution and those used in IPR2021-01491 and IPR2021-01479.

During prosecution, the Examiner indicated in an interview summary that "suggestions were made regarding Applicant's Fig. 10 to include additional limitations to describe the relationship of the passivation layer with the surrounding/contacting layers (e.g. the LED, sapphire substrate, and layer 1030) as well as the angled shape of the passivation layer" and that "[i]f amended to more clearly describe features of the passivation layer (1070) shown in Fig. 10, this would overcome the applied prior art (Yoo and Chakraborty)." (Ex. PAT-B, 74 (Applicant-Initiated Interview Summary).) Subsequently, Applicant amended the independent claims to recite that the passivation layer is "in direct contact with said metallization layer, said sapphire layer, a surface of said optically permissive layer, and said [semiconductor] LED." (*Id*., 49-52 claims 1 and 9.) Applicant argued that the prior art did not disclose such a passivation layer (*id*., 56-60), and, in response to the amendment and arguments, the Examiner issued a Notice of Allowance (*id*., 11-15). This request does not rely on prior art relied upon by the Examiner during prosecution. As discussed below in Section VI, the references and combinations of references relied on in this request provide substantially different disclosure with respect to the "passivation layer" elements that Applicant argued were not present in the prior art. Thus, this request raises substantial new questions of patentability with respect to the "passivation layer" limitation.

In IPR2021-01491, the PTAB denied institution because it determined that Petitioner had not demonstrated sufficiently that it would have been obvious to include an intrinsic layer or region in the LED device of Sugizaki (U.S. Patent Publication No. 2010/0148198) based on Camras (U.S. Patent 7,419,839) or the Applicant Admitted Prior Art (AAPA). IPR2021-01491, Paper 9 at 15-25 (P.T.A.B. Mar. 15, 2022). The Board reached this determination based on its finding that

"Petitioner has not adequately shown in the Petition a motivation to combine with a reasonable expectation of success the teachings of Sugizaki as to a light emitting layer with the teaching of Camras as to the use of an intrinsic (undoped) region or layer in an LED." *Id*. at 21. With respect to the AAPA, the Board found that "the Petition does not provide an adequate explanation or showing that an LED with a 3-layer structure including an intrinsic layer should be considered as AAPA based on the disclosure of the '405 patent." *Id*. at 25. Therefore, the Board's denial of institution was based on its determination that Petitioner had not demonstrated that it would have been obvious to include an intrinsic layer in Sugizaki's LED. This request does not rely on Sugizaki. Rather, this request raises substantial new questions of patentability, as both of the primary references (Horie and Slater) explicitly disclose LEDs with an intrinsic layer/region between p- and n-doped layers/regions as recited in the independent claims.

Regarding IPR2021-01479, the PTAB also denied institution based on a determination that Petitioner had not demonstrated that it would have been obvious to include an intrinsic layer/region in the LED disclosed by Sugizaki. (IPR2021-01479, Paper 11 at 17-25.) The Board determined that Schubert did not "recommend the use of an intrinsic (undoped) active or light emitting layer in an LED" (*id*. at 20-21); and that the Nakamura reference (U.S. Patent No. 5,777,350) did "not show that the light emitting layers of LEDs were conventionally or commonly undoped" (*id*. at 22.). In all, the PTAB found that the petition did not adequately explain why a skilled artisan would have chosen to use an undoped ("intrinsic") layer as the light emitting layer of an LED based on the teachings of the cited prior art. *Id.* at 18-21. This request, however, does not rely on Hashimoto, Schubert, or Nakamura for the intrinsic layer/region limitations of the independent claims 1 and 12. Instead, as noted above, both of the primary references (Horie and Slater) explicitly disclose LEDs with an intrinsic layer/region between p- and n-doped layers/regions.

Moreover, the Office erred in a manner material to patentability by not considering the teachings, arguments, obviousness combinations, and evidence presented in this request (Section VI). The primary references Horie and Slater, along with the secondary references Izumino and Furuyama, were not considered by the Office during prosecution and not presented in IPR2021-01491 and IPR2021-01479. And as further discussed below in Section VI, the prior art combinations presented raise substantial new questions of patentability with respect to the "passivation layer" limitation that the Examiner and Applicant focused on during prosecution. With respect to the remaining references Camras, Tanaka, and Tanimoto, the Board never reached

the merits of these references in IPR2021-01491 because, as discussed above, the Board determined that Petitioner did not meet its burden to show that it would have been obvious to include an intrinsic layer/region in Sugizaki. At least because the Office did not consider the teachings of Camras, Tanaka, and Tanimoto as they are presented in this Request, and because the combinations presented involving Camras, Tanaka, and Tanimoto were not previously before the Office, the Office erred in a manner material to patentability.

III. Identification of Claims and Citation of Prior Art Presented

Requester respectfully requests reexamination of claims 1-17 of the '405 patent in view of the following prior art references, which are also listed on the attached PTO Form SB/08.

Ex. PA-1	Japanese Patent Publication No. 2009-111102 to Horie *et al.* ("Izumino") (English translation)
Ex. PA-2	Japanese Patent Publication No. 2005-123560 to Izumino *et al.* ("Izumino") (English translation)
Ex. PA-3	U.S. Patent No. 7,419,839 to Camras *et al*. ("Camras")
Ex. PA-4	U.S. Patent Publication No. 2008/0031295 to Tanaka ("Tanaka")
Ex. PA-5	U.S. Patent Publication No. 2009/0001869 to Tanimoto *et al*. ("Tanimoto")
Ex. PA-6	U.S. Patent Publication No. 2011/0260184 to Furuyama ("Furuyama")
Ex. PA-7	U.S. Patent Publication No. 2010/0283077 to Slater, JR. *et al* ("Slater")

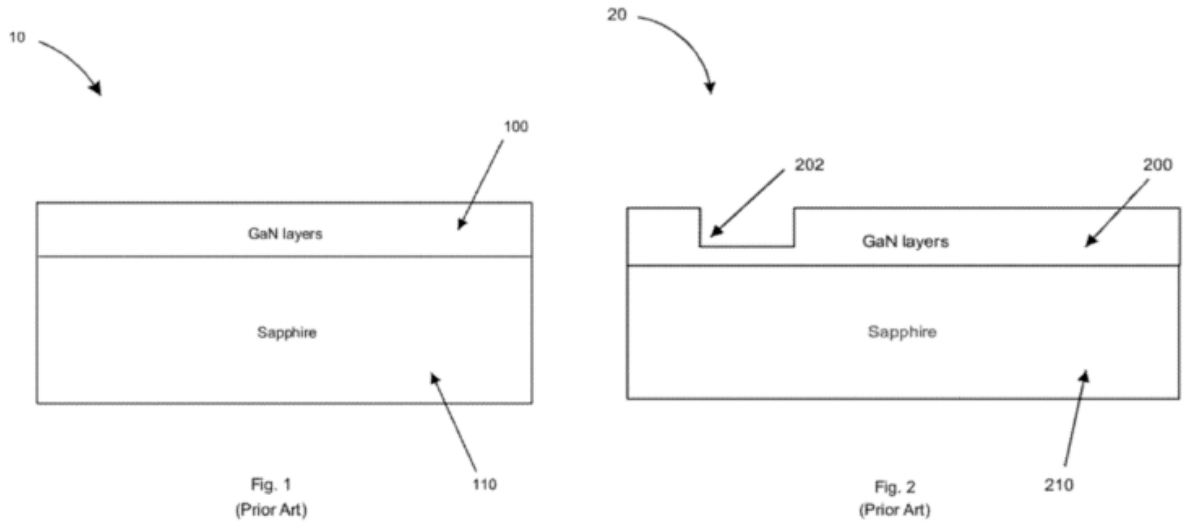
A copy of each of the above-listed references is attached to this request pursuant to 37 C.F.R. § 1.510(b)(3). A copy of the '405 patent is also attached to this request as Exhibit PAT-A pursuant to 37 C.F.R. § 1.510(b)(4).

IV. Overview of the '405 Patent

A. Specification and Drawings of the '405 Patent

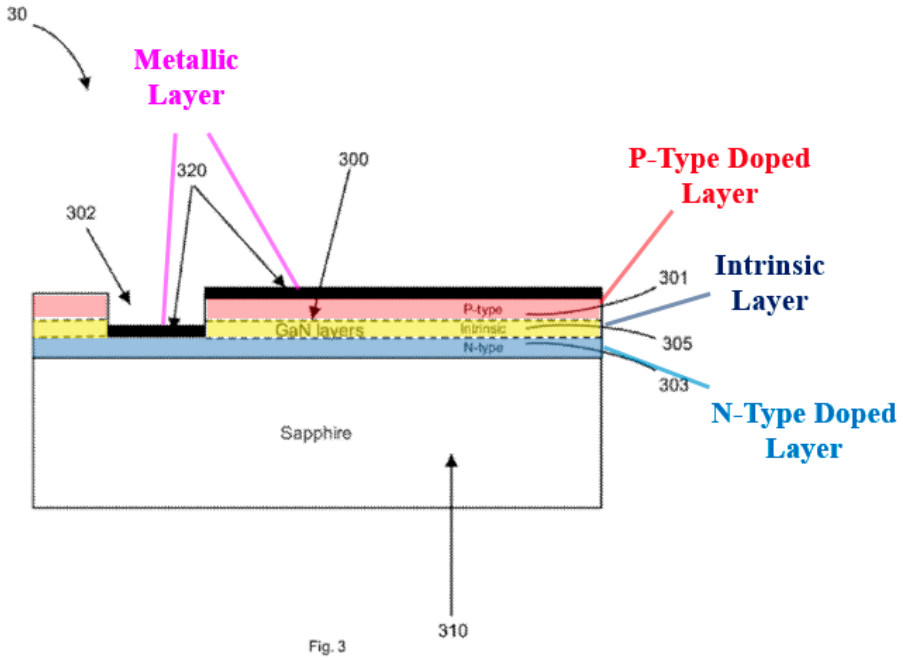
The '405 patent is entitled "Light Emitting Diode Package and Method of Manufacture" and describes the structure and formation of LED devices. (Ex. PAT-A, Title; Ex. PA-DEC, ¶¶31-39.) The '405 patent "is directed to a light emitting diode (LED) device implemented on a wafer cover layer and provided with features permitting efficient and repeatable manufacture of the same." (Ex. PAT-A, 1:13-16.) The '405 patent states that conventional LED packaging includes silicon or ceramic carrier substrates, which can increase the manufacturing costs for such LEDs. (*Id*., 1:55-63.) According to the '405 patent, the carrier substrate can also adversely affect the heat removal characteristics for the LED. (*Id*., 1:63-65.) In attempting to overcome these issues, the '405 patent discloses embodiments where "the LED is manufactured by epitaxial growth or other chemical or physical deposition techniques of a plurality of layers," where "[c]ertain layers act to promote mechanical, electrical, thermal, or optical characteristics of the device." (*Id*., 2:2-8.)

Figures 1 and 2 of the '405 patent illustrate prior art gallium nitride (GaN) LEDs that "are typically grown on a sapphire substrate." (*Id*., 3:10-13, 3:34-36, 3:44-46.) According to the '405 patent, "[t]hese LEDs comprise a P-I-N junction device having an intrinsic (I) layer disposed between an N-type doped layer and a P-type doped layer." (*Id*., 3:13-16.) Figure 2 illustrates a prior art LED device "like the one shown in FIG. 1 where a GaN layer 200 is disposed above a sapphire layer 210" and "a recess or groove or channel 202 is etched into a portion of the GaN layer 200." (*Id*., 3:44-47.)



(*Id.*, FIGs. 1, 2.)

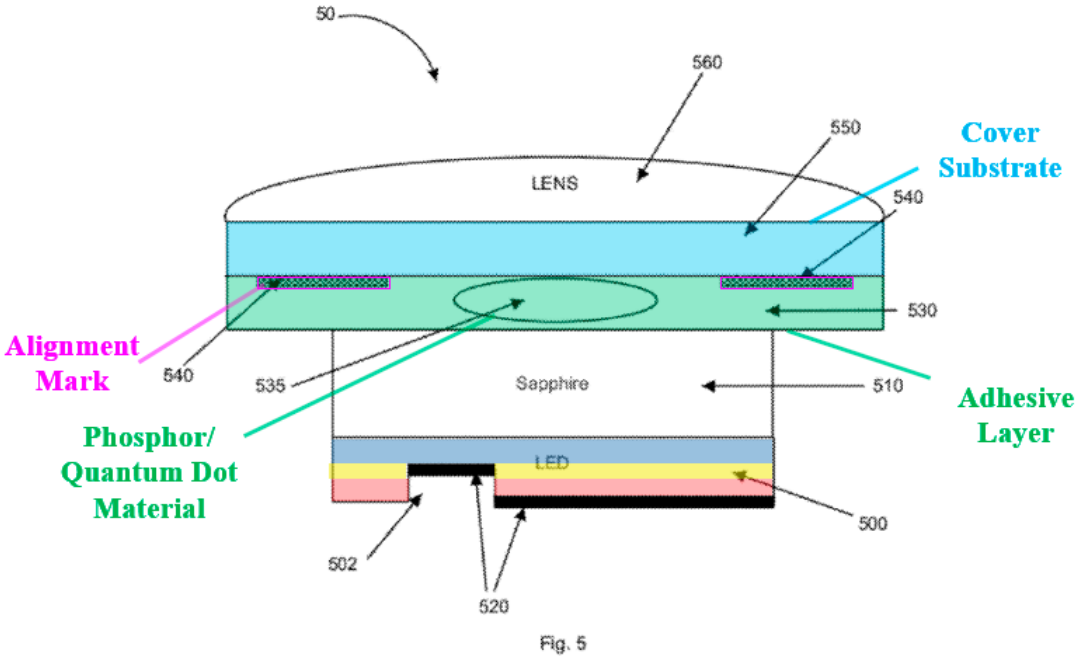
Building on the basic prior art structure of the LED, figure 3 shows "the result of metallization of the surface of the GaN layer 200 of the device of FIG. 2," where "the GaN layer 300 comprises a P-I-N junction having strata therein including a P-type doped layer 301 that is proximal to the bulk surface of the GaN layer 300 and distal from the sapphire layer 310, a N-type doped layer 303 within GaN layer 300 that is proximal to the sapphire layer 310, and an intrinsic (I) semiconductor layer 305 in the middle, between the P and N type layers 301 and 303." (*Id.*, 3:64-4:8.).



(*Id.*, FIG.3 (annotated); Ex. PA-DEC, ¶34.)

The metallization is provided in order to provide contacts to the P- and N-type regions such that current flows through the LED to cause photon emission from the intrinsic layer 305. (Ex. PAT-A, 4:8-10 ("In operation, electrical biasing of the P-type layer 301 against the N-type layer 303 causes photon emission from intrinsic layer 305."), 4:22-27 ("In this way, a set of contacts can be applied to the N-type layer 303 and the P-type layer 301 to drive or excite the LED device 30. Current can thus generally flow from a conducting electrode coupled to the N-type layer 303 to another conducting electrode coupled to the P-type layer 301.").)

Figure 5 of the '405 patent provides a cross sectional view of an LED device 50 that includes the LED shown in figure 3 above, where the figure 3 structure has been flipped vertically so that the sapphire substrate is on the top of the LED. (*Id.*, 4:65-5:2, FIGs. 3, 5.)



(*Id.*, FIG. 5 (annotated); Ex. PA-DEC, ¶36.)

As shown in annotated figure 5 above, the LED device 50 includes "an optically transparent or transmissive adhesive layer 530," where "[w]ithin, or contiguous to transparent adhesive layer 530 is a region containing phosphor and/or quantum dot material (QD) 535." (Ex. PAT-A, 5:3-8, 5:15-17.) The LED device 50 also includes alignment marks 540 on the adhesive layer 530 that are used to align the LED body over a cover substrate 550. (*Id.*, 5:24-27.) The cover substrate 550 is "transparent or optically transmissive to light in the wavelength emitted by LED layer 500 or by the combination of the LED layer 500 and the phosphor material." (*Id.*, 5:29-32.) An optical lens 560 on the cover substrate 550 "can act to spread, diffuse, collimate, or otherwise redirect and form the output of the LED." (*Id.*, 5:33-37.)

Figure 11 illustrates another embodiment of an LED device that also includes passivation layer 1170 and a metal seed layer 1177 applied to the passivation layer. (*Id.*, 7:24-26, FIG. 11.

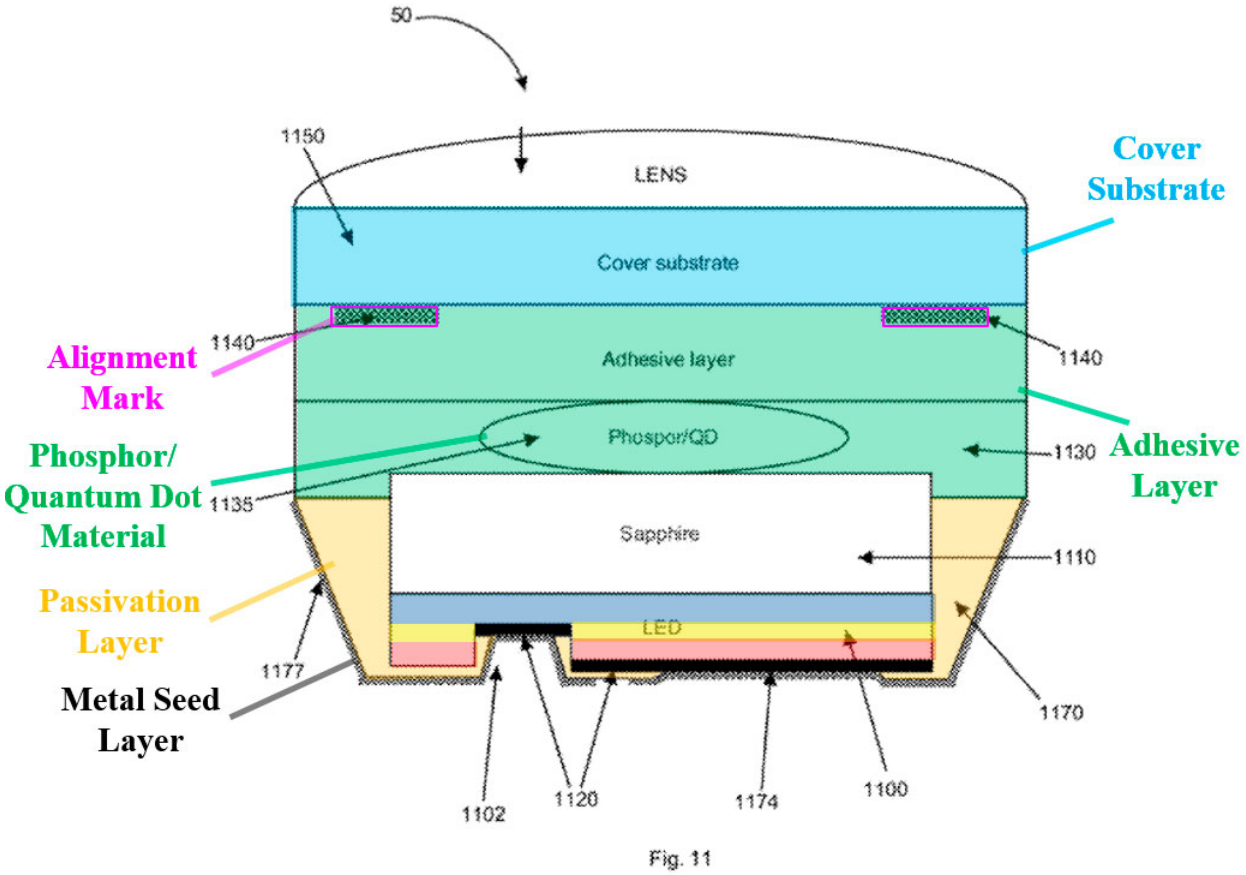


Fig. 11

(*Id*., FIG. 11 (annotated); Ex. PA-DEC, ¶38.)

The '405 patent discloses that the passivation layer can be a non-conductive layer such as SiO_2, SiN, AlN, Al_2O_3 or an organic material such as epoxy or electrophoretic deposited paint. (Ex. PAT-A, 6:14-20.) The passivation layer is shown in figure 11 to be shaped to provide optical reflectivity. (*Id*., 6:33-38.) The contact holes can be drilled or etched through the passivation layer. (*Id*., 6:47-59.) The metal seed layer 1177 provides enhanced electrical conductivity, heat removal, and reflectivity of light. (*Id*., 7:43-47.)

As explained below and in the accompanying declaration of Dr. Baker, all of the limitations in the challenged claims were known in the prior art. (*See infra* Section VI; Ex. PA-DEC, ¶¶42-70.)

B. Prosecution History of the '405 patent

As discussed above in Section II, the claims were allowed over the Yoo and Chakraborty after the Examiner suggested "additional limitations to describe the relationship of the passivation layer with the surrounding/contacting layers (e.g. the LED, sapphire substrate, and layer 1030)"

that were added by the Applicant and argued to not be present in the prior art. (*Supra*, Section II; (Ex. PAT-B, 74 (Applicant-Initiated Interview Summary).), 49-52 (amended claims 1 and 9), 56-60 (Patent Owner's arguments).) Horie, Izumino, Camras, Tanaka, Tanimoto, Slater, and Furuyama were not considered during prosecution of the '405 patent. (*See generally* Ex. PAT-B.)

C. The Effective Priority Date of the '405 Patent

The '405 patent issued February 10, 2015, from U.S. App. No. 13/413,293 ("the '293 application"), filed March 6, 2012. The '405 patent claims priority to U.S. Provisional Patent Application Nos. 61/449,685 (Ex. PAT-C) and 61/449,686 (Ex. PAT-D) ("the provisional applications"), both of which were filed March 6, 2011. However, the claims of the '405 patent are not entitled to priority to the provisional applications, as the only independent claims, claims 1 and 12, recite "an intrinsic region" where the positioning of the intrinsic region is specified in claim 1 as being between a positively-doped region and a negatively-doped region and specified in claim 12 as "between said positively-doped layer and a first surface of said LED." (Ex. PAT-A, 8:8-10, 9:27-30.) Neither of the provisional applications provides written description support for these features (*See* Exs. PAT-C, PAT-D), and therefore the earliest possible priority date for the '405 patent is the March 6, 2012 filing date of the '293 application. While the provisional applications mention an intrinsic layer, they do not provide any specificity as to where the intrinsic layer is positioned relative to other layers in the light emitting diode (LED) structure disclosed. (*Id*.)

Horie published May 21, 2009, Izumino published May 12, 2005, Camras issued September 2, 2008, Tanaka published Feb. 7, 2008, Tanimoto published January 1, 2009, Furuyama was filed September 14, 2010 and published October 27, 2011, Slater was filed July 13, 2010 and published November 11, 2010. Thus, based on the March 6, 2012 filing date of the '293 application, which is the earliest possible priority date for the '405 patent, Horie, Izumino, Camras, Tanaka, Tanimoto, and Slater qualify as prior art to the '405 patent under at least pre-AIA 35 U.S.C. § 102(b), whereas Furuyama qualifies as prior art under pre-AIA 35 U.S.C. § 102(e). Even if the March 6, 2011 filing date of the provisional applications is taken as the priority date for the '405 patent, Horie, Izumino, Camras, Tanaka, and Tanimoto are still prior art under at least pre-AIA 35 U.S.C. § 102(b), while Furuyama and Slater are prior art at least under pre-AIA 35 U.S.C. § 102(e).

V. Claim Construction

"During patent examination, the pending claims must be 'given their broadest reasonable interpretation consistent with the specification.'" MPEP § 2111; *see also* MPEP § 2258. Limitations in the specification are not read into the claims. MPEP § 2258. The standard of claim interpretation in reexamination is different than that used by the courts in patent litigation and the Board in *inter partes* review proceedings.[1] Therefore, any claim interpretations submitted or implied herein for the purpose of this reexamination do not necessarily correspond to the appropriate construction under the legal standards mandated in litigation. MPEP § 2686.04.11; *see also In re Zletz*, 893 F.2d 319, 322, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). For purposes of this request, Requester believes that no constructions of the challenged claims are needed. (Ex. PA-DEC, ¶¶40-41.)

For certain claim terms that may be unclear in scope, this request assumes an interpretation consistent with that advanced by the Patent Owner in litigation. (Ex. LIT-2, 2, 3.)[2] Nonetheless, the claims would be unpatentable under any reasonable construction of this term and the other terms given how closely the prior art maps to the claims. This is particularly true given that the broadest reasonable interpretation standard governs this request.

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[1] Requester reserves all rights and defenses available including, without limitation, defenses as to invalidity, unenforceability, and non-infringement regarding the '405 patent. Further, because the claim interpretation standard used by courts in patent litigation is different from the appropriate standard for this reexamination, any claim constructions submitted or implied herein for the purpose of this reexamination are not binding upon Requester in any litigation related to the '405 patent. Specifically, any interpretation or construction of the claims presented herein or in Dr. Baker's declaration for reexamination, either implicitly or explicitly, should not be viewed as constituting, in whole or in part, the Requester's own interpretation or construction of such claims.

[2] Requester reserves all rights to raise claim constructions in other venues. For example, Requester has not necessarily raised all challenges to the '405 patent in this proceeding, including those under 35 U.S.C. § 112, given the limitations placed by the Rules governing this proceeding. For example, Requester has alleged some terms are indefinite in district court proceedings. But given how closely the prior art maps to the claims (as explained below), those issues do not need to be resolved to assess patentability in this proceeding. In addition, a comparison of the claims to any accused products in litigation may raise controversies that need to be resolved through claim construction that are not presented here given the similarities between the references and the '405 patent. Thus, the SNQs presented herein should not be interpreted to (and do not) conflict with Requester's indefiniteness positions in other proceedings regarding the '405 patent (and how the Court ruled on such positions) (Ex. LIT-2).

VI. Statement of Substantial New Questions of Patentability

As mentioned above, Horie, Izumino, Camras, Tanaka, Tanimoto, Furuyama, and Slater were never made of record or considered by the Office during original prosecution of the '405 patent. However, the references (alone or in various combinations for respective claims) disclose or suggest all of the features of claims 1-17 of the '405 patent.

SNQ1: Horie and Izumino raise a substantial new question of patentability (SNQ1) with respect to claims 1-4 and 12 of the '405 patent.

SNQ2: Horie, Izumino, and Camras raise a substantial new question of patentability (SNQ2) with respect to claims 1-6 and 16 of the '405 patent.

SNQ3: Horie, Izumino, Camras, and Tanaka raise a substantial new question of patentability (SNQ3) with respect to claims 7 and 17 of the '405 patent.

SNQ4: Horie, Izumino, and Tanimoto raise a substantial new question of patentability (SNQ4) with respect to claim 4 of the '405 patent.

SNQ5: Horie, Izumino, and Furuyama raise a substantial new question of patentability (SNQ5) with respect to claims 1-4 and 8-15 of the '405 patent.

SNQ6: Horie, Izumino, Furuyama, and Camras raise a substantial new question of patentability (SNQ6) with respect to claims 1-6, 8-11, and 16 of the '405 patent.

SNQ7: Horie, Izumino, Furuyama, Camras, and Tanaka raise a substantial new question of patentability (SNQ7) with respect to claims 7 and 17 of the '405 patent.

SNQ8: Horie, Izumino, Furuyama, Camras, and Tanimoto raise a substantial new question of patentability (SNQ8) with respect to claim 4 of the '405 patent.

SNQ9: Horie, Izumino, Furuyama, and Tanimoto raise a substantial new question of patentability (SNQ9) with respect to claim 4 of the '405 patent.

SNQ10: Slater, Furuyama, and Camras raise a substantial new question of patentability (SNQ10) with respect to claims 1-3, 5, 6, and 8-16 of the '405 patent.

SNQ11: Slater, Furuyama, Camras, and Tanimoto raise a substantial new question of patentability (SNQ11) with respect to claim 4 of the '405 patent.

SNQ12: Slater, Furuyama, Camras, and Tanaka raise a substantial new question of patentability (SNQ12) with respect to claims 7 and 17 of the '405 patent.

Thus, for these reasons and the reasons discussed below and in the accompanying claim charts for SNQs 1-12 (CC-1 to CC-12) and supporting declaration of Dr. Baker (Ex. PA-DEC),

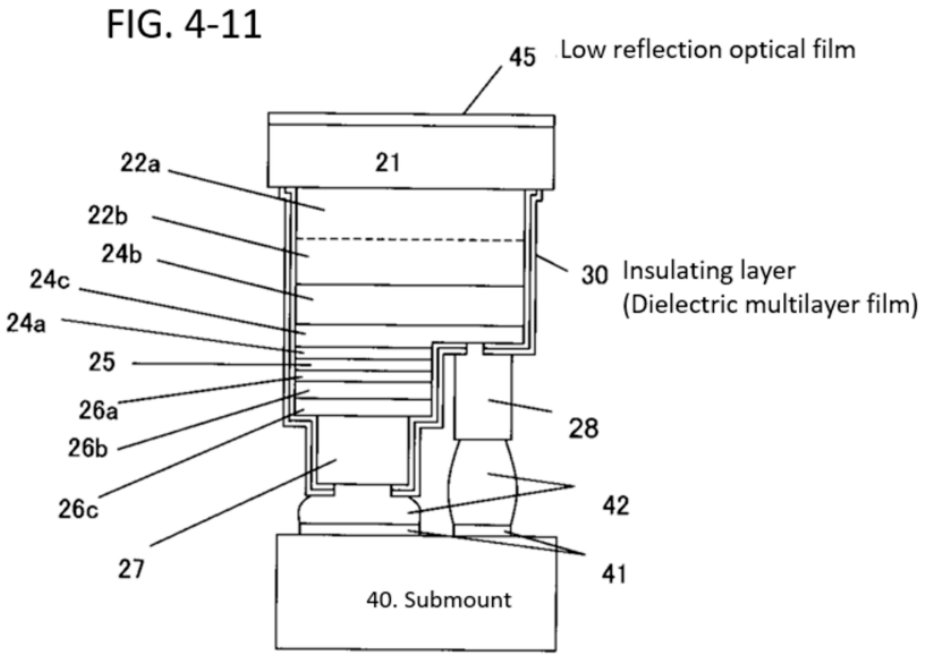
Horie and Izumino raise a substantial new question of patentability (SNQ1) with respect to claims 1-4 and 12 of the '405 patent; Horie, Izumino, and Camras raise a substantial new question of patentability (SNQ2) with respect to claims 1-6 and 16 of the '405 patent; Horie, Izumino, Camras, and Tanaka raise a substantial new question of patentability (SNQ3) with respect to claims 7 and 17 of the '405 patent; Horie, Izumino, and Tanimoto raise a substantial new question of patentability (SNQ4) with respect to claim 4 of the '405 patent; Horie, Izumino, and Furuyama raise a substantial new question of patentability (SNQ5) with respect to claims 1-4 and 8-15 of the '405 patent; Horie, Izumino, Furuyama, and Camras raise a substantial new question of patentability (SNQ6) with respect to claims 1-6, 8-11, and 16 of the '405 patent; Horie, Izumino, Furuyama, Camras, and Tanaka raise a substantial new question of patentability (SNQ7) with respect to claims 7 and 17 of the '405 patent; Horie, Izumino, Furuyama, Camras, and Tanimoto raise a substantial new question of patentability (SNQ8) with respect to claim 4 of the '405 patent; Horie, Izumino, Furuyama, and Tanimoto raise a substantial new question of patentability (SNQ9) with respect to claim 4 of the '405 patent; Slater, Furuyama, and Camras raise a substantial new question of patentability (SNQ10) with respect to claims 1-3, 5, 6, and 8-16 of the '405 patent; Slater, Furuyama, Camras, and Tanimoto raise a substantial new question of patentability (SNQ11) with respect to claim 4 of the '405 patent; and Slater, Furuyama, Camras, and Tanaka raise a substantial new question of patentability (SNQ12) with respect to claims 7 and 17 of the '405 patent.

A. SNQ1: Horie in View of Izumino Discloses or Suggests Claims 1-4 and 12

As explained in attached claim chart CC-1 (Exhibit-CC-1) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Horie in view of Izumino discloses the limitations of claims 1-4 and 12 of the '405 patent. (Ex. PA-DEC, ¶¶42-52.)

1. Overview of the Horie-Izumino Combination

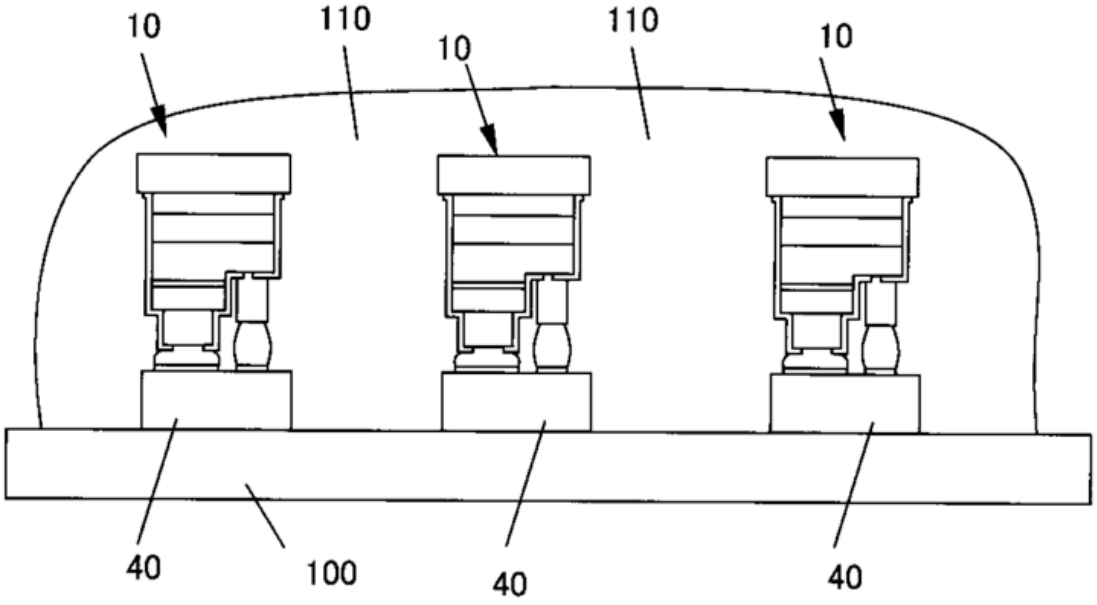
Horie discloses embodiments of light emitting devices and example methods of manufacturing such devices. For example, Horie discloses a method of manufacturing a light emitting element as shown in figure 4-11 below. (Ex. PA-1, ¶[0881], FIG. 4-11.)



(*Id.*, FIG. 4-11.)

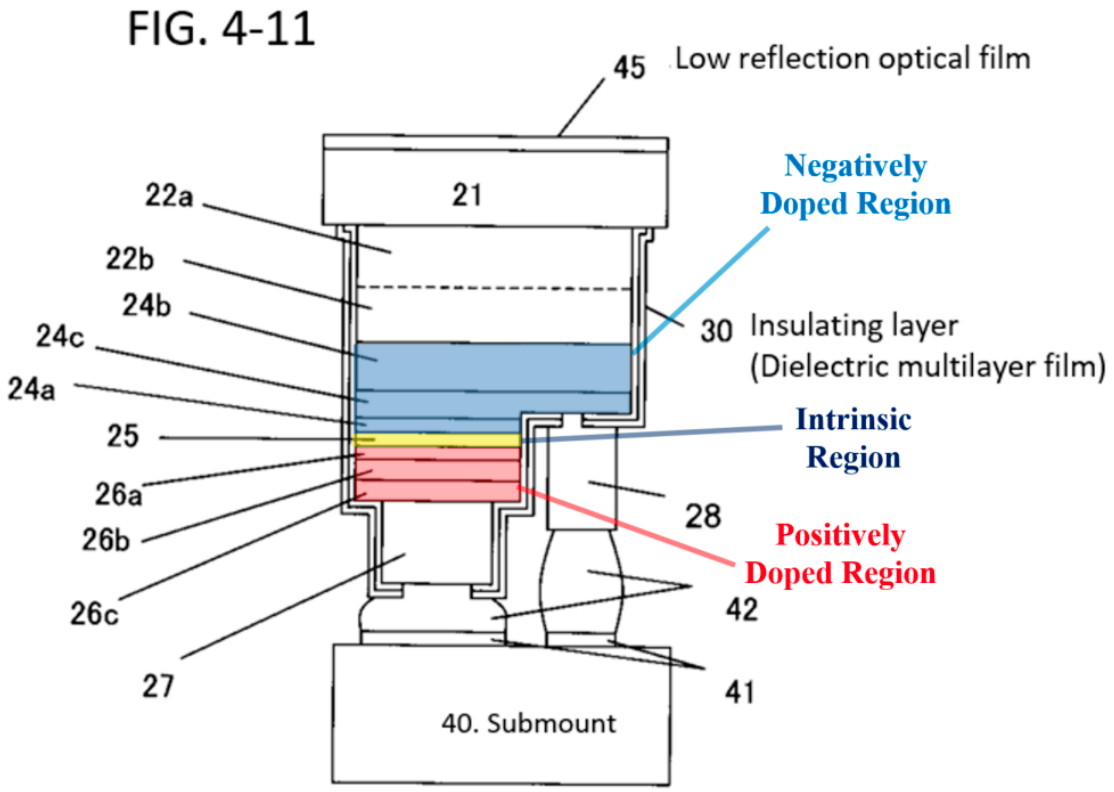
Horie further discloses that the submount 40 of the light emitting element in figure 4-11 above can be mounted on a main support body 100 like that shown in figure 11 below in order to form an integrated light emitting source ("a light emitting device") that includes a plurality of light emitting elements. (*Id.*, ¶¶[0712], [0715], FIG. 11.)

FIG. 11



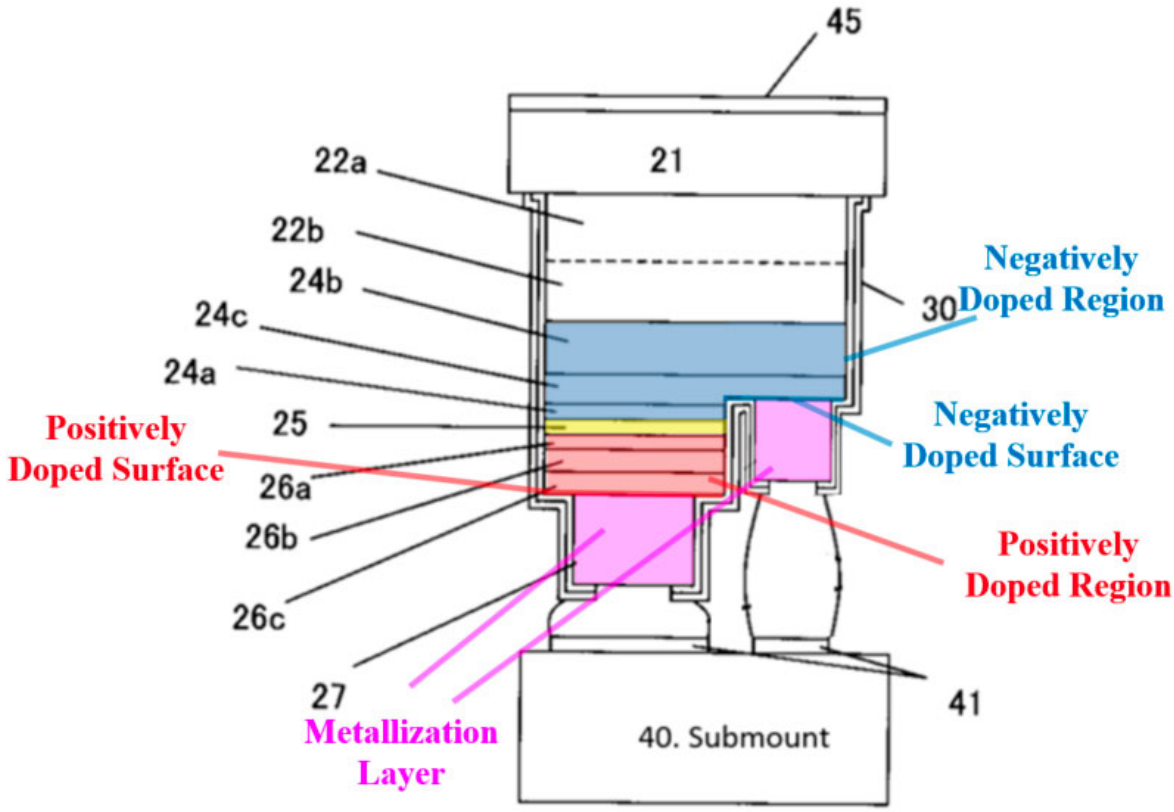
(*Id.*, FIG. 11.)

Horie discloses a semiconductor LED including a positively-doped region, an intrinsic region, and a negatively-doped region, wherein the intrinsic region is between the positively-doped region and the negatively-doped region. For example, Horie discloses that the type C light emitting element shown in figure 4-11 includes p-type layers 26a-26c that are a "positively-doped region," n-type layers 24a-24c that are a "negatively-doped region," and active layer structure 25 that is an undoped "intrinsic region." (*Id.*, ¶[0883].) Therefore, Horie explicitly discloses the "intrinsic layer" and "intrinsic region" that the Board determined was not disclosed or suggested by the combinations including Sugizaki in IPR2021-01491 and IPR-2021-01479.



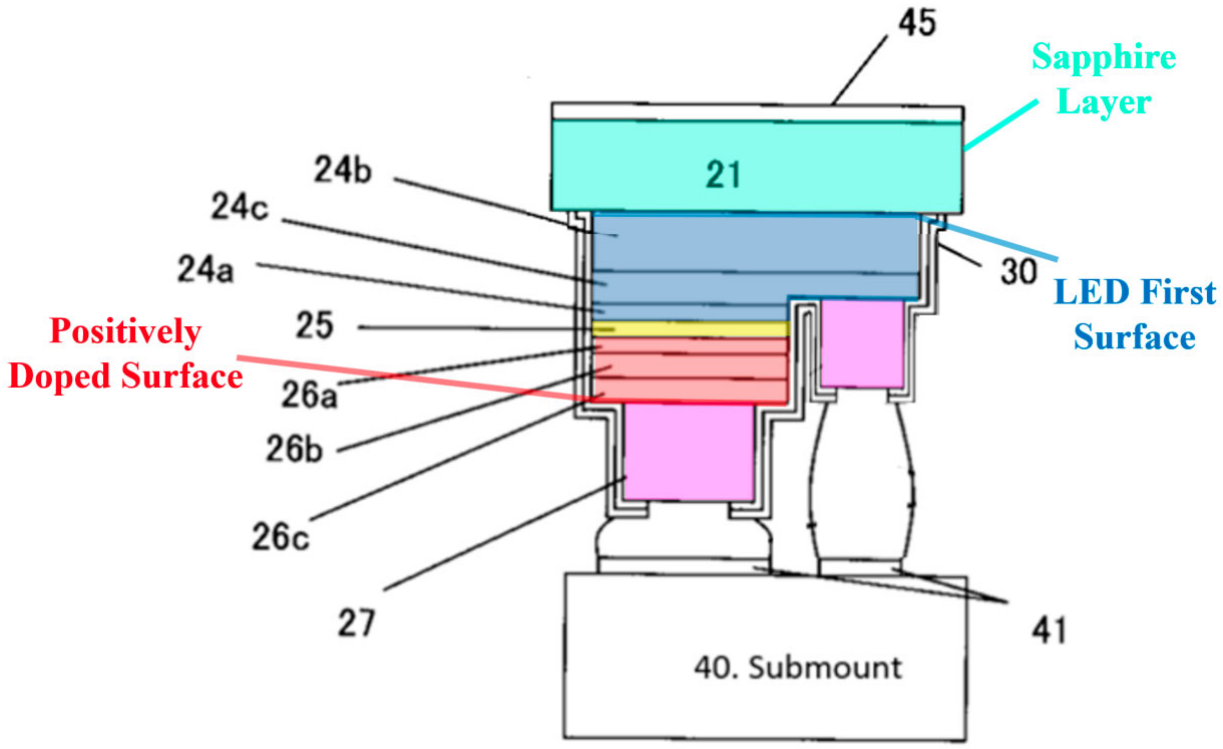
(*Id.*, FIG. 4-11 (annotated); Ex. PA-DEC, ¶45.)

Horie discloses a p-side electrode 27 and an n-side electrode 28 that are formed of metal. For example, Horie discloses that both electrodes can be formed of the same metal, molybdenum (Mo). (Ex. PA-1, ¶¶[0183], [0187], [0659], [0674], [0685]-[0686].) As discussed in claim chart CC-1, in view of Izumino, a POSITA would have found it obvious to form the electrodes ("metallization layer") in an LED like that disclosed by Horie simultaneously in order to reduce the number of steps required to produce the LED devices. (*See* Ex. CC-1, claim element 1[b].) As also discussed in claim chart CC-1, when the electrodes are formed simultaneously in the Horie-Izumino combination, a POSITA would have found it obvious to form both electrodes in a manner consistent with Horie's teachings regarding formation of the p-side electrode. (*Id.*) The demonstrative below shows the LED device according to the Horie-Izumino combination where the electrodes, which constitute the claimed "metallization layer," have been formed simultaneously in a manner consistent with Horie's p-side electrode. (*Id.*)



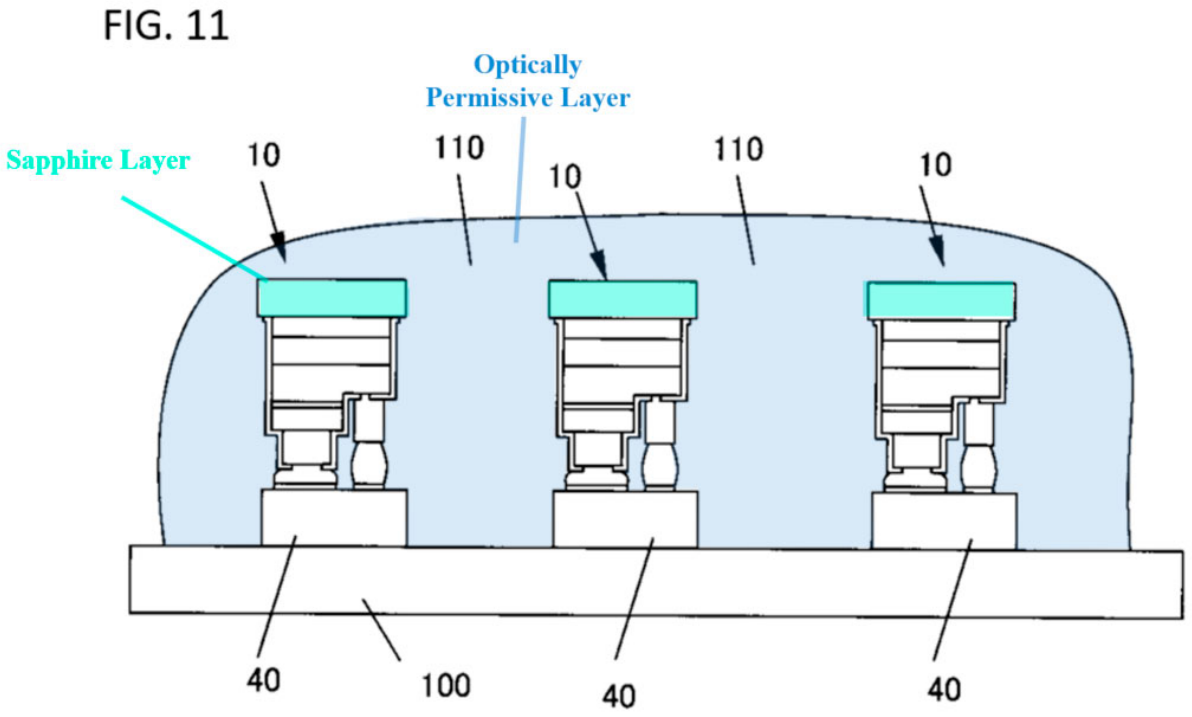
(Ex. PA-DEC, ¶46.)

Horie discloses that the light emitting element illustrated in figure 4-11 is formed on a sapphire substrate 21. (Ex. PA-1, ¶¶[0881], ¶[0882].) Horie also discloses that the buffer layers 22a and 22b shown in the demonstrative above are optional layers that can be omitted. (*Id*., ¶[0709].) The demonstrative below shows the LED of the Horie-Izumino combination without buffer layers 22a and 22b, where the sapphire substrate ("sapphire layer") is in direct contact with a first surface of the LED.



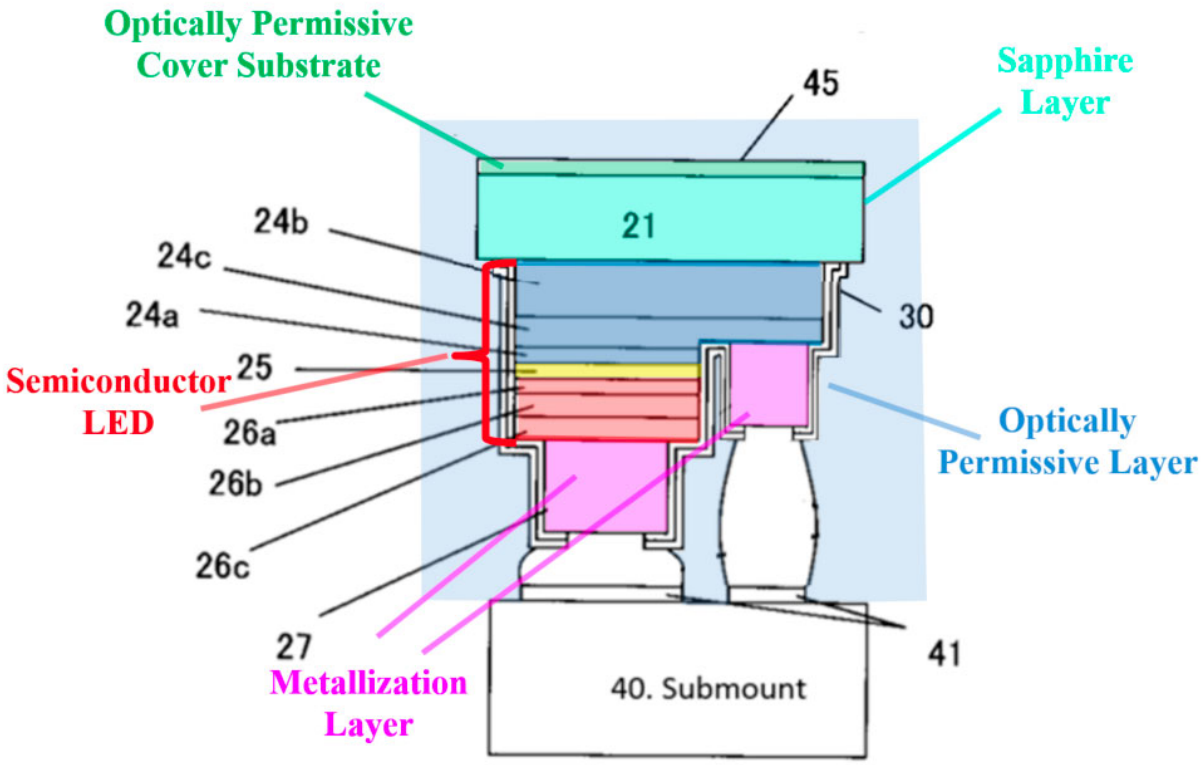
(Ex. PA-DEC, ¶47.)

With respect to the "optically permissive layer" limitation, as shown in annotated Figure 11 of Horie below, light extraction material 110 ("optically permissive layer") is in direct contact with the sapphire substrate ("sapphire layer"). Horie discloses that the light extraction material ("optically permissive layer") has transparency and is therefore "optically permissive." (Ex. PA-1, ¶[0719].) Horie further discloses that the light extraction material contains phosphors that convert the wavelength of the light emitted by the LED, and therefore adjust the frequency of the light that passes through the light extraction material and impinges on the phosphors. (*Id.*, ¶[0780].)



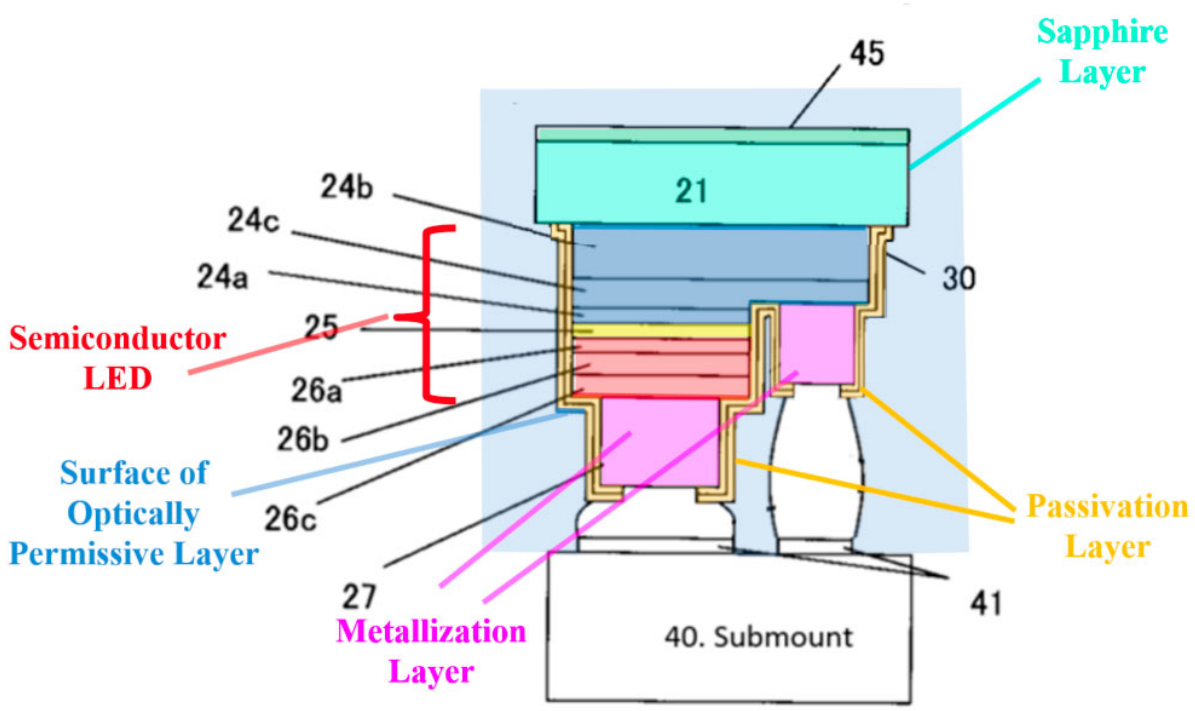
(*Id*., FIG. 11 (annotated); Ex. PA-DEC, ¶48.)

Horie discloses a low reflection optical film 45 ("optically permissive cover substrate") that overlies, and therefore "covers," at least a portion of the semiconductor LED, metallization layer, sapphire layer, and the optically permissive layer. (Ex. PA-1, ¶¶[0133], [0800].) The low reflection optical film 45 ("optically permissive cover substrate") is shown in the demonstrative below corresponding to the Horie-Izumino combination.



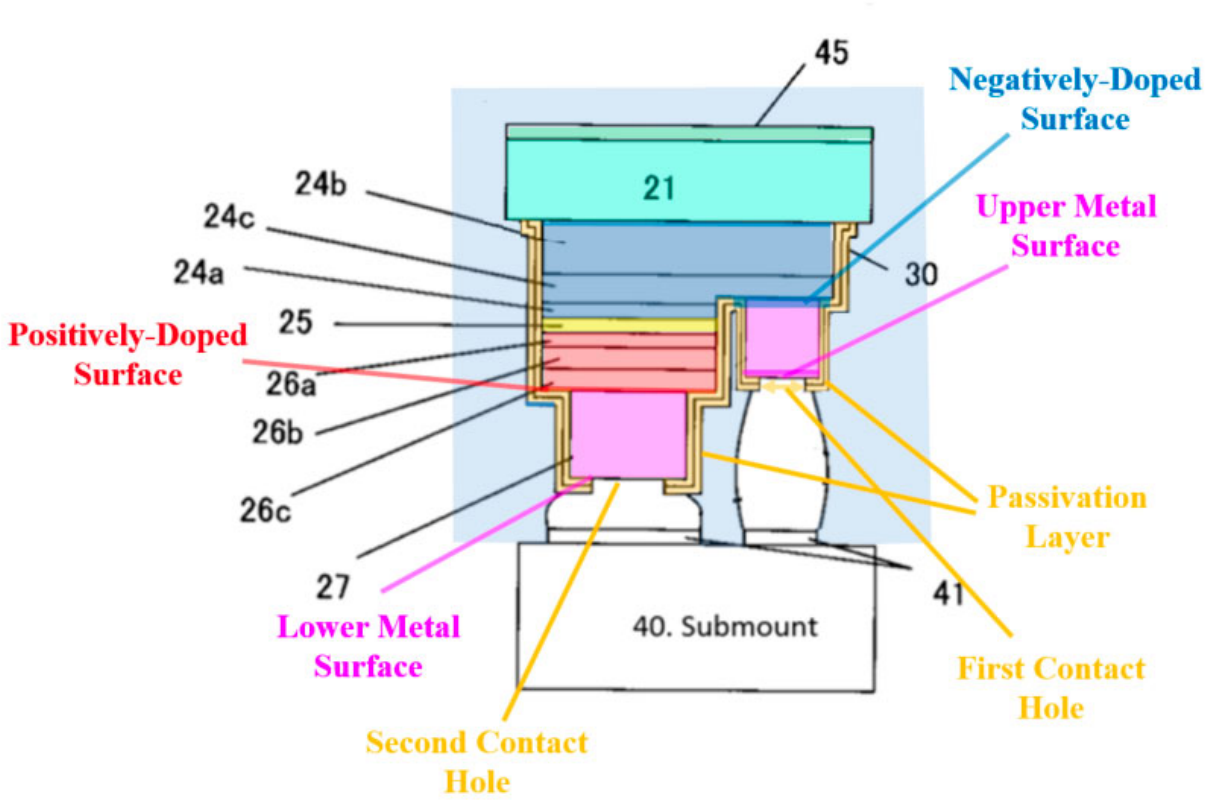
(Ex. PA-DEC, ¶49.)

Horie discloses an insulating layer 30 ("passivation layer") that is used to electrically isolate different aspects of the LED device. (Ex. PA-1, ¶¶[0452], [0921].) As shown in the demonstrative below corresponding to the Horie-Izumino combination, the insulating layer ("passivation layer") is in direct contact with the electrodes ("metallization layer"), the sapphire layer 21, a surface of the light extraction material 110 ("optically permissive layer"), and the semiconductor LED that includes layers 24-26. Therefore, the Horie-Izumino combination discloses or suggests the "passivation layer" recited in the independent claims that the Examiner indicated was not present in the prior art. (*Supra*, Section II; Ex. PAT-B, 74 (Applicant-Initiated Interview Summary).), 49-52 (amended claims 1 and 9), 56-60 (Patent Owner's arguments).)



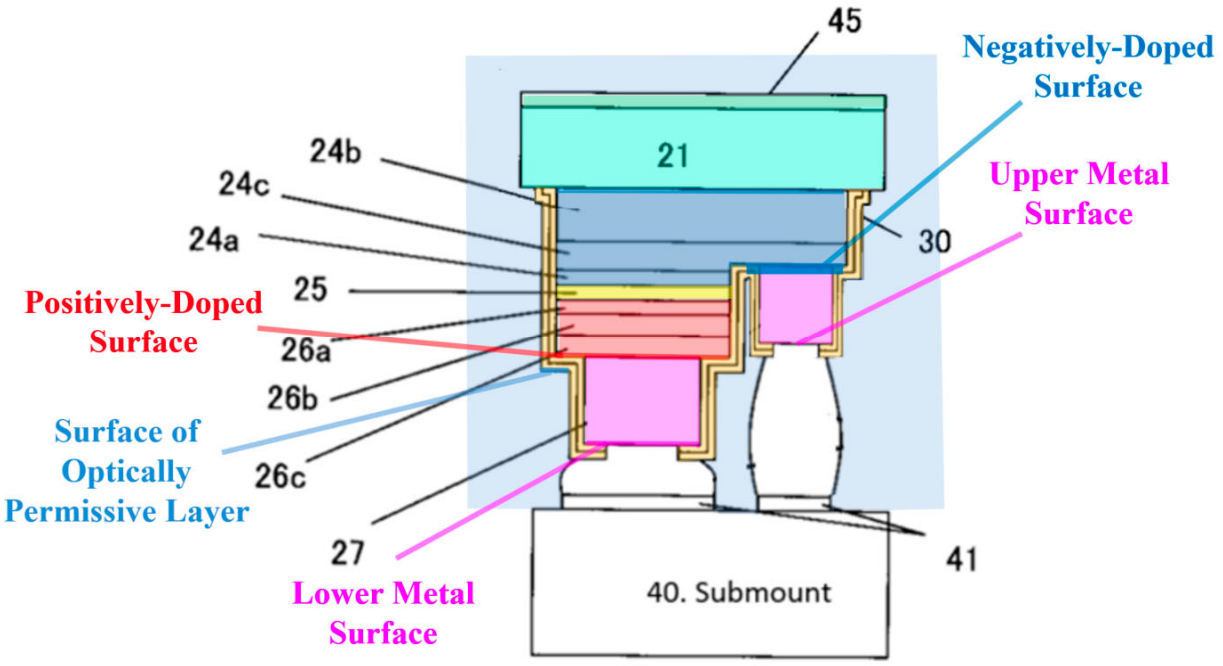
(Ex. PA-DEC, ¶50.)

As shown in the demonstrative below, the insulating layer ("passivation layer") in the Horie-Izumino combination defines first and second contact holes that expose portions of the metallization layer as claimed. The disclosure regarding formation of a contact hole in the insulating layer ("passivation layer") to provide electrical contact with the underlying metallization is consistent with that of the '405 patent, where such a passivation layer is deposited overlying the metal and then holes are cut or etched through the passivation layer in order to expose a portion of the metal. (Ex. PAT-A, 6:47-51 ("Here, contact holes are drilled, in one embodiment by use of a laser, through the passivation layer until reaching the metal pad and silicon substrate. If SiN or SiO2 are used, a plasma etch can also be used to create the contact holes."); Ex. PA-1, ¶[0893] (describing etching to remove a portion of the insulating layer to expose a portion of the p-side electrode).)



(Ex. PA-DEC, ¶51.)

The Horie-Izumino combination discloses or suggests that the upper metal surface, the lower metal surface, the negatively-doped surface, the positively-doped surface, and the surface of said optically permissive layer are parallel with one another. For example, as shown in the demonstrative below, the recited surfaces are horizontal and in parallel with each other.



(Ex. PA-DEC, ¶52.)

Thus, Horie and Izumino raise a substantial new question of patentability with respect to the challenged claims of the '405 patent.

B. SNQ2: Horie in View of Izumino and Camras Discloses or Suggests Claims 1-6 and 16

As explained in attached claim chart CC-2 (Exhibit-CC-2) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Horie in view of Izumino and Camras discloses or suggest the limitations of claims 1-6 and 16 of the '405 patent. (Ex. PA-DEC, ¶53.)

C. SNQ3: Horie in View of Izumino, Camras, and Tanaka Discloses or Suggests Claims 7 and 17

As explained in attached claim chart CC-3 (Exhibit-CC-3) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Horie in view of Izumino, Camras, and Tanaka discloses or suggests the limitations of claims 7 and 17 of the '405 patent. (Ex. PA-DEC, ¶54.)

D. SNQ4: Horie in View of Izumino and Tanimoto Discloses or Suggests Claim 4

As explained in attached claim chart CC-4 (Exhibit-CC-4) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Horie in view of Izumino and Tanimoto discloses or suggests the limitations of claim 4 of the '405 patent. (Ex. PA-DEC, ¶55.)

E. SNQ5: Horie in view of Izumino and Furuyama Discloses or Suggests Claims 1-4 and 8-15

As explained in attached claim chart CC-5 (Exhibit-CC-5) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Horie in view of Izumino and Furuyama discloses or suggests the limitations of claims 1-4 and 8-15 of the '405 patent. (Ex. PA-DEC, ¶56.)

F. SNQ6: Horie in view of Izumino, Furuyama, and Camras Discloses or Suggests Claims 1-6, 8-11, and 16

As explained in attached claim chart CC-6 (Exhibit-CC-6) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Horie in view of Izumino, Furuyama, and Camras discloses or suggests the limitations of claims 1-6, 8-11, and 16 of the '405 patent. (Ex. PA-DEC, ¶57.)

G. SNQ7: Horie in view of Izumino, Furuyama, Camras, and Tanaka Discloses or Suggests Claims 7 and 17

As explained in attached claim chart CC-7 (Exhibit-CC-7) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Horie in view of Izumino, Furuyama, Camras, and Tanaka discloses or suggests the limitations of claims 7 and 17 of the '405 patent. (Ex. PA-DEC, ¶58.)

H. SNQ8: Horie in view of Izumino, Furuyama, Camras, and Tanimoto Discloses or Suggests Claim 4

As explained in attached claim chart CC-8 (Exhibit-CC-8) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Horie in view of Izumino, Furuyama, Camras, and Tanimoto discloses or suggests the limitations of claim 4 of the '405 patent. (Ex. PA-DEC, ¶59.)

I. SNQ9: Horie in view of Izumino, Furuyama, and Tanimoto Discloses or Suggests Claim 4

As explained in attached claim chart CC-9 (Exhibit-CC-9) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Horie in view of Izumino, Furuyama, and Tanimoto discloses or suggests the limitations of claim 4 of the '405 patent. (Ex. PA-DEC, ¶60.)

J. SNQ10: Slater in view of Furuyama and Camras Discloses or Suggests Claims 1-3, 5, 6, and 8-16

As explained in attached claim chart CC-10 (Exhibit-CC-10) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Slater in view of Furuyama and Camras discloses or suggests the limitations of claims 1-3, 5, 6, and 8-16 of the '405 patent. (Ex. PA-DEC, ¶¶61-68.)

1. Overview of the Slater-Furuyama-Camras Combination

Slater discloses a light emitting device. For example, Slater relates to LEDs and methods of manufacturing LEDs, including the LEDs shown in figure 1 and 2 below. (PA-7, ¶¶[0003], [0051].) Slater discloses a semiconductor LED including a positively-doped region, an intrinsic region, and a negatively-doped region, wherein the intrinsic region is between the positively-doped region and the negatively-doped region. For example, Slater discloses such a structure with respect to figure 1, where the Slater's description of the layers in figure 1 is also applicable to figure 2. (*Id*., ¶[0035] ("Like numbers refer to like elements throughout."), ¶[0037] ("FIG. 1 is a cross-sectional view of light emitting diodes according to some embodiments of the present invention.") As shown below, Slater's figure 2 presents a "flip-chip" or upside-down mounted LED device like that depicted in figure 1. (*Id*, ¶¶[0051]-[0052].)

FIG. 1

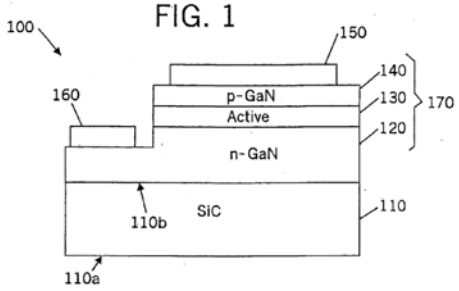
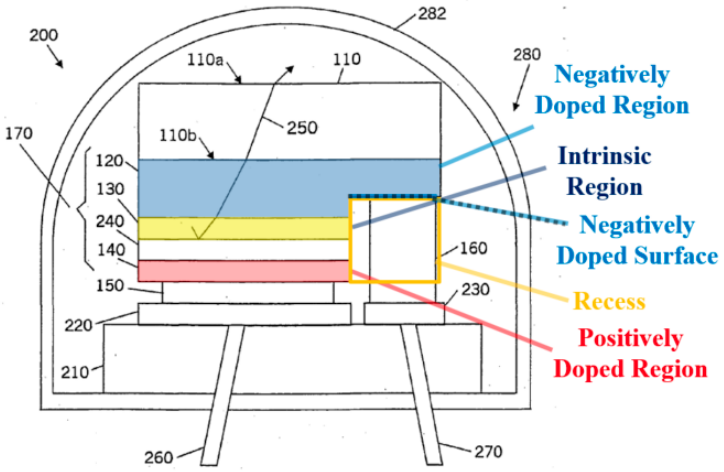


FIG. 2

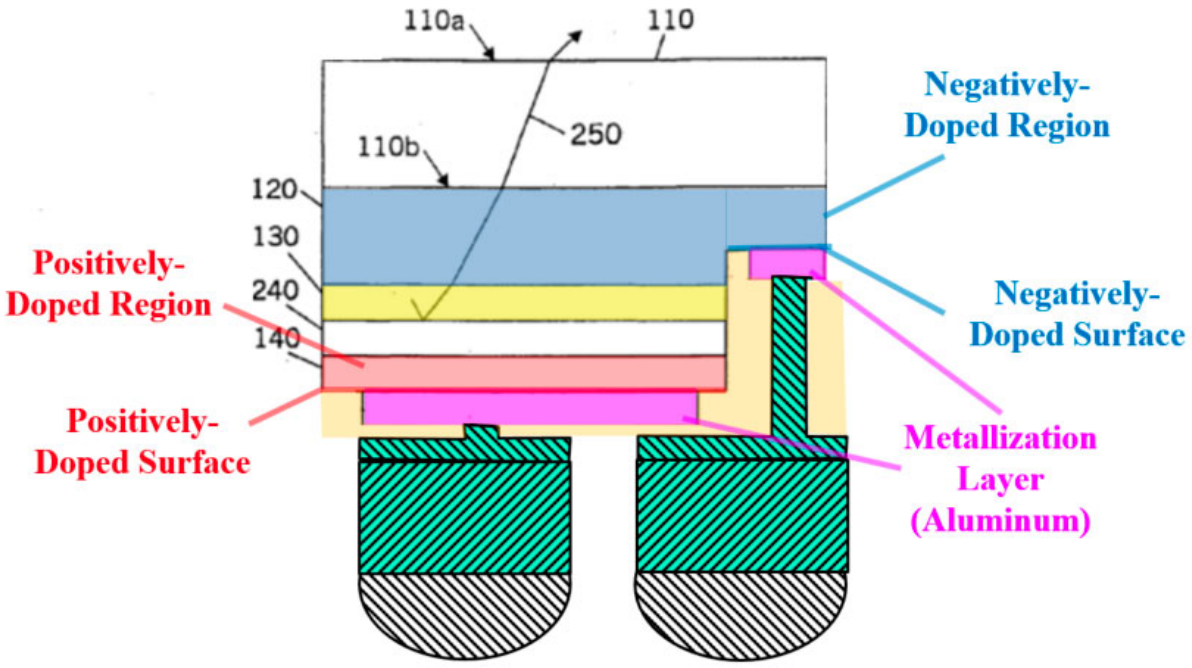


(*Id.*, FIGs. 1, 2 (annotated); Ex. PA-DEC, ¶62.)

Therefore, Slater explicitly discloses the "intrinsic layer" and "intrinsic region" that the Board determined was not disclosed or suggested by the combinations including Sugizaki in IPR2021-01491 and IPR-2021-01479.

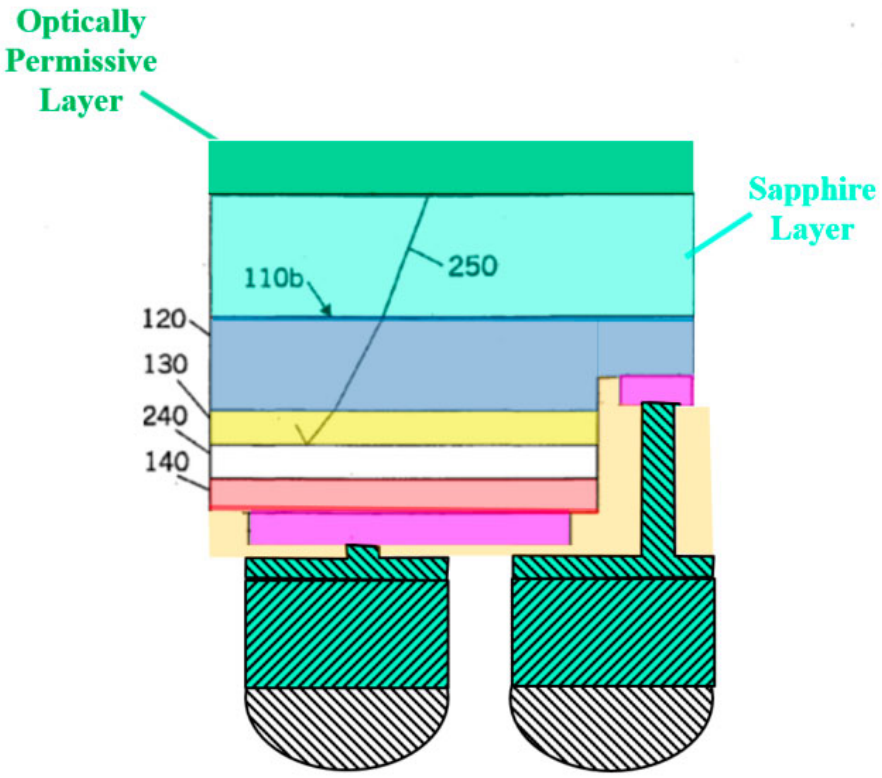
Slater discloses ohmic contacts 150 and 160 that connect to the p- and n-type layers of the LED, where the ohmic contacts are formed from a metal material such as aluminum. (*Id*., ¶[0040].) As discussed in claim chart CC-10, in view of Furuyama, a POSITA would have found it obvious to form the electrodes ("metallization layer") and metal interconnect in an LED like that disclosed by Slater such that the metal interconnect layers have a narrow upper surface and a wider lower

surface. (Ex. CC-10, claim element 1[b].) As taught by Furuyama, by using such interconnect the exposed portion of the n-doped layer of the LED to which contact is made is reduced in size, which allows the light emitting layer 12e to be widened, thereby providing a high level of light output. (Ex. PA-6, ¶¶[0037]-[0039], FIG. 17B.) The demonstrative below shows the LED device of the Slater-Furuyama combination where the electrodes and interconnect to those electrodes has been modified based on the disclosure of Furuyama regarding increasing the size of the light emitting layer.



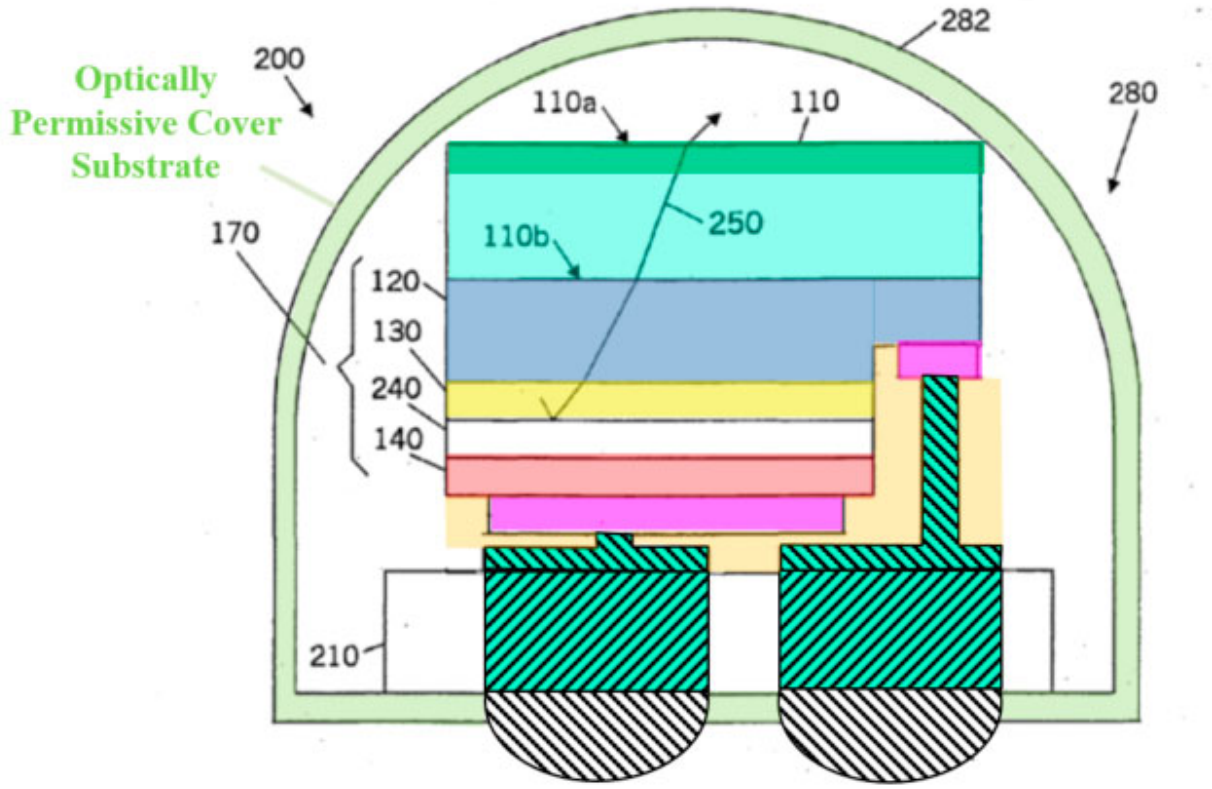
(Ex. PA-DEC, ¶63.)

Slater, which discloses embodiments of the light emitting elements formed on silicon carbide substrates, also discloses that such LEDs can be formed on other substrate materials, including sapphire. (Ex. PA-7, ¶¶[0004], [0036], [0050], [0060], [0086].) As discussed in claim chart CC-10, in view of Camras and Furuyama, a POSITA would have found it obvious to include a phosphor-containing layer ("optically permissive layer") in contact with the sapphire substrate of the Slater-Furuyama LED in order to change the frequency of at least some of the light emitted by the LED. (*See* Ex. CC-10, claim element 1[d].) The demonstrative below corresponds to the Slater-Furuyama-Camras combination, which includes a wavelength converting material layer/fluorescent layer ("optically permissive layer") on the surface of the sapphire substrate.



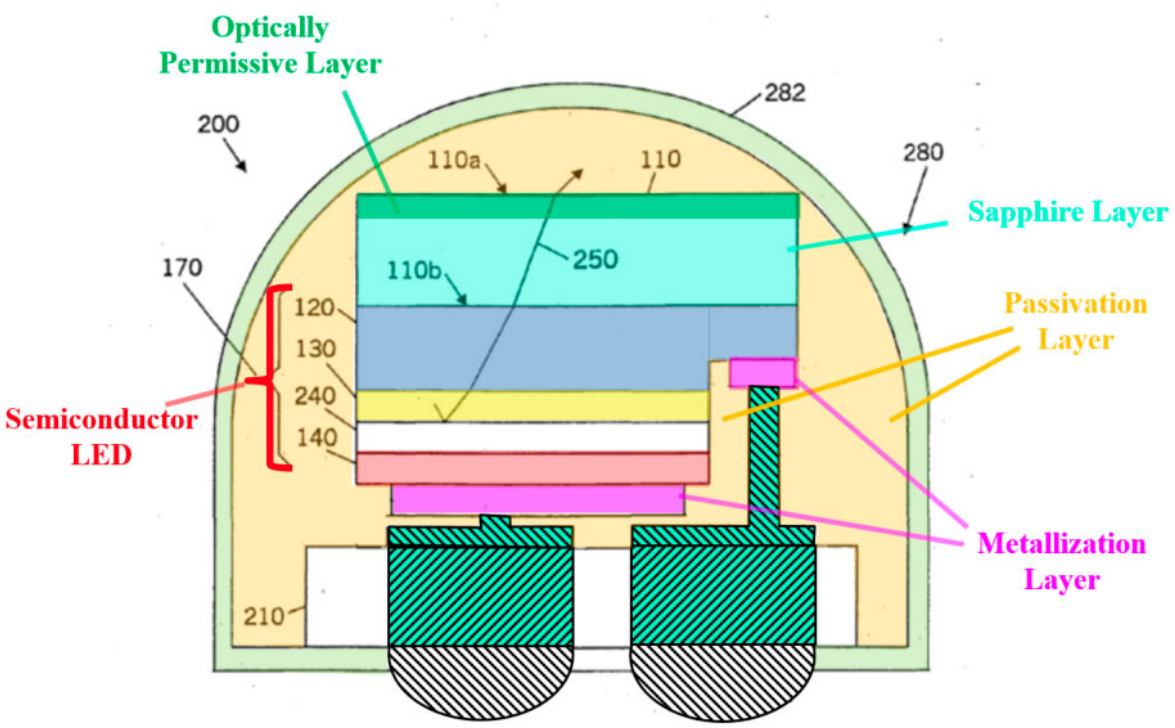
(Ex. PA-DEC, ¶64.)

The Slater-Furuyama-Camras combination discloses or suggests an optically permissive cover substrate that covers at least a portion of the above components. For example, Slater discloses an "optical element such as a window or lens" can be formed on the face of the LED that is on the opposite side of the LED from the mounting support underlying the LED. (Ex. PA-7, ¶[0014].) As shown in the demonstrative below corresponding to the Slater-Furuyama-Camras combination, a lens 282 ("optically permissive cover substrate") covers the LED structure ("covering least a portion of the above components").



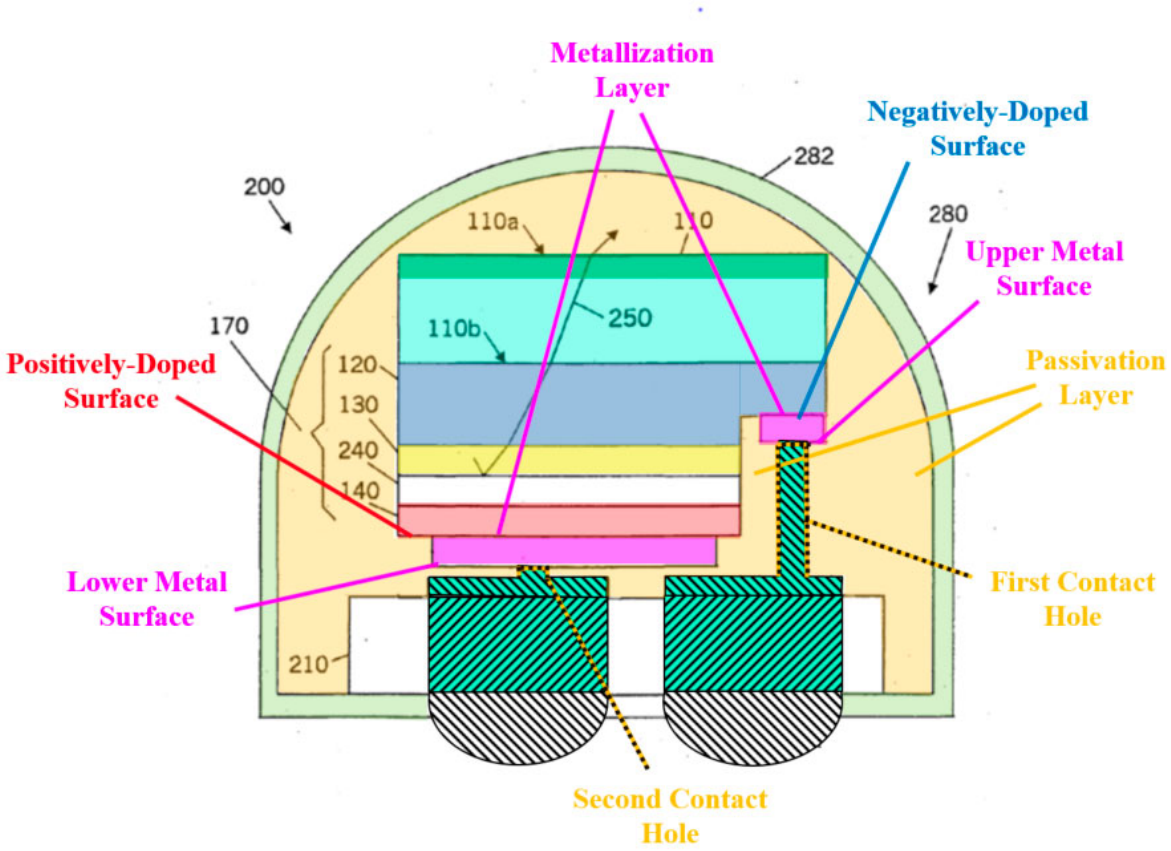
(Ex. PA-DEC, ¶65.)

Slater discloses that the dome structure 280, which can include lens 282, "may comprise plastic, glass and/or other materials and also may include silicone gel and/or other materials therein." (Ex. PA-7, ¶[0055].) Therefore, Slater discloses silicone gel (part of the "passivation layer") surrounding the LED device inside the dome structure 280. As shown in the demonstrative corresponding to the Slater-Furuyama-Camras combination below, the passivation material, which includes the silicone gel inside the dome and the insulating film used in forming the interconnect, is in direct contact with the metallization layer, the sapphire layer, a surface of the optically permissive layer, and the semiconductor LED. Notably, the understanding that two separately-formed materials can together constitute the "passivation layer" is consistent with the broadest reasonable interpretation of the claim language and also consistent with positions that Patent Owner has taken in litigation. (*See* Ex. LIT-5, 13-14 (mapping the passivation layer to the combination of one type of material for contact with the metallization layer, sapphire layer, and LED and another type of material for contact with the optically permissive layer).)



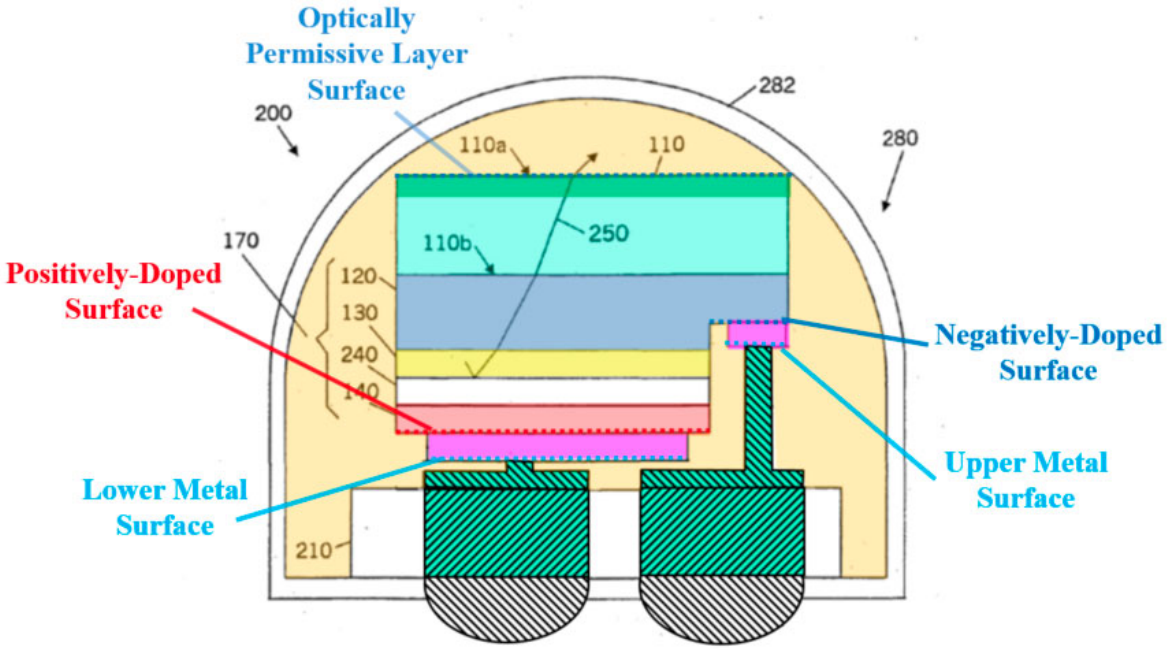
(Ex. PA-DEC, ¶66.)

Moreover, as shown in the demonstrative below, the Slater-Furuyama-Camras combination discloses or suggests that the insulating layer and silicone gel in the dome structure 280 (together the "passivation layer") defines first and second contact holes as recited in claim 1.



(Ex. PA-DEC, ¶67.)

As shown in the demonstrative below, in the LED of the Slater-Furuyama-Camras combination, the upper metal surface, the lower metal surface, the negatively-doped surface, the positively-doped surface, and the surface of said optically permissive layer are parallel with one another. For example, the recited surfaces are horizontal and in parallel with each other.



(Ex. PA-DEC, ¶68.)

Thus, Slater, Furuyama, and Camras raise a substantial new question of patentability with respect to the challenged claims of the '405 patent.

K. SNQ11: Slater in View of Furuyama, Camras, and Tanimoto Discloses or Suggests Claim 4

As explained in attached claim chart CC-6 (Exhibit-CC-6) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Slater in view of Furuyama, Camras, and Tanimoto discloses or suggests the limitations of claim 4 of the '405 patent. (Ex. PA-DEC, ¶69.)

L. SNQ12: Slater in View of Furuyama, Camras, and Tanaka Discloses or Suggests Claims 7 and 17

As explained in attached claim chart CC-7 (Exhibit-CC-7) and in the attached declaration of Dr. Baker (Ex. PA-DEC), Yamada in view of Furuyama, Camras, and Tanaka discloses or suggests the limitations of claims 7 and 17 of the '405 patent. (Ex. PA-DEC, ¶70.)

VII. Detailed Explanation of the Pertinence and Manner of Applying the Prior Art to the Claims

A. Bases for Proposed Rejections of the Claims

The following is a quotation of pre-AIA 35 U.S.C. § 102 that forms the basis for all of the identified prior art:

> A person shall be entitled to a patent unless . . .
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States . . . .
>
> (e) the invention was described in — (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for the purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language . . . .

The following is a quotation of pre-AIA 35 U.S.C. § 103(a) that forms the basis of all of the following obviousness rejections:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negative by the manner in which the invention was made.

The question under 35 U.S.C. § 103 is whether the claimed invention would have been obvious to one of ordinary skill in the art at the time of the invention. In *KSR International Co. v. Teleflex Inc*., 550 U.S. 398 (2007), the Court mandated that an obviousness analysis allow for "common sense" and "ordinary creativity," while at the same time not requiring "precise teachings directed to the specific subject matter of the challenged claim[s]." *KSR*, 550 U.S. at 418, 420-421. According to the Court, "[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *Id.* at 416. In particular, the Court emphasized "the need for caution in granting a patent based on the combination of elements found in the prior art." *Id.* at 401. The Court also stated that "when a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious." *Id.* at 417.

The Office has provided further guidance regarding the application of *KSR* to obviousness questions before the Office.

> If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability. For the same reason, if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

MPEP § 2141(I) (quoting *KSR* at 417.)

The MPEP identifies many exemplary rationales from *KSR* that may support a conclusion of obviousness. Some examples that may apply to this reexamination include:

- Combining prior art elements according to known methods to yield predictable results;
- Simple substitution of one known element for another to obtain predictable results;
- Use of a known technique to improve similar devices in the same way;
- Applying a known technique to improve devices in the same way;
- Choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success ("obvious to try")

MPEP § 2141(III).

In addition, the Office has published *Post-KSR* Examination Guideline Updates. *See* Fed. Reg. Vol. 75, 53464 (the "Guideline Updates"). The Guideline Updates discuss developments after *KSR* and provide teaching points from recent Federal Circuit decisions on obviousness. Some examples are listed below:

> A claimed invention is likely to be obvious if it is a combination of known prior art elements that would reasonably have been expected to maintain their respective properties or functions after they have been combined.

Id. at 53646.

> A combination of known elements would have been prima facie obvious if an ordinary skilled artisan would have recognized an apparent reason to combine those elements and would have known how to do so.

Id. at 53648.

> Common sense may be used to support a legal conclusion of obviousness so long as it is explained with sufficient reasoning.

Id.

B. Proposed Rejections

Pursuant to 37 C.F.R. § 1.510(b)(2), Requester identifies claims 1-17 as the claims for which reexamination is requested. The proposed rejections below, in conjunction with the analysis in Sections IV-VI above and the attached declaration of Dr. Baker (Ex. PA-DEC), provide a detailed explanation of the pertinence and manner of applying the prior art to each of claims 1-17.

1. Proposed Rejection #1

Claims 1-4 and 12 are obvious over Horie and Izumino under 35 U.S.C. § 103(a), as noted above in Section VI.A and the declaration of Dr. Baker provided in Exhibit PA-DEC.

2. Proposed Rejection #2

Claims 1-6 and 16 are obvious over Horie, Izumino, and Camras under 35 U.S.C. § 103(a), as noted above in Section VI.B and the declaration of Dr. Baker provided in Exhibit PA-DEC.

3. Proposed Rejection #3

Claims 7 and 17 are obvious over Horie, Izumino, Camras, and Tanaka under 35 U.S.C. § 103(a), as noted above in Section VI.C and the declaration of Dr. Baker provided in Exhibit PA-DEC.

4. Proposed Rejection #4

Claim 4 is obvious over Horie, Izumino, and Tanimoto under 35 U.S.C. § 103(a), as noted above in Section VI.D and the declaration of Dr. Baker provided in Exhibit PA-DEC.

5. Proposed Rejection #5

Claims 1-4 and 8-15 are obvious over Horie, Izumino, and Furuyama under 35 U.S.C. § 103(a), as noted above in Section VI.E and the declaration of Dr. Baker provided in Exhibit PA-DEC.

6. Proposed Rejection #6

Claims 1-6, 8-11, and 16 are obvious over Horie, Izumino, Furuyama, and Camras under 35 U.S.C. § 103(a), as noted above in Section VI.F and the declaration of Dr. Baker provided in Exhibit PA-DEC.

7. Proposed Rejection #7

Claims 7 and 17 are obvious over Horie, Izumino, Furuyama, Camras, and Tanaka under 35 U.S.C. § 103(a), as noted above in Section VI.G and the declaration of Dr. Baker provided in Exhibit PA-DEC.

8. Proposed Rejection #8

Claim 4 is obvious over Horie, Izumino, Furuyama, Camras, and Tanimoto under 35 U.S.C. § 103(a), as noted above in Section VI.H and the declaration of Dr. Baker provided in Exhibit PA-DEC.

9. Proposed Rejection #9

Claim 4 is obvious over Horie, Izumino, Furuyama, and Tanimoto under 35 U.S.C. § 103(a), as noted above in Section VI.I and the declaration of Dr. Baker provided in Exhibit PA-DEC.

10. Proposed Rejection #10

Claims 1-3, 5, 6, and 8-16 are obvious over Slater, Furuyama, and Camras under 35 U.S.C. § 103(a), as noted above in Section VI.J and the declaration of Dr. Baker provided in Exhibit PA-DEC.

11. Proposed Rejection #11

Claim 4 is obvious over Slater, Furuyama, Camras, and Tanimoto under 35 U.S.C. § 103(a), as noted above in Section VI.K and the declaration of Dr. Baker provided in Exhibit PA-DEC.

12. Proposed Rejection #12

Claims 7 and 17 are obvious over Slater, Furuyama, Camras, and Tanaka under 35 U.S.C. § 103(a), as noted above in Section VI.L and the declaration of Dr. Baker provided in Exhibit PA-DEC.

VIII. Conclusion

For the reasons set forth above, the Requester has established at least one substantial new question of patentability with respect to claims 1-17 of the ’405 patent. The analysis provided in this Request and in the declaration of Dr. Baker (Ex. PA-DEC) demonstrates the invalidity of claims 1-17 in view of prior art that was not substantively considered by the Patent Office. Therefore, it is requested that this request for reexamination be granted and claims 1-17 be cancelled.

As identified in the attached Certificate of Service and in accordance with 37 C.F.R. §§ 1.33(c) and 1.510(b)(5), a copy of this Request has been served, in its entirety, to the address of the attorney of record.

Respectfully submitted,

PAUL HASTINGS LLP

Dated: November 7, 2022

By: /Naveen Modi/
Naveen Modi
Reg. No. 46,224