

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NICHIA CORPORATION,
Petitioner,

v.

DOCUMENT SECURITY SYSTEMS, INC.,
Patent Owner.

Case IPR2018-00965
Patent 7,919,787 B2

Before SALLY C. MEDLEY, SCOTT C. MOORE, and
BRENT M. DOUGAL, *Administrative Patent Judges*.

MEDLEY, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

Nichia Corporation (“Petitioner”)¹ filed a Petition for *inter partes* review of claims 1–14 of U.S. Patent No. 7,919,787 B2 (Ex. 1001, “the ’787 patent”). Paper 2 (“Pet.”). Document Security Systems, Inc. (“Patent Owner”) filed a Preliminary Response. Paper 10 (“Prelim. Resp.”). Upon consideration of the Petition, we instituted an *inter partes* review, pursuant to 35 U.S.C. § 314, as to claims 1–14 based on all challenges set forth in the Petition. Paper 15 (“Decision on Institution” or “Dec.”).²

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 21, “PO Resp.”), and Petitioner filed a Reply to Patent Owner’s Response (Paper 24, “Reply”). Patent Owner elected not to file a Sur-Reply to Petitioner’s Reply. Paper 26; Ex. 3001. Neither party filed a request for oral argument, nor did we hold an oral argument. Paper 26; Ex. 3001.

A. Related Matters

The parties indicate that the ’787 patent is the subject of several court proceedings. Pet. 1; Paper 3, 2. Application 11/838,301, which issued as the ’787 patent, was filed August 14, 2007, as a continuation-in-part of Application 10/608,605 (“the ’605 application”), filed June 27, 2003, which issued as U.S. Patent No. 7,256,486 B2 (“the ’486 patent”). Ex. 1001, at

¹ Petitioner, Nichia Corporation, identifies Nichia America Corporation as a real party-in-interest. Pet. 1.

² Everlight Electronics Co., Ltd. (“Everlight”) joined as a petitioner to this proceeding. IPR2018-01260, Paper 12. Everlight and Document Security Systems, however, entered into a settlement agreement, and we terminated the proceeding with respect to Everlight. Paper 25.

codes (10), (21), (22), (63). The '486 patent is involved in IPR2018-00333, IPR2018-01166, IPR2018-01205, IPR2018-01220, and IPR2018-01225.

B. The '787 Patent³

The Specification of the '787 patent describes a semiconductor device that includes a light emitting semiconductor die mounted on first and second electrically conductive bonding pads. Ex. 1001, 2:6–8. Figure 7B, reproduced below, shows an embodiment of a semiconductor device with a light emitting diode (LED) die.

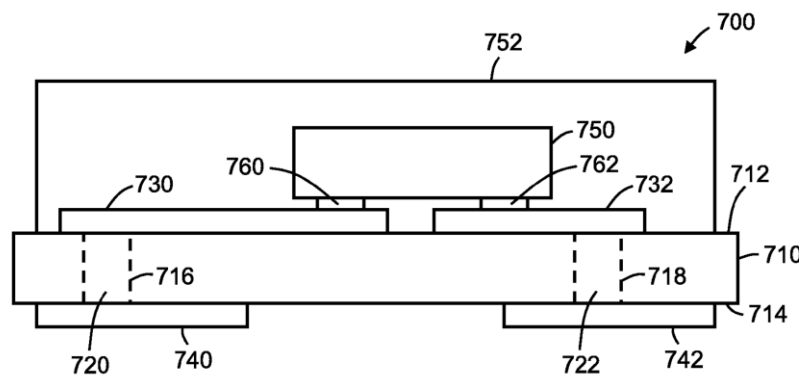


FIG. 7B

Figure 7B, reproduced above, shows a semiconductor device.

³ Petitioner contends, with reasoning and supporting evidence, that the challenged claims of the '787 patent are entitled only to the actual filing date of the '787 patent, and not the filing date of the '605 application. Pet. 4–5 (citing Ex. 1003 ¶¶ 25–34). Patent Owner does not dispute Petitioner's assertions. See PO Resp. Arguments not made in the Patent Owner Response are considered waived. Paper 16, 5. We agree with Petitioner's showing, which we adopt, that the challenged claims of the '787 patent are not entitled to priority to the '605 application.

As seen in Figure 7B, semiconductor device 700 includes substrate 710, interconnecting elements 720 and 722, bonding pads 730 and 732, connecting pads 740 and 742, and LED die 750 with bond pads 760 and 762 on the lower major surface of the LED die. *Id.* at 12:7–9, 12:35–39. Bonding pads 730 and 732 are “located on” upper major surface 712 of substrate 710. *Id.* at 12:21–22. Connecting pads 740 and 742 are located on lower major surface 714 of substrate 710. *Id.* at 12:31–32. Bond pads 760 and 762 are located on the bottom major surface of the LED die and connected to the anode and cathode of the LED die. *Id.* at 12:40–42.

C. Illustrative Claim

Petitioner challenges claims 1–14 of the ’787 patent. Claims 1, 7, and 11 are independent claims. Claim 1 is reproduced below.

1. A semiconductor device comprising:
 - a substantially planar substrate having first and second major surfaces, the first and second major surfaces being opposed surfaces; and
 - a light emitting semiconductor die comprising a top major light emitting surface and an oppositely-disposed bottom major surface, the light emitting semiconductor die having an anode and a cathode on the bottom major surface of the light emitting semiconductor die, the anode and the cathode of the light emitting semiconductor die being electrically connected to first and second electrically conductive bonding pads located on the first major surface, the semiconductor light emitting die being mounted on at least the first electrically conductive bonding pad such that one of the anode and the cathode on the bottom major surface of the light emitting semiconductor die is electrically connected to the first electrically conductive bonding pad;
 - first and second electrically conductive connecting pads located on the second major surface;

a first electrically conductive interconnecting element electrically connected to the first electrically conductive bonding pad and the first electrically conductive connecting pad; and

a second electrically conductive interconnecting element electrically connected to the second electrically conductive bonding pad and the second electrically conductive connecting pad,

wherein the bottom major surface of the light emitting semiconductor die is a bottom surface of a substrate of the die, each of the anode and cathode comprises a metallization layer formed on the bottom major surface of the light emitting semiconductor die.

Id. at 14:7–39.

D. Instituted Grounds of Unpatentability

We instituted trial based on all asserted grounds of unpatentability under 35 U.S.C. as follows (Dec. 5, 31):

References	Basis ⁴	Challenged Claims
Lumbard ⁵ and Weeks ⁶	§ 103(a)	1–14
Lumbard and Wirth ⁷	§ 103(a)	1–14
Lumbard and Negley ⁸	§ 103(a)	1–14

⁴ The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103. Because the ’787 patent has an effective filing date before the effective date of the applicable AIA amendments, we refer to the pre-AIA versions of 35 U.S.C. §§ 102 and 103.

⁵ U.S. Patent No. Re. 36,614, issued Mar. 14, 2000 (Ex. 1006, “Lumbard”).

⁶ U.S. Patent No. 6,611,002, filed Feb. 23, 2001, issued Aug. 26, 2003 (Ex. 1007, “Weeks”).

⁷ WO 2005/081319, filed Feb. 18, 2005, issued Sept. 1, 2005 (Ex. 1008, “Wirth”).

⁸ U.S. Patent Application Publication No. 2004/0217360 A1, filed Apr. 6, 2004, published Nov. 4, 2004 (Ex. 1009, “Negley”).

References	Basis ⁴	Challenged Claims
Ishidu ⁹ and Weeks	§ 103(a)	1 and 5–7
Ishidu and Wirth	§ 103(a)	1 and 5–7
Ishidu and Negley	§ 103(a)	1 and 5–7
Ogawa ¹⁰ and Weeks	§ 103(a)	1–14
Ogawa and Wirth	§ 103(a)	1–14
Ogawa and Negley	§ 103(a)	1–14

II. ANALYSIS

A. Principles of Law

To prevail in its challenge to Patent Owner’s claims, Petitioner must demonstrate by a preponderance of the evidence¹¹ that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person having ordinary skill in the art. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the

⁹ U.S. Patent Application Publication No. 2006/0198162 A1, filed Mar. 15, 2004, published Sept. 7, 2006 (Ex. 1010, “Ishidu”).

¹⁰ U.S. Patent Application Publication No. 2006/0113906 A1, filed Nov. 29, 2005, published June 1, 2006 (Ex. 1011, “Ogawa”).

¹¹ The burden of showing something by a preponderance of the evidence simply requires the trier of fact to believe that the existence of a fact is more probable than its nonexistence before the trier of fact may find in favor of the party who carries the burden. *Concrete Pipe & Prods. of Cal., Inc. v. Constr. Laborers Pension Tr. for S. Cal.*, 508 U.S. 602, 622 (1993).

prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective indicia of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill

In determining the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citation omitted). Petitioner relies on the testimony of Dr. James R. Shealy, who testifies that a person with ordinary skill in the art “would have had at least a B.S. in mechanical or electrical engineering or a related field, and four years’ experience designing LED packages.” Pet. 9 (citing Ex. 1003 ¶¶ 22–24). Patent Owner does not propose a definition. PO Resp.

For purposes of this Decision, we adopt Dr. Shealy’s assessment of a person with ordinary skill in the art. We further note that the prior art of record in the instant proceeding reflects the appropriate level of ordinary skill in the art. *Cf. Okajima v. Bourdeau*, 261 F.3d 1350, 1354–55 (Fed. Cir. 2001) (holding the Board may omit specific findings as to the level of ordinary skill in the art “where the prior art itself reflects an appropriate level and the need for testimony is not shown”).

C. Claim Construction

In an *inter partes* review filed before November 13, 2018, we construe claim terms in an unexpired patent according to their broadest reasonable construction in light of the specification of the patent in which

they appear. 37 C.F.R. § 42.100(b) (2017); *see* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018). Consistent with the broadest reasonable construction, claim terms are presumed to have their ordinary and customary meaning as understood by a person of ordinary skill in the art in the context of the entire patent disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

“surface” or “major surface”

Independent claims 1, 7, and 11 recite “a light emitting semiconductor die¹² comprising *a top major light emitting surface* and an oppositely-disposed *bottom major surface*” (emphases added). Claim 1 also recites “wherein the bottom major surface of the light emitting semiconductor die is *a bottom surface of a substrate of the die*” (emphasis added). Petitioner proposes that the “top major light emitting surface” means “of the two largest faces of the LED, the face through which light is emitted.” Pet. 11–12. Petitioner further proposes that “an oppositely-disposed bottom major surface” means “of the two largest faces of the LED, the face opposite the light emitting face.” *Id.* at 12–13. Lastly, Petitioner argues that “wherein the bottom major surface of the light emitting semiconductor die is a bottom surface of a substrate of the die” means that “the face of the LED opposite

¹² Petitioner refers to the “light emitting semiconductor die” as an LED. *See, e.g.*, Pet. 5 n.2. Patent Owner refers to the claimed “light emitting semiconductor die” as an “Led,” “LED die,” or “LED die substrate.” *See, e.g.*, PO Resp. 6 n.5, 7, 9. In this Decision, we refer to the claim language phrase “light emitting semiconductor die” or LED as a short hand for that phrase.

the light emitting face is on the substrate side of the LED.” *Id.* at 13.

Petitioner argues that the ’787 patent and the prosecution history supports the understanding that the above-recited major surfaces refer to geometric orientation. *Id.* at 11–13; Reply 5, 12.

Patent Owner argues that Petitioner incorrectly interprets the major surfaces of the LED to be synonymous with the largest faces of the LED. PO Resp. 19–20. Relying on the cross-examination testimony of *Petitioner’s expert*, Dr. Shealy, Patent Owner argues that “surface” “requires the presence of a ‘mathematical plane’ and not simply a ‘face’ as alleged by Petitioner[.]” *Id.* at 21–22 (citing Ex. 2008, 139:11–21). We understand Patent Owner to further define “major surface” or “surface” as claimed to mean a single planar, continuous, and unbroken physical material. *Id.* at 31 n.11 (arguing that “[t]reating a set of smaller surfaces together to constitute a ‘major surface’ is illogical and fails to give meaning to the claim term, ‘major surface’”), 34 (asserting that it is error to consider “the many different non-contact and contact surfaces along the optoelectric component’s backside, despite their geometric arrangements, as a ‘bottom major surface’”); Reply 4. For the following reasons, we do not adopt Patent Owner’s proposed construction and otherwise need not construe the disputed terms.

The claims themselves do not define the “top major light emitting surface,” or the “oppositely-disposed bottom major surface,” of the LED, or the “bottom surface of a substrate of the die” to be a mathematical plane (a single planar, continuous, and unbroken physical material). Patent Owner does not discuss the Specification of the ’787 patent at all in support of its narrow claim construction for “surface.” *See generally* PO Resp. The

Specification of the '787 patent does not define the “top major light emitting surface,” “oppositely-disposed bottom major surface,” or “bottom surface of a substrate of the die” as a single planar, continuous, and unbroken physical material. The Specification of the '787 patent does describe that “[t]he light emitting semiconductor die has an anode and a cathode on a bottom major surface of the light emitting semiconductor die” and that “the anode . . . is electrically connected to the first electrically conductive bonding pad and the cathode . . . is electrically connected to the second electrically conductive bonding pad.” Ex. 1001, 2:58–66. Specific details of the LED, however, or how the respective anode and cathode are connected, or formed, on the bottom major surface of the LED are not shown or described. *See, e.g., id.* at 5:22–25, 8:35–38,¹³ 12:35–42 (describing an embodiment where a cathode and an anode are located on the bottom major surface of the LED die, but not describing the details of how the anode and cathode are connected, or formed, on the bottom of the LED); Reply 7.

Independent claims 1, 7, and 11 further recite a different element having a first and second major surface, e.g., “a substantially planar *substrate*” that has “first and second major surfaces” (emphasis added). The Specification of the '787 patent describes at least one of the major surfaces of the substantially planar substrate, upon which the LED is mounted, as a single surface, despite through holes 716 located in that surface. *See, e.g.,* Ex. 1001, 9:16–18 (“The substrate is substantially planar, has opposed major

¹³ We agree with Petitioner that the only description of a die’s basic structural makeup are found in columns 5 and 8, which descriptions are directed to embodiments where the *cathode and anode are on opposite surfaces of the light emitting semiconductor die*, which is not claimed. *See, e.g.,* Ex. 1001, 5:22–67, 8:35–52; Reply 7 n.2.

surfaces, and includes a through hole extending between the major surfaces”). For example, and with respect to Figure 7B illustrated above, the Specification of the ’787 patent describes 712 as an upper major surface of substrate 710 and 714 as a lower major surface of substrate 710. *Id.* at 12:21–22, 12:31–32. As seen in Figure 7B above, through holes 716 and 718 disrupt the continuity of top and bottom surfaces 712 and 714 of substrate 710. Nonetheless, the Specification of the ’787 patent consistently refers to the top and bottom of the substrate as “major surfaces.” *Id.* at 3:63–4:18, 12:6–38, Figs. 1B, 2B, 7B; Reply 5–6. We agree with Petitioner that the ’787 patent’s description of the major surfaces of the substrate would have been instructive to a person having ordinary skill in the art at the time of the invention regarding the meaning of the major surfaces of the LED. Reply 5–7 (citing *Rexnord Corp. v. Laitram Corp.*, 274 F.3d 1336, 1342 (Fed. Cir. 2001) for the proposition that a claim term “should be construed consistently with its appearance in other places in the same claim or in other claims of the same patent”).

In arguing against Patent Owner’s proposed narrow construction for the surfaces of the LED, Petitioner contends that semiconductor die 750 (Figure 7B) appears as a black box, not because it literally has six totally smooth sides made of unitary material, but because a person having ordinary skill in the art at the time of the invention would have understood the various ways in which the die would have been formed. *Id.* at 7. Petitioner argues that a person having ordinary skill in the art would have understood that the claimed die substrate must include a via into the die to work. *Id.* at 8. In support of the assertion, Petitioner directs attention to Dr. Shealy’s

testimony discussing the Specification of the '787 patent, reproduced as follows:

Q. . . . So the anode and cathode would be some part of 750 that's in contact with 760 or 762 – is that right?

. . . .

A. [Dr. Shealy] What's not shown here is one of those – depending on the kind of die it is, one of those – either 760 or 762 has to have a connection to – depending upon the orientation of the die, the top N or P type layer. So there has to be a via in here to make this function. But this patent is silent on the details of the die. But as it's drawn here, you know, the die is just a black box. They're not showing any detail on how to actually achieve getting electrodes on the bottom major surface. But, of course, in defense of the patent, the inventors did say this was a well-known art, so that's a – why I guess they didn't focus at all on it.

Ex. 2008, 170:20–171:20; *see also id.* at 172:11–22. Dr. Shealy's testimony stands unrebutted¹⁴ and is reasonable and consistent with the prior art of record. *See, e.g.*, Exs. 1007–1009. We give the above testimony substantial weight that a person having ordinary skill in the art at the time of the invention would have understood that the LED described in the Specification of the '787 patent would have had a via into the die to work.

Lastly, Patent Owner fails to direct us to anything in the prosecution history of the '787 patent in support of its construction, and we find none. Rather, the statements made by the then applicant confirm that it was not necessary to show the details of the black box 750, for example, because a

¹⁴ Although given the opportunity, Patent Owner choose not to (1) cross-examine Dr. Shealy on the above testimony; (2) provide its own declarant to aver otherwise; or (3) file a Patent Owner Sur-Reply. Paper 16, 4, 6; Paper 26, 2.

person having ordinary skill in the art would have “known . . . [how] to construct a light emitting semiconductor die with an anode and cathode on one surface of the semiconductor die and a light emitting surface on the opposite surface of the semiconductor die” and that it was “well within the knowledge of one of ordinary skill in the art to construct a light emitting semiconductor die as claimed.” Ex. 1002, 146.

Patent Owner has not directed attention to where in either the Specification of the '787 patent or the file history of the '787 patent, there is support for such a narrow construction of the term “major surface” of the LED. Patent Owner relies solely on the testimony of Petitioner’s expert, Dr. Shealy, in support of its argument that “surface” must be a mathematical plane. PO Resp. 21–22. The passage that Patent Owner relies on in support of its proposed construction is as follows:

Q: -- for the record. So how would a person of ordinary skill in the art on August 14, 2007, have understood the term “surface”?

MR. COLSHER: Objection to form.

[Dr. Shealy]: Well, in the context -- if I can add a slight restriction, the context that’s used here, the surface would be a plane.

BY MR. JACKSON: Q: Okay.

A: A mathematical plane.

Ex. 2008, 139:11–21.

We do not find that the above statement outweighs all of the other evidence before us against Patent Owner’s narrow construction. In particular, Dr. Shealy also testified that a surface can be a face, referring to the geometric orientation of a surface. Ex. 2008, 139:22–145:21, 169:2–

177:7; Ex. 1003 ¶¶ 48–54. He testified that “[f]ace’ seems to fit the way ‘surface’ is used in this patent pretty well. That’s why it was done.” Ex. 2008, 145:19–21. Dr. Shealy’s statement, quoted above, does not outweigh all of the other evidence already discussed: (1) the Specification of the ’787 patent and the usage of the term “major surface”; (2) the prosecution history statements made by then applicant; and (3) the totality of Dr. Shealy’s unrebutted testimony explaining that the term “surface” as used in the claims (e.g., “top major light emitting surface” and “oppositely-disposed bottom major surface”) means a geometric orientation. Ex. 1003 ¶¶ 48–54. When we evaluate all record evidence before us, we disagree with Patent Owner that “surface” means a continuous, smooth, unbroken mathematical plane. For purposes of this Decision, we need not further construe the phrases “top major light emitting surface,” “an oppositely-disposed bottom major surface,” or “wherein the bottom major surface of the light emitting semiconductor die is a bottom surface of a substrate of the die.”

“formed on”

Independent claims 1, 7, and 11 include “wherein the bottom major surface of the light emitting semiconductor die is a bottom surface of a substrate of the die, each of the anode and cathode comprises a metallization layer *formed on* the bottom major surface of the light emitting semiconductor die” (emphasis added). We preliminarily construed the term “formed on” to mean directly or indirectly formed on. Dec. 6–7. Patent Owner disagrees with our interpretation, while Petitioner agrees with it. See, e.g., PO Resp. 23, 28, 31–32; Reply 13–16.

In essence, Patent Owner argues that the term “formed on” means directly formed on. *See, e.g.*, PO Resp. 28, 31, 34. Patent Owner, however, fails to direct attention to record evidence in support of its proposed construction. Petitioner argues that “formed on” includes both direct and indirect formation and provides evidence in support of its proposed construction. Reply 16 (citing Ex. 1001, 5:30–35, 7:4–12, 9:19–21, 10:11–37, 11:11–21; Ex. 1007, 4:11–15; Ex. 1009 ¶ 20; Ex. 2008, 169:2–177:7). Patent Owner provides us no reason, supported by record evidence, to interpret “formed on” to mean directly formed on. For purposes of this Decision, we agree with and adopt Petitioner’s showing, supported by record evidence, that “formed on” is not limited to directly formed on. For example, the Specification of the ’787 patent describes various elements being “formed on” another element in the context of how the element is “formed,” but does not otherwise specify that the element be directly formed on another element. *See, e.g.*, Ex. 1001, 10:24–37. Further, we give substantial weight to Dr. Shealy’s testimony that “formed on” must include indirectly formed on for the claimed device to work. Ex. 2008, 169:2–177:7. Lastly, the prior art of record supports the interpretation of “formed on” to include both direct and indirect formation. Ex. 1007, 4:11–15; Ex. 1009 ¶ 20. Accordingly, we agree with Petitioner that “formed on” includes both direct and indirect formation.

For purposes of this Decision, we need not expressly construe any other claim term. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that “only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean*

Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs.* in the context of an *inter partes* review).

D. Discussion of Patent Owner's Arguments Regarding SAS

Patent Owner argues that Petitioner failed to establish a “reasonable likelihood” of showing unpatentability of any challenged claim based on the grounds relying on *Negley*, and that in order for the Board to be in compliance with statutory authority, as interpreted by *SAS Institute Inc. v. Iancu*, 138 S. Ct. 1348 (2018), and the Board’s regulations, the proceeding should be dismissed without a final written decision. PO Resp. 8–10. In essence, Patent Owner repeats its arguments made in its Preliminary Response. Prelim. Resp. 18–19. We still are not persuaded by such arguments and reiterate our reasoning provided in the Decision on Institution. Dec. 8–9.

On April 24, 2018, the Supreme Court held that a decision to institute under 35 U.S.C. § 314 may not institute on fewer than all claims challenged in the petition. *SAS*, 138 S. Ct. 1348. *SAS* requires the Board, when instituting, to institute review of all claims in a petition after determining there is a reasonable likelihood that at least one of the claims challenged is unpatentable. *Id.* at 1356. In *SAS*, the Supreme Court, interpreting 35 U.S.C. § 314, held that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged.” *Id.* at 1359–60.

Title 35, section 314(a), directs, in relevant part, that “[t]he Director may not authorize an *inter partes* review to be instituted unless the Director determines that the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the

petition.” The Supreme Court determined that “Section 314(a) does not require the Director to evaluate every claim individually. Instead, it simply requires a decision whether the petitioner is likely to succeed on ‘at least 1’ claim.” SAS, 138 S. Ct. at 1356. The Court explained: “[o]nce that single claim threshold is satisfied, it doesn’t matter whether the petitioner is likely to prevail on any *additional* claims; the Director need not even consider any other claim before instituting review.” *Id.* (emphasis in original). Further, the Court emphasized: “Rather than contemplate claim-by-claim institution . . . the language [of section 314(a)] anticipates a regime where a reasonable prospect of success on a single claim justifies review of all.” *Id.* The Supreme Court’s interpretation of the law in SAS controls the Decision on Institution. Patent Owner does not address the Supreme Court’s instructions in SAS concerning institution decisions and why we should dismiss the *inter partes* review without a final written decision. See PO Resp. 9. In particular, Patent Owner has not provided any persuasive justification for why we should interpret rule 42.108(c) in a manner that would be inconsistent with SAS.

E. Asserted Obviousness of Claims 1–14 over Lumbard and Wirth

Petitioner contends claims 1–14 are unpatentable under 35 U.S.C. § 103(a) as obvious over Lumbard in view of Wirth. Pet. 16–56.¹⁵ In

¹⁵ It is clear that this is a separate challenge. In other words, Petitioner is not relying on the combined teachings of Lumbard, Weeks, Wirth, and Negley. See, e.g., Pet. 3–4, 16 (“Grounds 1–3: Lumbard, in view of Weeks, Wirth, or Negley, renders obvious claims 1–14” (some emphasis omitted)). For purposes of this Decision we focus on the second challenge: Lumbard in view of Wirth. See, e.g., Pet. 3 (Ground 2).

support of its showing, Petitioner relies upon the Declaration of Dr. James R. Shealy. *Id.* (citing Ex. 1003).

1. Lumbard

Lumbard describes a method of manufacturing electro-optical components. Ex. 1006, 1:9–11. Figure 1 of Lumbard is reproduced below.

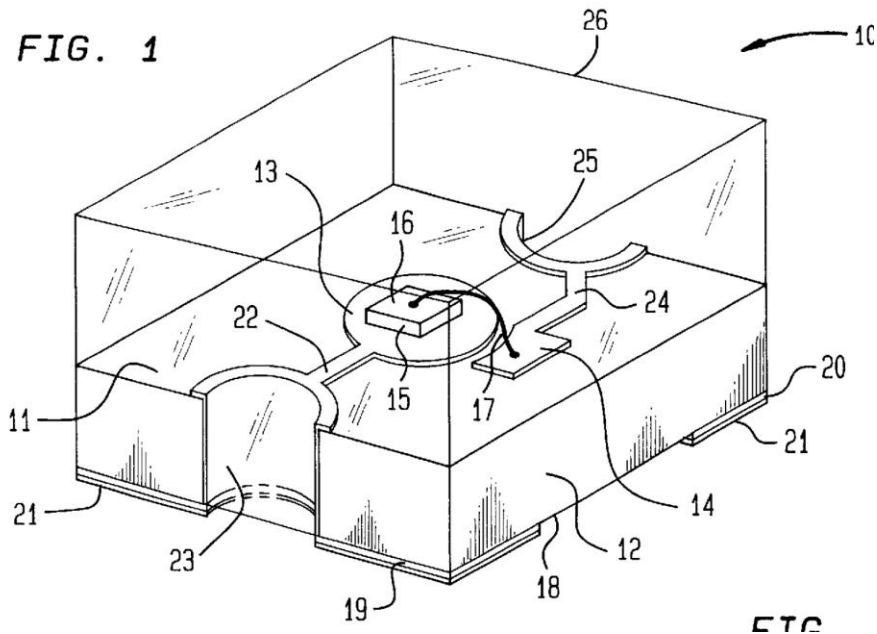


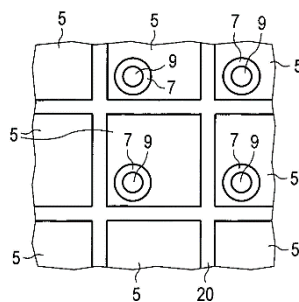
Figure 1 of Lumbard shows a modular compact component including an LED.

As seen in Lumbard's Figure 1, a conductive pattern including a land area 13 and a connection pad 14 is deposited on upper side 11 of flat, electrically insulated substrate 12. *Id.* at 2:66–3:4. LED 15 is mounted on land area 13 so that its terminal on the underneath is electrically connected to land area 13. *Id.* at 3:4–7. Upper side of LED 15 includes a terminal 16 that is electrically conductive and connected with the connection pad 14 via bonding wire 17. *Id.* at 3:7–10. Deposited onto backside 18 of substrate 12 is a second conductive pattern with first terminal pad 19 and second terminal

400 comprises a plurality of semiconductor layers. *Id.* Semiconductor function region 2 is surrounded by envelope 4, which is translucent to radiation. *Id.* at 188. Current spreading layer 5 is disposed on semiconductor function region 2 facing away from carrier 3 and includes a radiation-translucent conductive oxide, for example, a transparent conducting oxide (TCO). *Id.* at 188–189. Connecting conductor material 8 is electrically conductively connected to first connection 11. *Id.* at 191. A further insulation material 10a is disposed between first connection 11 and carrier 3. *Id.* Connection 12 is conductively connected to carrier 3. *Id.*

Wirth Figure 4e, reproduced below, shows a top view of the structure from Figure 4d. *Id.* at 211. Semiconductor function regions 3 are covered by current spreading layers 5 and are designed to be substantially square, separated from one another by a contiguous network of spaces 20. *Id.* Cut-outs 9 in the semiconductor function region are substantially circular in this exemplary embodiment and are provided in the regions of the corners of the respective semiconductor function regions. *Id.*

FIG 4E



Wirth Figure 4e shows a top view of the structure from Figure 4d.

3. Discussion

Claim 1 recites a “semiconductor device comprising.” Petitioner contends, and we are persuaded, that Lumbard’s described surface mounted semiconductor package meets the claimed “semiconductor device.” Pet. 16

(citing Ex. 1006, 5:66–67). Claim 1 further recites “a substantially planar substrate having a first and second major surfaces, the first and second major surfaces being opposed surfaces.” Petitioner contends, and we are persuaded, that Lumbard, with reference to Figure 1, describes a flat substrate 12 with an upper side 11 (“first major surface”) and a backside 18 (“second major surface”). Pet. 17 (citing Ex. 1006, 2:64–3:13). Claim 1 further recites “first and second electrically conductive bonding pads located on the first major surface” and “first and second electrically conductive connecting pads located on the second major surface.” We agree with Petitioner’s showing and find that Lumbard describes a first electrically conductive bonding pad (connection pad 14 and connective strip 24), second electrically conductive bonding pad (land area 13 and connective strip 22), first electrically conductive connecting pad (second terminal pad 20), and second electrically conductive connecting pad (first terminal pad 19). Pet. 32–35 (citing Ex. 1006, 3:11–34, Fig. 1; Ex. 1003 ¶¶ 125–129).

Claim 1 further recites “a first electrically conductive interconnecting element” and “a second electrically conductive interconnecting element.” Petitioner contends, and we are persuaded, that Lumbard describes “a first electrically conductive interconnecting element” (plated through groove 25) and “a second electrically conductive interconnecting element” (plated through groove 23). Pet. 35–36 (citing Ex. 1006, Fig. 1; Ex. 1003 ¶ 130).

Patent Owner does not dispute Petitioner’s showing with respect to Lumbard meeting the above claimed elements. *See generally* PO Resp.

Claim 1 further recites “a light emitting semiconductor die comprising a top major light emitting surface and an oppositely-disposed bottom major surface, the light emitting semiconductor die having an anode and a cathode

on the bottom major surface of the light emitting semiconductor die.” Claim 1 also recites “wherein the bottom major surface of the light emitting semiconductor die is a bottom surface of a substrate of the die, each of the anode and cathode comprises a metallization layer formed on the bottom major surface of the light emitting semiconductor die.”

Petitioner contends that although Lumbar discloses LED 15 mounted on land area 13, Lumbar does not expressly describe that LED 15 is configured such that its top is a light emitting surface. Pet. 19. Petitioner also contends that Lumbar does not describe an anode and cathode on the bottom surface of Lumbar’s LED.¹⁷ *Id.* Petitioner argues that during prosecution of the application that matured into the ’787 patent, “applicants admitted that ‘it was known as of the filing date of the [’787 patent application] to construct a light emitting semiconductor die with an anode and cathode on one surface of the semiconductor die and a light emitting surface on the opposite surface of the semiconductor die.’” Pet. 19 (alteration in original) (quoting Ex. 1002, 146; Ex. 1003 ¶ 96). Petitioner also contends that the LED of Wirth meets the claimed LED. *Id.* In particular, Petitioner relies on Wirth’s LED as including a top major light emitting surface and an anode and cathode on an oppositely-disposed bottom major surface of the respective LED, where the bottom surface is a bottom

¹⁷ Patent Owner’s argument, spanning pages 24–26 of its brief, that Lumbar does not disclose the claimed light emitting semiconductor die is not persuasive, because such argument addresses Lumbar individually. Petitioner, however, does not rely on Lumbar alone to meet the recited features of the light emitting semiconductor die. *See In re Keller*, 642 F.2d 413, 426 (CCPA 1981) (“[O]ne cannot show non-obviousness by attacking references individually where, as here, the rejections are based on combinations of references.”).

surface of a substrate of the die. Pet. 22–23, 36. Petitioner provides reasons for substituting Lumbard’s LED with Wirth’s LED and further explains how a person having ordinary skill in the art would have mounted Wirth’s LED onto Lumbard’s substrate to make the claimed connections between the LED and substrate to meet claim element 1[c]. *Id.* at 26–33.

We agree with Petitioner’s showing, and it is not disputed, that Wirth’s LED device having an active zone 400 provided to generate radiation and a current spreading layer 5 that is highly transparent disposed on the active region meets the claim phrase “a top major light emitting surface.” Pet. 22 (citing Ex. 1008, 187–188; Ex. 1003 ¶ 104).

Petitioner further contends that Wirth discloses a cathode (first connection 11, which contains a metallization layer) and anode (second connection 12, which contains a metallization layer) that are on the bottom major surface of die (carrier 3), which is a substrate. Pet. 22, 38–40 (citing Ex. 1008, 187–191, Fig. 1; Ex. 1003 ¶ 104). Notwithstanding Patent Owner’s arguments, which we address below, we find that Wirth discloses a cathode and anode on the bottom major surface of a die (which also is a substrate) as claimed.

Petitioner explains why it would have been obvious to replace Lumbard’s LED with Wirth’s LED. Pet. 26–33. Petitioner contends, and we find, that Wirth itself provides reasons for making the combination. *Id.* at 26. In particular, Wirth explains that its invention “advantageously eliminates the need for an electrical contact that requires the use of a bonding wire” and “[t]he creation of very small components is therefore simplified.” Ex. 1008, 193. As explained by Dr. Shealy, a person having ordinary skill in the art would have understood that Lumbard’s wire-bonded

LED with its top electrode and bond wire would have obscured the light generated by Lumbard's LED. Ex. 1003 ¶ 118. Petitioner contends, and we agree, that it would have been obvious to replace Lumbard's LED with Wirth's LED because Wirth's LED does not suffer from the same disadvantages as Lumbard's LED. Pet. 28 (citing Ex. 1003 ¶ 118). Patent Owner does not dispute that it would have been obvious to combine Lumbard with Wirth. PO Resp. 36.

Nor does Patent Owner dispute that during prosecution, the then applicant admitted that "it was known as of the filing date of the ['787 patent application] to construct a light emitting semiconductor die with an anode and cathode on one surface of the semiconductor die and a light emitting surface on the opposite surface of the semiconductor die." Ex. 1002, 146; PO Resp. Patent Owner, however, raises two issues regarding Wirth, both stemming from Patent Owner's narrow proposed claim constructions for the "oppositely-disposed bottom major *surface*" of the LED and "formed on." PO Resp. 33–36 (emphasis added).¹⁸

¹⁸ Patent Owner argues that for the same reasons discussed in "Section V.A.2 for Weeks, Wirth does not include a 'bottom major surface.'" PO Resp. 34. This loose incorporation by reference is inaccurate. For example, with respect to Weeks, Patent Owner argues that Weeks does not show, in Figure 8, a bottom *major* surface, because the sides of LED 70 are substantially greater in length than the four contact surfaces on the bottom of LED 70. *Id.* at 29. We do not understand, and it makes no sense, that such arguments pertain to Wirth, which is an entirely different reference. In any event, we have considered all of Patent Owner's arguments in "Section V.A.2" and address them to the extent they are relevant to the combination of Lumbard and Wirth, e.g., with respect to claim interpretation of "oppositely-disposed bottom major *surface*" of the LED (emphasis added) and "formed on."

First, Patent Owner argues that “there is no bottom major *plane* that includes both an anode and a cathode formed thereon,” and that “the bottom surface of carrier 3 is not the bottom major surface of the LED die” because “the bottom surface . . . is not *planar*.” *Id.* at 34 (emphases added). Patent Owner’s arguments are based on an improper construction of the “bottom major *surface*” (emphasis added) meaning a mathematical plane. As explained above in the claim construction section of this Decision, we do not adopt such a narrow interpretation.

Patent Owner also argues that the bottom surface of carrier 3 is not the bottom major surface of the die, because the bottom surface includes insulation material 10a. *Id.* at 34–35. For reasons provided above in the claim construction section of this Decision addressing the term “formed on,” we are not persuaded that the claims require the cathode and anode be formed directly on the substrate bottom surface. Indirect placement is within the scope of the claims for either the cathode or anode. As explained above, Petitioner contends, and we agree, that Wirth discloses a cathode (first connection 11, which contains a metallization layer) and anode (second connection 12, which contains a metallization layer) that are formed on the bottom major surface of die (carrier 3), which is a substrate. Pet. 22, 38–40 (citing Ex. 1008, 187–191, Fig. 1; Ex. 1003 ¶ 104).

Accordingly, for the reasons given above, having considered Petitioner’s and Patent Owner’s arguments and evidence, we determine that the combination of Lumbard and Wirth teaches each limitation of claim 1 and that a person of ordinary skill in the art would have had reason to combine Wirth with Lumbard to reach the device recited in claim 1. We

further determine that Petitioner has shown by a preponderance of the evidence that claim 1 would have been obvious over Lumbard and Wirth.

Claim 2 depends from claim 1 and recites “wherein at least one of the first and second electrically conductive interconnecting elements is on at least one sidewall of the substantially planar substrate and electrically interconnects one of the first and second electrically conductive bonding pads to one of the first and second electrically conductive connecting pads.”

Claim 3 depends from claim 2 and includes that the first electrically conductive interconnecting element is on a sidewall of the substantially planar substrate and the second electrically conductive interconnecting element is on the same sidewall or another sidewall of the substantially planar substrate. Claim 4 depends from claim 2 and requires that at least one of the first and second interconnecting elements is situated within a partial cylindrical depression in the at least one sidewall of the planar substrate.

Petitioner relies on Lumbard as describing these claimed features. Pet. 41–44. In particular, and as seen from Lumbard Figure 1, reproduced above, Lumbard describes plated through grooves 23 and 25 on the sidewalls of planar substrate 12, which serve to connect elements 13 and 22 to element 19 and to connect elements 14 and 24 to element 21. Patent Owner does not make separate arguments with respect to claims 2–4. We are persuaded by Petitioner’s showing, which we adopt, that claims 2–4 would have been obvious over Lumbard and Wirth.

Claim 5 depends from claim 1 and specifies that both the anode and cathode of the light emitting semiconductor die are electrically connected to the first and second electrically conductive bonding pads. Similar to its showing with respect to claim 1, discussed above, Petitioner relies on

Wirth's LED on Lumbar's substrate packaging assembly to meet claim 5. Pet. 44–47. Patent Owner does not make separate arguments with respect to claim 5. We are persuaded by Petitioner's showing, which we adopt, that claim 5 would have been obvious over Lumbar and Wirth.

Claim 6 depends from claim 1 and specifies that the light emitting semiconductor die is a light emitting diode die. Similar to its showing with respect to claim 1, discussed above, Petitioner explains that Wirth describes an LED as claimed. *Id.* at 47. Patent Owner does not make separate arguments with respect to claim 6. We are persuaded by Petitioner's showing, which we adopt, that claim 6 would have been obvious over Lumbar and Wirth.

Independent claim 7 is similar in scope to claim 1. Claim 8 depends from claim 7 and is similar in scope to claim 2. Claim 9 depends from claim 8 and is similar in scope to claim 3. Claim 10 depends from claim 8 and is similar in scope to claim 4. Independent claim 11 is similar in scope to claim 8. Claim 12 depends from claim 11 and is similar in scope to claims 3 and 9. Claim 13 depends from claim 11 and is similar in scope to claims 4 and 10. Claim 14 depends from claim 11 and is similar in scope to claim 5.

Petitioner's showings for claims 7–14 references its showings with respect to claims 1–6 and are nearly the same for claims 7–14 as they are for claims 1–6, while sufficiently accounting for differences. *See* Pet. 47–56. Patent Owner's arguments with respect to independent claims 7 and 11 are the same as those directed to claim 1 and have been addressed above. PO Resp. 39. Patent Owner does not make any arguments with respect to any of the dependent claims. We are persuaded by Petitioner's showings, which we adopt, that claims 7–14 would have been obvious over Lumbar and Wirth.

In sum, for the reasons given above, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–14 of the ’787 patent would have been obvious over Lumbard and Wirth.

F. Remaining Grounds Challenging the Claims of the ’787 Patent

For the reasons discussed above, Petitioner has shown, by a preponderance of the evidence, that all challenged claims 1–14 of the ’787 patent are unpatentable as obvious over Lumbard in view of Wirth. In addressing this ground, we have addressed all challenged claims. *See SAS*, 138 S. Ct. at 1359 (holding that a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *see also* 35 U.S.C. § 318(a). Accordingly, we need not and do not decide whether Petitioner has shown by a preponderance of the evidence that claims 1–14 also would have been obvious based on the remaining challenges. *Cf. In re Gleave*, 560 F.3d 1331, 1338 (Fed. Cir. 2009) (not reaching other grounds of unpatentability after affirming the anticipation ground); *see also Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (holding that once a dispositive issue is decided, there is no need to decide other issues).

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–14 of the ’787 patent are unpatentable.

IV. ORDER

Accordingly, it is:

ORDERED that claims 1–14 of the '787 patent have been shown to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

IPR2018-00965
Patent 7,919,787 B2

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