

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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NICHIA CORPORATION,  
Petitioner,

v.

DOCUMENT SECURITY SYSTEMS, INC.,  
Patent Owner.

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Case IPR2018-00966  
Patent 7,652,297 B2

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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”)<sup>1</sup> filed a Petition for *inter partes* review of claims 1–17 of U.S. Patent No. 7,652,297 B2 (Ex. 1001, “the ’297 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 1–17 based on all challenges set forth in the Petition. Paper 14 (“Decision on Institution” or “Dec.”).

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 21, “PO Resp.”), Petitioner filed a Reply to Patent Owner’s Response (Paper 24, “Reply”), and Patent Owner filed a Sur-Reply (Paper 26, “Sur-reply”). On July 30, 2019, we held an oral hearing. Paper 32 (“Tr.”).

### A. *Related Matters*

The parties indicate that the ’297 patent is the subject of several court proceedings. Pet. 1; Paper 3, 2.

### B. *The ’297 Patent*

The specification of the ’297 patent describes a light-emitting device. Ex. 1001, Abstract. Figure 1 is reproduced below:

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

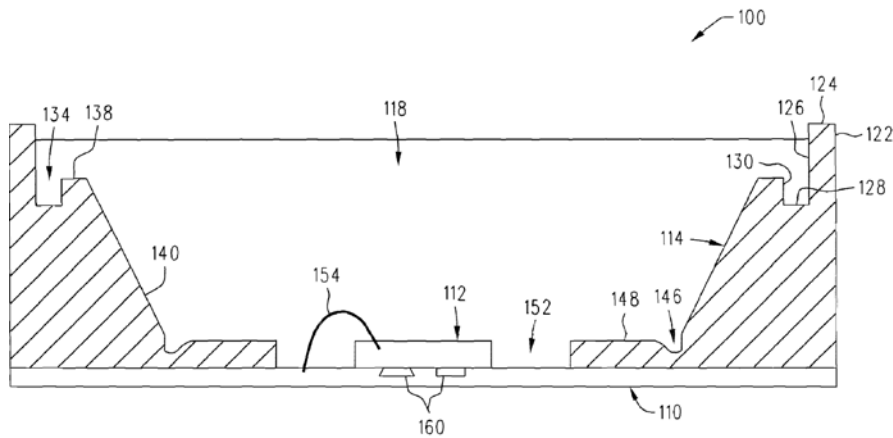


**FIG. 1**

Figure 1 depicts a side cut away of an embodiment of a light-emitting device.

As seen from the above, light-emitting device 100 includes substrate 110, light emitting diode (LED) 112, and reflector 114. *Id.* at 1:39–41. Cavity 118 is filled with encapsulant. *Id.* at 1:48–50. Reflector 114 has an outer wall 122 with an upper edge 124. *Id.* at 1:59–63. First inner wall 126, first platform 128, and second inner wall 130 form a first notch 134, which extends axially around reflector 114. *Id.* at 2:6–9. First notch 134 serves to hold encapsulant within cavity 118. *Id.* at 2:9–10. A second platform 138 extends from second inner wall 130 to a slanted wall 140. *Id.* at 2:13–15. A second notch 146 is located between slanted wall 140 and a third platform 148 and extends along and around reflector 114. *Id.* at 2:19–21. Second notch 146 may be filled with encapsulant. *Id.* at 2:21–23. Gap 152 exists between reflector 114 and LED 112 and may contain contacts used to supply power to LED 112. *Id.* at 2:33–35. A single wire bond 154 extends between gap 152 and LED 112 and may supply power or signals to LED 112. *Id.* at 2:36–38.

*C. Illustrative Claim*

Petitioner challenges claims 1–17 of the '297 patent. Claims 1, 10, and 15 are independent claims. Claim 1 is reproduced below.

1. A light emitting device comprising:  
a substrate;  
a reflector extending from said substrate, said reflector forming a cavity in conjunction with said substrate;  
a light emitter located in said cavity; and  
at least one first notch located in said reflector, said at least one first notch extending substantially axially around said reflector, said at least one first notch being formed by a first wall and a second wall wherein said first wall and said second wall extend substantially perpendicular to said substrate.

*Id.* at 3:36–47.

*D. Asserted Grounds of Unpatentability*

We instituted trial based on all asserted grounds of unpatentability under 35 U.S.C.<sup>2</sup> as follows (Dec. 4–5, 40):

| Challenged Claims | 35 U.S.C. § | Reference(s)/Basis                 |
|-------------------|-------------|------------------------------------|
| 1–6               | 102(e)      | Loh '842 <sup>3</sup>              |
| 1–6, 9            | 103(a)      | Loh '842                           |
| 7, 8, 10–17       | 103(a)      | Loh '842 and Fujiwara <sup>4</sup> |

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<sup>2</sup> 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 '297 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.

<sup>3</sup> U.S. Patent No. 7,939,842 B2, filed Aug. 27, 2007, issued May 10, 2011 (Ex. 1004, “Loh '842”).

<sup>4</sup> U.S. Patent No. 6,680,568 B2, issued Jan. 20, 2004 (Ex. 1005, “Fujiwara”).

| Challenged Claims | 35 U.S.C. § | Reference(s)/Basis                |
|-------------------|-------------|-----------------------------------|
| 7, 8, 10–17       | 103(a)      | Loh '842 and Uraya <sup>5</sup>   |
| 1–6               | 102(e)      | Loh '819 <sup>6</sup>             |
| 1–6, 9            | 103(a)      | Loh '819                          |
| 1–6, 9            | 103(a)      | Loh '819 and Andrews <sup>7</sup> |
| 7, 8, 10–17       | 103(a)      | Loh '819 and Fujiwara             |
| 7, 8, 10–17       | 103(a)      | Loh '819, Fujiwara, and Andrews   |
| 7, 8, 10–17       | 103(a)      | Loh '819 and Uraya                |
| 7, 8, 10–17       | 103(a)      | Loh '819, Uraya, and Andrews      |

## II. ANALYSIS

### A. Principles of Law

To prevail in its challenge to Patent Owner's claims, Petitioner must demonstrate by a preponderance of the evidence<sup>8</sup> that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). To establish anticipation under 35 U.S.C. § 102, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *See Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir.

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<sup>5</sup> Japanese Patent Application No. 2005-174998, published June 30, 2005 (Ex. 1011, "Uraya").

<sup>6</sup> U.S. Patent No. 7,960,819 B2, filed July 13, 2006, issued June 14, 2011 (Ex. 1006, "Loh '819").

<sup>7</sup> U.S. Patent Application Publication No. 2005/0218421 A1, filed Jan. 27, 2005, published Oct. 6, 2005 (Ex. 1007, "Andrews").

<sup>8</sup> 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).

2008); *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). Although the elements must be arranged or combined in the same way as in the claim, “the reference need not satisfy an *ipsissimis verbis* test,” i.e., identity of terminology is not required. *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009) (*accord In re Bond*, 910 F.2d 831, 832–33 (Fed. Cir. 1990)).

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 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 argues that the level of skill in the art is apparent from the cited art. Pet. 10. Petitioner further 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.” *Id.* (citing Ex. 1003 ¶¶ 24–26). Patent Owner does not propose a definition. *See* PO Resp.

For purposes of this Decision, we adopt Dr. Shealy's assessment of a person with ordinary skill in the art. We further agree with Petitioner, and find, that the prior art of record in the instant proceeding reflects the appropriate level of ordinary skill in the art, which is consistent with Dr. Shealy's assessment.

### *C. Claim Construction*

In this *inter partes* review, we construe the claim terms in the '297 unexpired patent according to their broadest reasonable construction in light of the specification of the '297 patent. 37 C.F.R. § 42.100(b) (2017); *Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard).<sup>9</sup> 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).

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<sup>9</sup> A recent change to this rule does not apply here because the Petition was filed before November 13, 2018. *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).

1. “a reflector extending from said substrate”

All of the challenged independent claims recite “a reflector extending from said substrate.” We preliminarily construed “a reflector extending from said substrate” to mean that the reflector may be in direct or indirect contact with the substrate for it to extend from the substrate. Dec. 9. Patent Owner disagrees with our interpretation, while Petitioner agrees with it. *See, e.g.*, PO Resp. 11–13; Reply 2–3; Sur-reply 1–3.

In essence, Patent Owner argues that “a reflector extending from said substrate” means that the reflector must be in direct physical contact with the substrate in order for it to extend from the substrate. PO Resp. 11–13 (citing Ex. 2009 ¶¶ 18–23; Ex. 2008, 69:20–70:15; Ex. 1004, 5:27–31). For example, Patent Owner argues that the claims “define[] the starting point of reflector to be at the surface of the substrate, from which it extends, not separated from the substrate by intervening layers.” *Id.* at 13.

Each of the challenged independent claims 1, 10, and 15 recites “a reflector extending from said substrate.” The claim language, however, does not itself include that the starting point of the reflector must be at the surface of the substrate in order for it to extend from the substrate, e.g., be in direct contact with the substrate as Patent Owner argues. *Id.* at 13. Patent Owner does not direct us to where in the Specification of the ’297 patent there is support for its narrow construction that the reflector must be in direct contact with the substrate in order for the reflector to extend from the substrate.

Although the Specification of the ’297 patent does not describe explicitly what is meant by “a reflector extending from said substrate,” the Specification describes that reflector 14 is mounted on substrate 110. Ex. 1001, 1:39–41. We find that such description is relevant to understanding

the meaning of “a reflector extending from said substrate.” Ex. 1017, 112:15–25 (Mr. Credelle testifying that the claim phrase is referring back to “Column 1, line 38”). As pointed out by Petitioner, both experts testify that a person having ordinary skill in the art at the time of the invention would have understood that one method of mounting would be with an adhesive layer to bond a reflector to a substrate. Reply 2–3 (citing Ex. 1017, 35:18–38:25, 44:25–45:23, 48:17–50:7, 52:21–53:10, 60:19–64:9, 112:15–25; Ex. 2008, 70:22–74:22). Thus, we disagree with Patent Owner’s proposed narrow construction that the reflector must be in direct contact with the substrate, e.g., with no intervening layers such as adhesive between the reflector and substrate, because such a construction would exclude the full breadth of what would be understood as the invention. The Specification of the ’297 patent, as understood by a person having ordinary skill in the art at the time of the invention does not support such a narrow construction. Rather, we find that a person having ordinary skill in the art at the time of the invention would have understood the Specification of the ’297 patent supports a construction that would include indirect contact between the reflector and the substrate, e.g., a layer of adhesive between the substrate and reflector in order to mount (attach) the reflector to the substrate. *See* Ex. 1017, 35:18–38:25, 44:25–45:23, 48:17–50:7, 52:21–53:10, 60:19–64:9, 112:15–25; Ex. 2008, 70:22–74:22.

Patent Owner’s argument that Petitioner is attempting to rewrite the claims to require a reflector on a substrate, rather than extending from a substrate is misplaced. It is Patent Owner in the first instance that argues for a narrow construction that would require a reflector *directly* on a substrate. Sur-reply 2; Tr. 46:5–14. Petitioner merely responded to Patent Owner’s

proposed construction. Reply 1–2. For all of these reasons, we do not adopt Patent Owner’s construction that “a reflector extending from said substrate” means that the reflector must be in direct physical contact with the substrate. Rather, we construe “a reflector extending from said substrate” to mean that the reflector may be in direct or indirect contact with the substrate for the reflector to extend from the substrate.<sup>10</sup>

2. “*upper portion*”/“*lower portion*”

Claims 3, 4, 13, and 14 recite that the “reflector has an upper portion and a lower portion, said lower portion being located proximate said substrate.” Patent Owner argues that the upper portion must be vertically higher than the lower portion, and the two portions cannot overlap. PO Resp. 18. Petitioner argues that even under Patent Owner’s proposed construction, the claims are anticipated or rendered obvious by the prior art. Reply 7, 15. We agree. As explained below with respect to the discussion of claims 3 and 4, even if the upper and lower portions cannot overlap as Patent Owner contends, we determine below that Loh ’842 anticipates or renders obvious the claims with these limitations. Accordingly, we need not construe “upper portion” and “lower portion.”

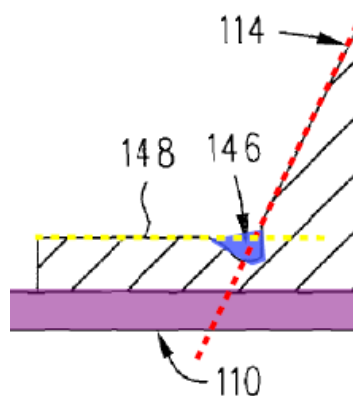
3. “*intersects*”/“*intersecting*”

Claim 6 recites a reflector comprising “a slanted portion that intersects a platform.” Each of claims 9 and 15 recites a reflector comprising “a third platform located on said substrate and intersecting said slanted portion.”

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<sup>10</sup> As discussed below, we alternatively find that Loh ’842 meets even Patent Owner’s narrow construction that the lens coupler be in physical contact with the substrate.

Petitioner argues that the term “intersects” means “if considered to be a geometric line, connects or crosses through,” and the term “intersecting” means “if considered to be a geometric line, connecting or crossing through.” Pet. 12 (citing Ex. 1003 ¶¶ 46–49; Ex. 1001, Fig. 1). Petitioner contends that a person having ordinary skill in the art would have understood that the claimed intersecting does not mandate that the platform and slanted portion physically intersect, but instead that they intersect geometrically. Pet. 13 (citing Ex. 1003 ¶ 49; Ex. 1001, 2:13–27, Fig. 1). Petitioner’s annotated Figure 1, reproduced below, illustrates Petitioner’s position. *Id.*



Petitioner’s annotated Figure 1 from the ’297 patent.

As seen from the above, the red dotted line, representing the slanted portion of the reflector, intersects with the dotted yellow line, representing the platform portion of the reflector. Patent Owner does not disagree with Petitioner’s proposed interpretation of “intersects” or “intersecting.” For purposes of this decision, we adopt Petitioner’s proposed interpretation of “intersects” to mean “if considered to be a geometric line, connects or crosses through,” and the term “intersecting” to mean “if considered to be a geometric line, connecting or crossing through.”

4. “*at the intersection*”

Claims 6, 9, and 15 recite a notch located at the intersection of a slanted portion of the reflector and a platform of the reflector. Petitioner argues that the ’297 patent does not use the term “intersection” or its variants outside of the claims. Pet. 13–14 (citing Ex. 1001, 2:13–27, Fig. 1). Directing attention to Dr. Shealy’s declaration and a dictionary definition for the term “at,” Petitioner argues that “at the intersection” means “in, on or near the intersection.” *Id.* (citing Ex. 1003 ¶¶ 50–54; Ex. 1012, 4 (Merriam-Webster’s Collegiate Dict., 11th Ed.)). Petitioner further contends that the only such intersection, shown in Figure 1 of the ’297 patent, depicts notch 146 located near the intersection. *Id.* at 14 (citing Ex. 1003 ¶¶ 50–54).

Patent Owner argues that “at the intersection” means “that the notch overlaps the point of intersection between the reflector wall and a platform located on the substrate.” PO Resp. 22. Patent Owner argues that the correct interpretation means that the “upper edge on one side of the notch, the side on the slanted portion, is higher than the upper edge of the side located on the platform.” *Id.*

The Specification of the ’297 patent describes a second notch 146 located between the slanted wall 140 and a third platform 148. Ex. 1001, 2:13–27, Fig. 1. The Specification of the ’297 patent does not describe what it means for the notch to be “located *at the intersection*” of a slanted portion of the reflector and a platform of the reflector. We agree, however, with Petitioner that one of ordinary skill in the art, reading the claims in light of the Specification of the ’297 patent, would have understood the word “at” in this context to mean “in, on, or near.” Ex. 1003 ¶¶ 50–54; Ex. 1012, 4. Patent Owner does not explain why Petitioner’s proposed construction for

the term “at” would be inconsistent with the Specification or present evidence tending to show that Patent Owner has disavowed or disclaimed the meaning of “at the intersection” to support the narrow interpretation proposed by Patent Owner. Thus, we interpret “at the intersection” to mean “in, on, or near the intersection.”

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

#### *D. Asserted Challenges Based on Loh ’842*

Petitioner contends (1) claims 1–6 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Loh ’842; (2) claims 1–6 and 9 are unpatentable under 35 U.S.C. § 103(a) as obvious over Loh ’842; (3) claims 7, 8, and 10–17 are unpatentable under 35 U.S.C. § 103(a) as obvious over Loh ’842 and Fujiwara. Pet. 27–57. In support of its showing, Petitioner relies upon the declaration of Dr. James R. Shealy. *Id.* (citing Ex. 1003).

1. Loh '842<sup>11</sup>

Loh '842 describes LED packages. Ex. 1004, Abstract. Figure 8B of Loh '842, annotated by Petitioner, is reproduced below. Pet. 18 (citing Ex. 1004, Fig. 8B).

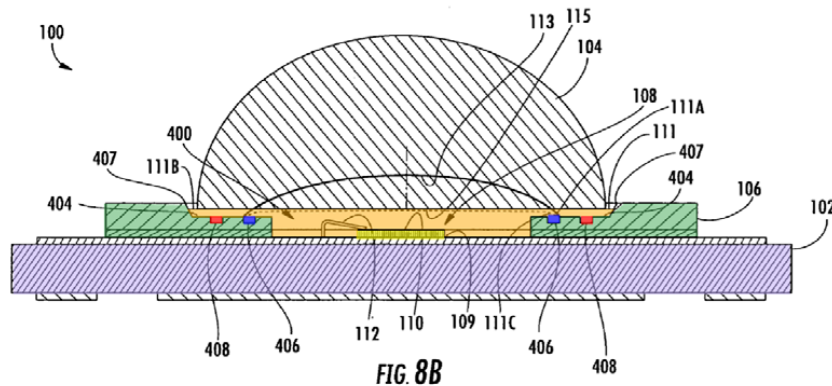


Figure 8B of Loh '842 shows a cross-sectional side view of a light emitting device package, with highlighting added by Petitioner.

As seen from the above, light emitting package 100 includes reflective lens coupler 106 (green), substrate 102 (purple), cavity space 400 (orange), LED 110 (yellow), lens 104, and encapsulant 111. Ex. 1004, 5:5–6:5, 8:24–29, Fig. 8B. The package further includes depressions 406 and 408 (shown

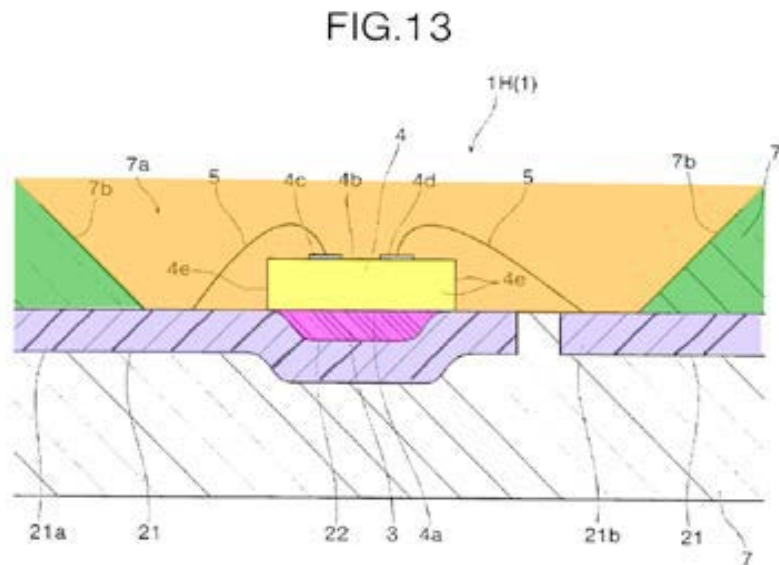
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<sup>11</sup> Petitioner argues that the effective filing date of Loh '842 is August 27, 2007, which is fifteen days prior to the '297 patent's September 11, 2007 effective filing date. Pet. 16 n. 5. Patent Owner argued, in its Preliminary Response, that the close dates are circumstantial evidence that Loh '842 is not prior art to the '297 patent. Prelim. Resp. 14. We preliminarily rejected that argument. Dec. 13–14. In its Patent Owner Response, Patent Owner makes no argument regarding Loh '842 as prior art. See PO Resp. Arguments not made in the Patent Owner Response are considered waived. Scheduling Order, Paper 15, 5; see also *In re Nuvasive, Inc.*, 842 F.3d 1376, 1381 (Fed. Cir. 2016) (explaining that a patent owner waives an issue presented in its preliminary response if it fails to renew the issue in its response after trial is instituted).

in blue and red). *Id.* at 8:26–27. The package includes a substrate which includes a mounting pad. *Id.* at 4:1–3. Mounting pad 109 may be mounted to substrate 102 with electrical connections to LED 110. *Id.* at 5:27–29.

## 2. Fujiwara

Fujiwara describes a light emitting device used for a light source of a liquid crystal display. Ex. 1005, 1:6–7. Fujiwara Figure 13, annotated by Petitioner, is reproduced below. Pet. 50.



Fujiwara Figure 13, annotated by Petitioner, is a partial sectional view showing an embodiment of a light emitting device.

As seen from the above, light emitting device 1H(1) has lead frame 21, transparent resin 3, semiconductor luminous element 4, wires 5, and case 7. Ex. 1005, 14:61–64. In lead frame 21, a concave portion 22 having a size smaller than that of lower surface 4a of element 4 is formed at a position in which element 4 is mounted. *Id.* at 15:5–9.

### 3. Discussion

#### Claim 1

Petitioner contends that claim 1 is unpatentable under 35 U.S.C. § 102(e) as anticipated by Loh '842 and unpatentable under 35 U.S.C. § 103(a) as obvious over Loh '842. Pet. 27–33, 44–45. For the reasons that follow, having considered Petitioner's and Patent Owner's arguments and evidence, we determine that claim 1 is anticipated by Loh '842.<sup>12</sup> Therefore, we need not and do not determine whether claim 1 also would have been obvious over Loh '842.

Claim 1 recites a “light emitting device comprising.” Ex. 1001, 3:36. Petitioner contends, and we are persuaded, that Loh '842 describes light emitting device packages such as that shown above in Figure 8B, which is a “light emitting device.” Pet. 27 (citing Ex. 1004, 1:16–20, 2:7–59, 3:25–27, 8:25–59, Figs. 4A–4C, 5, 8A–8G; Ex. 1003 ¶ 90). Claim 1 further recites “a substrate.” Ex. 1001, 3:37. We agree with Petitioner's showing and find

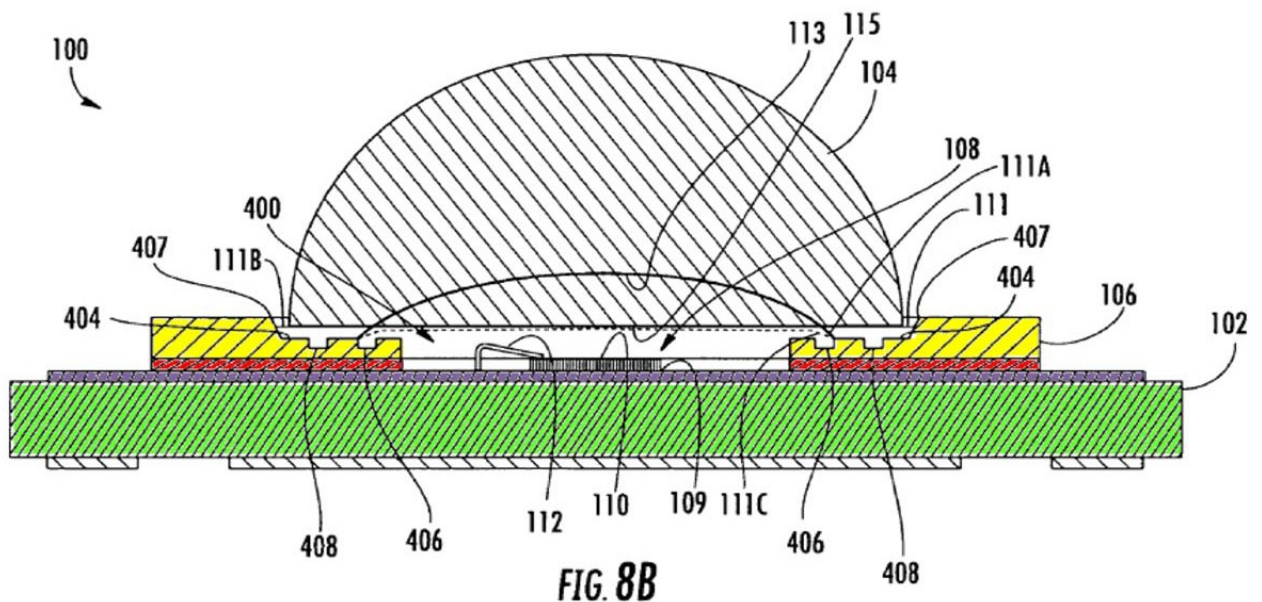
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<sup>12</sup> Although Petitioner cites to several figures in Loh '842 as individually anticipating claim 1, the arguments presented by the parties as to whether Loh '842 anticipates claim 1 primarily pertain to Loh '842 Figure 8B. For instance with respect to whether Loh '842 anticipates claim 1, Patent Owner does not argue that Petitioner improperly combined multiple embodiments. PO Resp. 11–26. Accordingly, we primarily focus on whether Loh '842 Figure 8B and related descriptions meet the claim 1 elements. This does not mean, however, that the other Loh '842 figures cited by Petitioner do not individually also anticipate claim 1. For example, with respect to our discussion below regarding whether Loh '842 anticipates claims 3, 4, and 6, we find that Loh '842 Figures 8C and 8E, modified with square depressions anticipates those claims. Thus, similar to our discussion below, either of Loh '842's Figures 8C and 8E modified with square depressions would likewise anticipate claim 1.

that Loh '842 describes a substrate 102 like that shown above in Figure 8B. Pet. 27–28 (citing Ex. 1004, 5:5–12, 8:24–34, Figs. 8A–8G; Ex. 1003 ¶¶ 90–93).

Claim 1 further recites “a reflector extending from said substrate, said reflector forming a cavity in conjunction with said substrate.” Ex. 1001, 3:39–40. Petitioner contends that Loh '842's lens coupler 106, described as including reflective surfaces positioned to reflect light generated by LED 110 and being bonded to substrate 102 (or adapted for attaching to substrate 102) through mounting pad 109 meets the claimed “reflector extending from said substrate.” Pet. 28–29 (citing Ex. 1004, 4:2–6, 4:46–47, 5:23–27, 5:32–43, 6:16–7:1, Figs. 4A–4C, 8A–8G; Ex. 1003 ¶¶ 94–98). Notwithstanding Patent Owner's arguments, which we address immediately below, we find that Loh '842 discloses a reflector (lens coupler 106 seen above in Figure 8B) extending from said substrate as claimed.

Patent Owner annotated Loh '842's Figure 8B is shown below.



Patent Owner annotated Figure 8B from Loh '842 illustrates a lens coupler (yellow) on top of substrate 102 (green).

Referencing an annotated Figure 8B of Loh '842 (shown above), Patent Owner argues that lens coupler 106 does not extend from substrate 102, because there are two adhesive layers, red and purple, in between the substrate 102 and lens coupler 106 that are separate from either the lens coupler 106 or the substrate 102. PO Resp. 11–13 (citing Ex. 2009 ¶ 23). The purple layer is described in Loh '842 as the mounting pad 109. The red layer is not described at all in Loh '842. Patent Owner's arguments are based on an improper construction of “a reflector extending from said substrate” to mean that the reflector must be in direct physical contact with the substrate in order for it to extend from the substrate. *Id.* As explained above in the claim construction section of this Decision, we do not adopt such a narrow interpretation. We find that Loh '842 describes a reflector (lens coupler 106) that extends from Loh '842's substrate 102. Similar to the description in the '297 patent that '297 reflector 114 is mounted on substrate 110, which both experts agree would have included attaching reflector 114 to substrate 110 using an intervening layer of adhesive, Loh '842 describes that lens coupler 106 is bonded<sup>13</sup> to substrate 102 and that “a quantity of epoxy 600 can attach lens coupler 106 to substrate 102. Alternatively, any other suitable adhesive or attachment technique may be utilized for attaching lens coupler to substrate 102.” Ex. 1004, 6:11–12, 8:7–12; *see* Ex. 1017, 35:18–38:25, 44:25–45:23, 48:17–50:7, 52:21–53:10,

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<sup>13</sup> During his deposition, Mr. Credelle used “bonded” interchangeably with “mounting” or “mounted” to mean attaching one thing to another. Ex. 1017, 60:19–64:9; Tr. 8:6–17.

60:19–64:9, 112:15–25; Ex. 2008, 70:22–74:22. Accordingly, we find that Loh ’842’s reflector 106 extends from substrate 102 under the proper claim construction of “a reflector extending from said substrate.”

Alternatively, even under Patent Owner’s narrow construction that the lens coupler must be in direct physical contact to the substrate in order for the reflector to extend from the substrate, the record evidence supports Petitioner’s assertion that Loh ’842 meets the disputed phrase. Reply 12 (citing Ex. 1004, 2:42–44, 4:2–6, 11:1–7; Ex. 2008, 70:7–73:5); Tr. 51:10–16. We credit Dr. Shealy’s testimony that a person having ordinary skill in the art at the time of the invention would have understood that “both of those layers [referring to Loh ’842 Figure 4A (which is the same as Figure 8B in this respect)] are adhesives” that would have been considered to be part of the lens coupler and substrate respectively. Ex. 2008, 70:2–73:5.<sup>14</sup> Dr. Shealy’s testimony that the mounting pad would have been considered to be part of the substrate is consistent with Loh ’842’s description that the substrate *includes* a “mounting pad.” Ex. 1004, 2:42–44, 4:2–6, 11:1–7.

Patent Owner argues that the mounting pad 109 is a separate layer, not part of the substrate, because Loh ’842 describes that mounting pad 109 may be mounted to substrate 102. PO Resp. 13 (citing Ex. 1004, 5:27–31). Patent Owner, however, does not address those descriptions of Loh ’842 that explain the substrate as including the mounting pad, and therefore, we are

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<sup>14</sup> Patent Owner does not dispute that a mounting pad is adhesive or that Loh ’842 shows in some figures, only one intervening layer between the lens coupler and substrate, such as seen in Figures 8D–8F. PO Resp. 13. Patent Owner also does not present evidence to rebut Dr. Shealy’s testimony that Patent Owner’s annotated red layer would have been considered to be part of the lens coupler. *Id.*

not persuaded that a person having ordinary skill in the art would have understood that Loh '842's mounting pad 109 is necessarily separate from the substrate. Thus, we find that based on Dr. Shealy's testimony and Loh '842's description that mounting pad 109 is included as part of the substrate, Loh '842 meets even Patent Owner's narrow construction that the lens coupler is physically connected to the substrate.

Claim 1 further recites "said reflector forming a cavity in conjunction with said substrate." Ex. 1001, 3:39–40. Petitioner contends, and we agree, that Loh '842's substrate 102 and reflective lens coupler 106 together form a space 400, and, thus, meets the claimed "said reflector forming a cavity in conjunction with said substrate." Pet. 29 (citing Ex. 1004, 5:45–6:10, Figs. 4A–4C, 8A–8G; Ex. 1003 ¶¶ 99–100). Patent Owner argues that Loh '842's lens coupler 106 along with substrate 102 fail to form a space 400 together, because the space is formed by the combination of lens coupler 106 and two layers between the substrate 102 and lens coupler 106. PO Resp. 13–14. Patent Owner fails to address or explain in any way how Loh '842's explicit description that "encapsulant 111 may be deposited in *a space 400 defined between substrate 102, lens 104, and/or lens coupler 106*" fails to meet "said reflector forming a cavity in conjunction with said substrate." Ex. 1004, 5:45–47 (emphasis added). We find that such description meets "said reflector forming a cavity in conjunction with said substrate." Pet. 29 (citing Ex. 1004, 5:45–6:10, Figs. 4A–4C, 8A–8G; Ex. 1003 ¶¶ 99–100).

Claim 1 further recites "a light emitter located in said cavity." Ex. 1001, 3:41. The present record supports the contention that Loh '842's LED 110, located in cavity space 400 meets the claimed "light emitter located in said cavity." Pet. 30 (citing Ex. 1004, 5:33–6:10, Figs. 4A–4C,

8A–8G; Ex. 1003 ¶¶ 101–102). We are not persuaded by Patent Owner’s argument that Loh ’842’s space 400 does not meet the claimed cavity because the cavity is not defined by the substrate and reflector. PO Resp. 14. For reasons discussed immediately above, we find that Loh ’842 describes a cavity as claimed. Ex. 1004, 5:45–47.

Claim 1 also recites “at least one first notch located in said reflector, said at least one first notch extending substantially axially around said reflector, said at least one first notch being formed by a first wall and a second wall wherein said first wall and said second wall extend substantially perpendicular to said substrate.” Ex. 1001, 3:42–47. Petitioner contends, and we agree, that either one of Loh ’842’s square shaped depressions 406 and 408 seen in Figure 8B, for example, would satisfy this claim limitation. Pet. 30–33 (citing Ex. 1004, 3:19–21, 6:25–51, 7:56–8:65, Figs. 4A–4C, 5, 8A–8G; Ex. 1003 ¶¶ 103–109). Loh ’842 describes that depressions 406 and 408 form circles having LED 110 positioned at a common center. Ex. 1004, 7:56–8:6, Fig. 5. Patent Owner makes no arguments regarding this claim phrase.

For all of the reasons given above, having considered Petitioner’s and Patent Owner’s arguments and evidence, we determine that Loh ’842 teaches each limitation of claim 1. Accordingly, Petitioner has shown by a preponderance of the evidence that claim 1 is unpatentable as being anticipated by Loh ’842.

### Claim 2

Petitioner contends that claim 2 is unpatentable under 35 U.S.C. § 102(e) as anticipated by Loh ’842 and unpatentable under 35 U.S.C. § 103(a) as obvious over Loh ’842. Pet. 33–35, 44–45. For the reasons that

follow, having considered Petitioner's and Patent Owner's arguments and evidence, we determine that claim 2 is anticipated by Loh '842. Therefore, we need not and do not determine whether claim 2 also would have been obvious over Loh '842.

Claim 2 recites "[t]he light emitting device of claim 1 and further comprising an encapsulant located in said cavity, wherein said encapsulant is also located in said at least one first notch." Petitioner contends that Loh '842's encapsulant deposited in space 400 meets claim 2. Pet. 33–35 (citing Ex. 1004, 4:33–40, 5:45–47, 6:17–66, 7:3–4, Figs. 4A–4C, 5, 8A–8G; Ex. 1003 ¶¶ 110–116). For instance, Petitioner contends, and we agree, Loh '842 describes encapsulant 111 that fills cavity space 400 and square-shaped depressions 406 and 408 after lens attachment. *Id.* at 34 (citing Ex. 1004, 6:54–66, Fig. 8B; Ex. 1003 ¶ 112).

Patent Owner argues that the claimed "cavity" is defined by a substrate and reflector, similar to the arguments it makes with respect to claim 1 above. PO Resp. 14. We are not persuaded by this argument for reasons already discussed. We also are not persuaded by Patent Owner's arguments that Petitioner has improperly combined multiple embodiments in its analysis of dependent claim 2. *Id.* at 14–15. While it may be inappropriate to combine different embodiments of a single reference in an anticipation analysis, that is not what Petitioner has done here. For example, Petitioner argues that a person having ordinary skill in the art would have understood that the encapsulant described in detail with respect to Figure 4C is the same encapsulant appearing in the other figures that depict the LED package after lens 104 has been attached. *See* Pet. 34 (citing Ex. 1003 ¶¶ 113–114). Indeed, all of Loh '842's embodiments (including the LED

package depicted in Figure 8B) include encapsulant. Ex. 1004, 2:7–58, 8:24–29.

For all of the reasons given above, having considered Petitioner’s and Patent Owner’s arguments and evidence, we determine that Loh ’842 teaches each limitation of claim 2. Accordingly, Petitioner has shown by a preponderance of the evidence that claim 2 is unpatentable as being anticipated by Loh ’842.

#### Claims 3 and 4

Petitioner contends that claims 3 and 4 are unpatentable under 35 U.S.C. § 102(e) as anticipated by Loh ’842 and unpatentable under 35 U.S.C. § 103(a) as obvious over Loh ’842. Pet. 36–41, 44–45. For the reasons that follow, having considered Petitioner’s and Patent Owner’s arguments and evidence, we determine that Loh ’842 anticipates claims 3 and 4. We also determine that claims 3 and 4 are rendered obvious over Loh ’842.

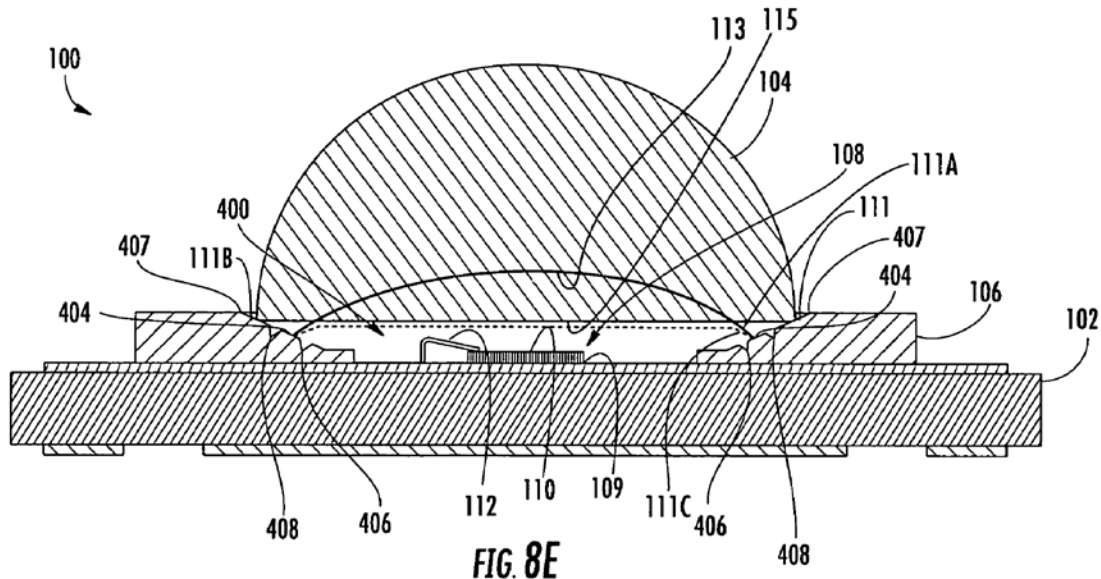
Claim 3 depends from claim 1 and recites “wherein said reflector has an upper portion and a lower portion, said lower portion being located proximate said substrate, said at least one first notch being located proximate said upper portion.” Ex. 1001, 3:52–55. Claim 4 depends from claim 1 and recites “wherein said reflector has an upper portion and a lower portion, said lower portion being located proximate said substrate, said at least one first notch being located proximate said lower portion.” *Id.* at 3:56–59.

Although Petitioner argues that Loh ’842 anticipates claims 3 and 4, based on Loh ’842’s Figure 8B (Pet. 36), our Decision focuses on Petitioner’s alternative argument that Loh ’842 anticipates claims 3 and 4, based on any one of Loh ’842’s Figures 8C, 8D, 8E, and 8F. Pet. 37–38. In

particular, Petitioner argues that Loh '842's description of depressions 406 and 408 at varying heights, where the walls of the reflective surface of the lens coupler 106 ("reflector") are inclined, such as shown in Figures 8C, 8D, 8E, and 8F, meets claims 3 and 4 since depression 406 is proximate the lower portion and depression 408 is proximate the upper portion. *Id.* at 37–41 (citing Ex. 1004, 5:32–43, 6:30–8:65, Figs. 8A–8G; Ex. 1003 ¶¶ 64–67, 119–129). Petitioner further explains that a person having ordinary skill in the art would have understood that Loh '842's described shaped notches, such as square shaped notches, could be used in any of the described embodiments, such as those illustrated in Figures 8C, 8D, 8E, and 8F. *Id.* at 37–41 (citing Ex. 1003 ¶¶ 119–129).

For reasons that follow, we agree with Petitioner that depression 406 in any of Figures 8C, 8D, 8E, and 8F is proximate the lower portion of the reflector (lens coupler 106), which lower portion is located proximate the substrate, and depression 408 is proximate the upper portion of the reflector (lens coupler 106), even under Patent Owner's construction that the upper portion and lower portion of the reflector cannot overlap. *See e.g.*, Reply 14–15. This is illustrated in, for example, Loh '842's Figure 8E, shown

below.



Loh '842 Figure 8E shows a cross-sectional side view of a light emitting device package showing an alternative embodiment of a lens coupler. Ex. 1004, 3:19–21.

With respect to the above figure, we find that lens coupler 106 (reflector) “has an upper portion, and a lower portion, said lower portion being located proximate said substrate.” We further find that depression 408 is “located proximate said upper portion” (claim 3) and that depression 406 is “located proximate said lower portion” (claim 4). We further determine, as explained in more detail below in connection with Patent Owner’s arguments, that a person having ordinary skill in the art, reading Loh '842, would have at once envisaged the above illustrated depressions 406 and 408 to have been interchangeable with square shaped depressions.

Patent Owner argues that while the depressions in Figures 8C, 8D, 8E, and 8F “are vertically offset from each other, the depressions still are located closer to the vertical center of the lens coupler than they are to either the upper or lower portions of the lens coupler.” PO Resp. 19 (citing Ex. 2009 ¶ 25). Patent Owner’s argument, however, is not commensurate in scope with the claim language. The claims do not recite a vertical center. Moreover, Patent Owner fails to explain cogently why it considers, with respect to Figure 8E, depicted above, that the triangles, e.g., “notches” 408 and 406 are closer to the vertical center than the upper or lower respective portions. Patent Owner only directs us to paragraph 25 of Mr. Credelle’s declaration in support of Patent Owner’s argument. *Id.* Mr. Credelle testifies that “[e]ven though the center points of the depressions are vertically spaced, the depressions are located closer to the vertical center line, and not proximate the upper or the lower portions of the lens coupler.” Ex. 2009 ¶ 25. Again, the claims do not recite a vertical centerline and Mr. Credelle fails to explain the relevance of the vertical centerline to the notches located proximate an upper or lower portion of the reflector. Accordingly, his testimony regarding this limitation is accorded little weight. 37 C.F.R. § 42.65(a). Patent Owner also appears to argue that the claimed notches must be “very near an edge” of the reflector “rather than in the middle” to meet claims 3 and 4. Sur-reply 14. The word edge is not in claims 3 and 4. We do not read these limitations into the claims. Moreover, as explained immediately above, Patent Owner has failed to persuade us that depressions 406 and 408 are “in the middle” of lens coupler 106.

Patent Owner also argues that Petitioner has improperly combined multiple embodiments in its analysis of dependent claims 3 and 4. PO Resp.

19–20. Patent Owner argues that Petitioner relied primarily upon the embodiment shown in Loh '842 Figure 8B as showing each element of claim 1, but for claims 3 and 4 Petitioner additionally relies upon the embodiments shown in Figures 8C, 8D, 8E, and 8F. *Id.* Patent Owner further argues that Petitioner cannot combine multiple embodiments and argue that the combination anticipates a claim. *Id.*

Petitioner explains in its Petition that a person having ordinary skill in the art would have understood that Loh '842 teaches that the square depressions of Figure 8B would apply to the inclined walls of Figures 8C–8F. Pet. 38 (citing Ex. 1003 ¶¶ 123–129). We agree. As pointed out by Petitioner and Dr. Shealy, Loh '842 describes in numerous passages, that the depressions 406 and 408 may alternatively be any other suitable shape. For example, Petitioner directs attention to the following Loh '842 passage (Pet. 38–39):

*Depressions 406 and 408 can have any suitable size and shape for forming an outer surface of encapsulant 111A. For example, the depression can have substantially vertical walls such that a convex meniscus is formed by encapsulant 111A when opening 402 is filled with encapsulant 111A. In one example, a vertical wall of depressions 406 and 408 can be about 90° with respect to ledge surface 404. Further, a wall of depressions 406 and 408 can be inclined in the range of between about 60° and 90° with respect to ledge surface 404. The width and depth of depressions 406 and 408 can range between 5 and 10 mils, although the depressions may have any other suitable depth or width.*

Ex. 1004, 6:40–51 (emphasis added). Petitioner directs attention to numerous other passages explaining that the depressions 406 and 408 may be any other suitable shape. Pet. 39–40 (citing multiple passages from Ex. 1004). Petitioner argues, and we agree, that a person having ordinary skill in

the art would have understood Loh '842 to teach the use of square shaped depressions in any of the reflectors of Figures 8C–8F “thereby disclosing the limitations of claims 3 and 4 should they not be taught by Figure 8B alone.” *Id.* at 41 (citing Ex. 1003 ¶ 129).

With respect to Figure 8E, reproduced above, Loh '842 describes that “depressions 406 and 408 are triangular in shape, although the depressions may alternatively be any other suitable shape.” Ex. 1004, 8:50–53. We determine that one of ordinary skill in the art, reading Loh '842, would have understood that the triangular depressions 406 and 408 could have been replaced with square shaped depressions. Pet. 41; Ex. 1003 ¶¶ 123–129. Thus, the facts before us are similar to those in *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331 (Fed. Cir. 2016). Like in *Blue Calypso*, we find that a person having ordinary skill in the art “would at once envisage the claimed arrangement.” *See id.* at 1341 (internal quotations omitted).

For all of the reasons given above, having considered Petitioner’s and Patent Owner’s arguments and evidence, we determine that Loh '842 teaches each limitation of claims 3 and 4. Accordingly, Petitioner has shown by a preponderance of the evidence that claims 3 and 4 are unpatentable as being anticipated by Loh '842.

Alternatively, Petitioner argues that to the extent claims 3 and 4 are found not anticipated because they require disclosure from multiple Loh '842 embodiments, as well as motivations from prior art, it would have been obvious to combine features from the various Loh '842 figures. Pet. 44. For instance, Petitioner contends, with supporting evidence that Loh '842 discloses that to provide a variety of radiation patterns, a person having ordinary skill in the art would have known to use variously shaped,

numbered, and located depressions in reflective walls of varying inclines and configurations. Pet. 44 (citing Ex. 1004, 5:32–43, 6:30–8:65, Figs. 8A–8G; Ex. 1003 ¶¶ 121–129). Petitioner further explains that a person having ordinary skill in the art would have found it obvious to apply the square shaped depressions of Figure 8B of Loh ’842 to the slanted reflector of Figures 8C–8F of Loh ’842 and also to add depressions at varying locations along the reflector (e.g., close to the upper and lower portions) in order to alter the radiation pattern and to reduce “peel-off” delamination that decreases radiation efficiency and causes LED failure. Pet. 44–45 (citing Ex. 1004, 5:32–43, 6:30–8:65, Figs. 8A–8G; Ex. 1003 ¶¶ 75–81, 121–129, 142; Ex. 1010, 2:5–25, 10:47–55, 11:56–62, 20:27–32, Fig. 1C (Nii ’343 patent)).

We determine that claims 3 and 4 would have been obvious in view of Loh ’842 for the reasons provided by Petitioner. We find that Loh ’842 itself states that lens coupler 106 can have many different shapes and sizes, and discloses examples of different shapes and sizes in the many figures of Loh ’842. Ex. 1004, 5:32–43, Figs. 1–3, 4A–4C, 5–7, 8A–8G. That alone would have motivated a person having ordinary skill in the art at the time of the invention to substitute one shape of the depressions in any of the embodiments shown for another shape. Ex. 1003 ¶¶ 121–129. We are not persuaded by Patent Owner’s argument that Petitioner has failed to provide any evidentiary basis to support the “contention that a POSITA would have looked to use different depression shapes to alter the radiation patterns.” PO Resp. 26–27. Loh ’842 explicitly describes that lens coupler 106 includes reflective surfaces positioned to reflect light generated by LED 110; that the reflective surfaces can be positioned for directing the light upwardly and

away from package 100; and that lens coupler can have many different shapes and sizes to enhance its reflectivity. Ex. 1004, 5:32–38. We give substantial weight to Dr. Shealy’s testimony that a person having ordinary skill in the art reading such passage, along with all of the other passages that explain that different shaped notches could be used in different embodiments (*Id.* at 6:30–8:65), would have understood Loh ’842 to teach altering the “radiation pattern” by using different shaped lens couplers by altering the shape of depressions 406 and 408. Ex. 1003 ¶¶ 121–129; Ex. 2008, 60:14–62:10.

Petitioner provides yet another reason to make the proposed modification of using square shaped depressions. Petitioner argues that a person having ordinary skill in the art would have found it obvious to apply the square shaped depressions of Figure 8B of Loh ’842 to the slanted reflector of Figures 8C–8F of Loh ’842 and also to add depressions at varying locations along the reflector (e.g., close to the upper and lower portions) to reduce “peel-off” delamination that decreases radiation efficiency and causes LED failure. Pet. 44–45 (citing Ex. 1004, 5:32–43, 6:30–8:65, Figs. 8A–8G; Ex. 1003 ¶¶ 75–81, 121–129, 142; Ex. 1010, 2:5–25, 10:47–55, 11:56–62, 20:27–32, Fig. 1C). In support of this assertion, Petitioner relies on Nii, which explicitly describes the known problem of peel-off between the inner edge of the opening of an LED housing and the sealing material. Ex. 1010, 1:5–8, 2:5–13. Nii further supports Petitioner’s contention that it would have been obvious to use square shaped depressions (notches) located at the top of the housing to reduce delamination, because the square-shaped depressions would have increased the surface area, making it easier to hold sealing material in the recess of the housing and

prevent sealing material from falling off. *Id.* at 10:47–55, 11:56–62, 20:27–32, Fig. 1C. Patent Owner does not make any arguments with respect to the knowledge of the person having ordinary skill in the art as evidenced by Nii. PO Resp. 26–28.

For all of the reasons given above, having considered Petitioner’s and Patent Owner’s arguments and evidence, we determine that Loh ’842 teaches each limitation of claims 3 and 4 and that it would have been obvious to combine any of Loh ’842’s embodiments for the reasons provided by Petitioner. Accordingly, Petitioner has shown by a preponderance of the evidence that claims 3 and 4 are unpatentable as obvious over Loh ’842.

#### Claim 5

Petitioner contends that claim 5 is unpatentable under 35 U.S.C. § 102(e) as anticipated by Loh ’842 and unpatentable under 35 U.S.C. § 103(a) as obvious over Loh ’842. Pet. 41–42, 44–45. For the reasons that follow, having considered Petitioner’s and Patent Owner’s arguments and evidence, we determine that claim 5 is anticipated by Loh ’842. We also determine that claim 5 is rendered obvious over Loh ’842.

Claim 5 depends from claim 1 and recites “wherein said light emitter is electrically connected to said substrate.” Ex. 1001, 3:61–62. Petitioner contends that Loh ’842 describes that mounting pad 109 is mounted to substrate 102 with electrical connections being made to LED 110 for applying an electrical bias and that the top surface of LED 110 may be connected to electrical connections via one or more conductive bond wires 112. Pet. 41–42 (citing Ex. 1004, 5:27–31, 7:57–67; Ex. 1003 ¶¶ 132–134). Loh ’842 explicitly describes that LED 110 is electrically connected to

traces on the substrate, as seen in, for example Figure 5, element 502. Ex. 1004, 7:57–67 (cited by Petitioner), 8:13–23. Thus, we find that Loh '842 describes the LED is electrically connected to the substrate.

Patent Owner argues that the LED is electrically connected to the separate mounting pad 109, not the substrate 102. PO Resp. 20 (citing Ex. 1004, 5:27–31). We disagree based on the teachings of Loh '842 explained immediately above. We also disagree because, as separately explained above with respect to our discussion of claim 1, we find that Loh '842's mounting pad would have been considered to be part of the substrate, and not necessarily separate from the substrate. Ex. 1004, 2:42–44, 4:2–6, 11:1–7; Ex. 2008, 70:7–73:5. Thus, we are not persuaded by Patent Owner's argument that the LED is not electrically connected to substrate 102 because the substrate and mounting pad are separate elements. Patent Owner further argues that in our Decision on Institution, we did not rely on the Petition's analysis and that we instead relied on an embodiment shown in Loh '842, Figs. 5 and 7, which includes a die mounting pad as part of a substrate. Sur-reply 17. We disagree that we did not rely on the Petition's analysis, because the Petition itself cites to the same passage (Ex. 1004, 7:57–67) that we discussed in the Decision on Institution. Dec. 19.

For all of the reasons given above, having considered Petitioner's and Patent Owner's arguments and evidence, we determine that Loh '842 discloses each limitation of claim 5. Accordingly, Petitioner has shown by a preponderance of the evidence that claim 5 is unpatentable as being anticipated by Loh '842.

Alternatively, Petitioner argues that to the extent Loh '842 does not disclose the light emitter electrically connected to the substrate, a person

having ordinary skill in the art would have known to electrically connect the LED to the substrate for proper operation. Pet. 45 (citing Ex. 1003 ¶¶ 145–146). We are not persuaded by Patent Owner’s argument with respect to claim 5 that because Loh ’842 shows electrical connections located on mounting pad 109, not substrate 102, it is not necessary for the LED to be connected to substrate 102. *Id.* at 29. As explained above, we find that Loh ’842 shows electrical traces on the substrate, similar to the ’297 patent’s description. Thus, Patent Owner’s argument is not persuasive. In addition, Patent Owner’s argument does not take into account Dr. Shealy’s testimony. Ex. 1003 ¶¶ 145–146. We give substantial weight to this portion of his testimony. A person having ordinary skill in the art would have understood that in order for the LED to operate properly it would have to be connected to the electrical traces on the substrate shown in Loh ’842 itself. Ex. 1004, 7:57–67, 8:13–23; Ex. 1003 ¶¶ 145–146.

For all of the reasons given above, having considered Petitioner’s and Patent Owner’s arguments and evidence, we determine that Loh ’842 teaches each limitation of claim 5 and that it would have been obvious to combine any of Loh ’842’s embodiments for the reasons provided by Petitioner. Accordingly, Petitioner has shown by a preponderance of the evidence that claim 5 is unpatentable as obvious over Loh ’842.

#### Claim 6

Petitioner contends that claim 6 is unpatentable under 35 U.S.C. § 102(e) as anticipated by Loh ’842 and unpatentable under 35 U.S.C. § 103(a) as obvious over Loh ’842. Pet. 42–45. For the reasons that follow, having considered Petitioner’s and Patent Owner’s arguments and evidence,

we determine that Loh '842 anticipates claim 6, and claim 6 also is rendered obvious over Loh '842.

Claim 6 depends from claim 1 and recites “wherein said reflector comprises a slanted portion that intersects a platform, wherein said platform is located proximate said substrate; and wherein said at least one notch is located at the intersection of said slanted portion and said platform.” Ex. 1001, 3:63–67. Petitioner reproduces and cites to Loh '842, Figs. 8C, 8E as showing this feature and further argues that a person having ordinary skill in the art would have understood that Loh '842's described shaped notches, such as square shaped notches, could be used in any of the described embodiments, such as those illustrated in Figures 8C and 8E. Pet. 42–43 (annotated Loh '842, Figs. 8C, 8E; and citing Ex. 1004, 5:32–39, 6:30–8:65, Figs. 8A–8G; Ex. 1003 ¶¶ 121–139).

We agree that Loh '842 describes a slanted portion of lens coupler 106 that intersects a platform that is proximate the substrate 102 and where at least one depression 406 is located at the intersection. Ex. 1004, Figs. 8C, 8E. We further determine that a person having ordinary skill in the art, reading Loh '842, would have at once envisaged that depression 406 seen in Figures 8C and 8E would have been interchangeable with a square shaped depression. Ex. 1004, 5:32–53, Figs. 8C, 8E; Ex. 1003 ¶¶ 135–139.

Patent Owner's argument that Loh '842 does not meet claim 6 is based on Patent Owner's proposed construction for the phrase “at the intersection.” PO Resp. 21–24. We explain above why we do not adopt Patent Owner's proposed construction. Moreover, with respect to Figure 8C we do not agree with Patent Owner that depression 406 is not at the intersection, even under Patent Owner's construction that “at the

intersection” means that the notch overlaps the point of intersection between the reflector wall and a platform located on the substrate. *Id.* at 24. Patent Owner argues that “even if the slanted portion intersects a side of the notch [Loh ’842 depression 406 in Fig. 8C], the notch is only near the intersection, not ‘at’ the intersection.” Sur-reply 16. This argument makes little sense. If any portion of the notch (Loh ’842 depression 406 in Fig. 8C), such as the side of the notch, overlaps the intersection, we do not understand why such arrangement would not meet even Patent Owner’s proposed construction. For all of these reasons, we find that Loh ’842 teaches a notch “located at the intersection” of the slanted portion and the platform.

For similar reasons provided above, we determine that one of ordinary skill in the art, reading Loh ’842, would have understood that the depressions 406 and 408 seen in Figure 8C could have been replaced with square shaped depressions. *Supra*, at 26–30; Pet. 43; Ex. 1003 ¶¶ 135–139. Like in *Blue Calypso*, we find that a person having ordinary skill in the art would at once envisaged the claimed arrangement of claim 6.

For all of the reasons given above, having considered Petitioner’s and Patent Owner’s arguments and evidence, we determine that Loh ’842 discloses each limitation of claim 6. Accordingly, Petitioner has shown by a preponderance of the evidence that claim 6 is unpatentable as being anticipated by Loh ’842.

Alternatively, Petitioner argues that to the extent claim 6 is found not anticipated because it requires disclosure from multiple Loh ’842 embodiments, as well as motivations from prior art, it would have been obvious to combine features from the various Loh ’842 figures. *Id.* at 44–47. For instance, Petitioner contends, with supporting evidence that Loh

'842 discloses that to provide a variety of radiation patterns, a person having ordinary skill in the art would have known to use variously shaped, numbered, and located depressions in reflective walls of varying inclines and configurations. Pet. 44 (citing Ex. 1004, 5:32–43, 6:30–8:65, Figs. 8A–8G; Ex. 1003 ¶¶ 121–129). Petitioner further explains that to achieve a particular radiation pattern and to minimize encapsulant delamination, a person having ordinary skill in the art would have found it obvious to apply the square shaped depressions of Figure 8B of Loh '842 to the intersection of the slanted wall and platform of Figures 8C and 8E of Loh '842, and also that the platform would have been proximate the substrate. *Id.* at 45–46 (citing previous sections in the Petition; Ex. 1004, Figs. 8A–8G; Ex. 1003 ¶¶ 121–129, 141–142, 148–151; Ex. 1010, Fig. 1C). We are persuaded by Petitioner's showing as to why it would have been obvious to use square shaped depressions in the arrangements shown in either of Figures 8C and 8E of Loh '842 for reasons already explained above with respect to claims 3 and 4.

Patent Owner's arguments regarding why it would not have been obvious to combine the different Loh '842 embodiments are similar to the arguments Patent Owner makes with respect to claims 3 and 4. *See* PO Resp. 26–31. For similar reasons expressed above with respect to claims 3 and 4, we are not persuaded by Patent Owner's arguments regarding Petitioner's obviousness showing of claim 6.

For all of the reasons given above, having considered Petitioner's and Patent Owner's arguments and evidence, we determine that Loh '842 teaches each limitation of claim 6 and that it would have been obvious to combine any of Loh '842's embodiments for the reasons provided by

Petitioner. Accordingly, Petitioner has shown by a preponderance of the evidence that claim 6 is unpatentable as obvious over Loh '842.

Claim 9

Petitioner contends claim 9 is unpatentable under 35 U.S.C. § 103(a) as obvious over Loh '842. Pet. 46–49. For the reasons that follow, having considered Petitioner's and Patent Owner's arguments and evidence, we determine that claim 9 is rendered obvious over Loh '842.

Claim 9 depends from claim 1 and reads as follows:

9. The light emitting device of claim 1, wherein said reflector comprises:

a first wall extending substantially perpendicular to said substrate;

a first platform extending from said first wall;

a second wall extending from said first platform and facing said first wall, the space between said first wall and said second wall constituting one of said at least one notch;

a second platform extending from said second wall toward the center of said light emitting device;

a slanted portion extending from said second platform toward said substrate; and

a third platform located on said substrate and intersecting said slanted portion;

wherein a second of said at least one notch is located at the intersection of said third platform and said slanted portion.

Ex. 1001 at 4:9–26.

Petitioner contends, and we agree, that the claimed first wall, first platform, second wall (the first notch), and second platform are described in Loh '842 Figure 8B as one of the square depressions, e.g., 408, as explained in the Petition. Pet. 46–47 (citing Ex. 1004, 6:25–51, 8:26–29, Figs. 8B–8G; Ex. 1003 ¶¶ 154–157). Petitioner further contends, and we agree, that Loh

'842 discloses various slanted inclined portions that extend toward the substrate and intersect various platforms where a second depression is located, similar to the discussion above with respect to claim 6. Pet. 47 (citing Ex. 1004, 8:30–59, Figs. 8C, 8E, 8F; Ex. 1003 ¶ 158). Petitioner additionally contends that although Loh '842 does not disclose, within a single figure, a slanted portion followed by a third platform, a “POSITA would have found it obvious to utilize various combinations taught by Loh '842 to create a various configurations—*e.g.*, combining Figures 8B and 8C.” Pet. 48 (citing Ex. 1004, 5:32–43, 6:30–8:65, Figs. 8A–8G; Ex. 1013, Fig. 1; Ex. 1003 ¶¶ 160–162). Petitioner provides reasoning with rationale underpinnings for modifying Loh '842 similar to its obviousness showing for claims 3, 4, and 6. Pet. 49 (citing Ex. 1003 ¶ 161; Ex. 1004, 5:32–43, 6:30–8:65, Figs. 8A–8G; Ex. 1010, 2:5–25, 10:47–55, 11:56–62, 20:27–32, Fig. 1C). Notwithstanding Patent Owner’s arguments, which we address below, we are persuaded by Petitioner’s showing that it would have been obvious to use square shaped depressions of Figure 8B in the arrangements shown in, for example, Figure 8C for reasons already explained above with respect to claims 3, 4, and 6.

Patent Owner argues that there is no embodiment that shows a second platform extending from a second wall toward the center of the light emitting device coupled with a slanted portion extending from the second platform toward the substrate. PO Resp. 31–32. Patent Owner’s arguments are misplaced, because they are based on whether a single embodiment shows what is claimed in claim 9, when Petitioner’s showing proposes to combine two embodiments, *e.g.*, combine Loh '842 Figure 8B with Figure 8C. Pet. 48. Patent Owner argues that similar to its discussion of claim 6,

Loh '842 fails to disclose a notch located at the intersection of a platform and a slanted portion. PO Resp. 32. For reasons provided above for claim 6, we disagree with Patent Owner. As explained above, we find that depression 406 of Figure 8C shows a depression (notch) located at the intersection of the platform and slanted portion. Patent Owner also argues that Petitioner provides no evidentiary basis why a person having ordinary skill would have used a particularly shaped depression for particularly shaped lens couplers. *Id.* at 32–34. For reasons already discussed above with respect to claims 3, 4, and 6, that equally apply to claim 9, we disagree.

For all of the reasons given above, having considered Petitioner's and Patent Owner's arguments and evidence, we determine that Loh '842 teaches each limitation of claim 9 and that it would have been obvious to combine Loh '842's embodiments shown in Figures 8B and 8C for the reasons provided by Petitioner. Accordingly, Petitioner has shown by a preponderance of the evidence that claim 9 is unpatentable as obvious over Loh '842.

Claims 7, 8 and 10–17

Petitioner contends claims 7, 8, and 10–17 are unpatentable under 35 U.S.C. § 103(a) as obvious over Loh '842 in view of Fujiwara. Pet. 49–57.

Claim 7 depends from claim 1 and recites “wherein said substrate comprises at least one recessed portion and wherein said light emitter is located on said at least one recessed portion.” Ex. 1001, 4:1–4. Claim 8 depends from claim 7 and recites “further comprising an adhesive located in said at least one recessed portion, said adhesive serving to bond said light emitter to said substrate.” *Id.* at 4:5–8. Petitioner contends, and we agree,

that Fujiwara describes formation of concave portion 22 (pink in annotated Figure 13, *supra*, at 15) in the lead frame or board into which resin is inserted to act “as an adhesive cement for sticking the semiconductor luminous element 4” on the slab. Pet. 51 (citing Ex. 1005, 11:36–38, Figs. 13, 14(a)–14(c); Ex. 1003 ¶ 167). The Petition also cites to several passages throughout Fujiwara, consistently describing the same resin (3). *Id.* (citing Ex. 1005, 4:54–63, 5:50–51, 14:53–60, 15:54–67, 17:50–57).

Petitioner provides reasoning with rational underpinnings for modifying Loh ’842 with Fujiwara. Pet. 51–52. Petitioner contends, and we agree, that a person having ordinary skill in the art would have been motivated to combine Fujiwara’s adhesive recess with Loh ’842’s LED packaging because (i) delamination of both the encapsulant from the reflector and the LED from the substrate was known at the time; (ii) Fujiwara teaches that the adhesive in the recess fixes the semiconductor luminous element in place and (iii) it would eliminate tilted LED mounting and uneven and inefficient heat dissipation resulting from conventional mounting-pad techniques, such as disclosed in Loh ’842. Pet. 51–52 (citing Ex. 1005, 11:36–38; Ex. 1010, 2:5–25, 11:56–62; Ex. 1003 ¶ 168).

Petitioner further argues that a person having ordinary skill in the art would have had a reasonable expectation of success in making the modification as it would have been nothing more than routine design and implementation applying Fujiwara’s known adhesive recess technique to a light emitting device. Pet. 52 (citing Ex. 1003 ¶ 169). Notwithstanding Patent Owner’s arguments, which we address below, we are persuaded by Petitioner’s showing that it would have been obvious to combine Fujiwara’s adhesive

recess with Loh '842's LED packaging for the reasons articulated by Petitioner.

Despite conceding that Fujiwara at column 4, lines 53 to 60, relates to Embodiment 8, which in turn relates to Figure 13, Patent Owner argues that that passage does not refer to an adhesive. PO Resp. 36. Patent Owner is mistaken. Fujiwara describes a resin inserted in a concave portion of a substrate, which serves to bond a light emitter to the substrate. Ex. 1005, 4:47–63, 24:3–7 (claim 7).

For all of the reasons given above, having considered Petitioner's and Patent Owner's arguments and evidence, we determine that Loh '842 in view of Fujiwara teaches each limitation of claims 7 and 8 and that it would have been obvious to combine Loh '842 and Fujiwara for the reasons provided by Petitioner. Accordingly, Petitioner has shown by a preponderance of the evidence that claims 7 and 8 are unpatentable as obvious over Loh '842 and Fujiwara.

Independent claim 10 is similar in scope to claim 7. Petitioner's showing with respect to claim 10 is similar to its showing with respect to claim 7. Pet. 52–53, 60. Claims 11–14 depend directly from claim 10 and are similar in scope to claims 8 and 2–4, respectively. Petitioner's showing with respect to claims 11–14 is similar to its showing with respect to claims 8 and 2–4. Pet. 54–55, 60. Independent claim 15 is similar in scope to claims 1, 7, and 9. And claims 16 and 17, which each depend directly from claim 15, are similar in scope to claims 8 and 2, respectively. Petitioner's showing with respect to claims 15–17 is similar to its showing with respect to claims 1, 2, and 7–9. Pet. 55–57, 60. *See generally* Ex. 1001, 4:28–6:8

(claims 10-17). Patent Owner does not argue these claims separate from those already discussed. PO Resp. 36–37.

We have considered Petitioner’s and Patent Owner’s arguments and evidence, and we determine that Loh ’842 in view of Fujiwara teaches each limitation of claims 10–17 and that it would have been obvious to combine Loh ’842 and Fujiwara for the reasons provided by Petitioner. Accordingly, Petitioner has shown by a preponderance of the evidence that claims 10–17 are unpatentable as obvious over Loh ’842 and Fujiwara.

*F. Remaining Grounds Challenging the Claims of the ’297 Patent*

For the reasons discussed above, Petitioner has shown, by a preponderance of the evidence, that challenged claims 1–6 and 9 of the ’297 patent are unpatentable over Loh ’842 and that claims 7, 8, and 10–17 are unpatentable over Loh ’842 in combination with Fujiwara. We have addressed all challenged claims. *See SAS Institute Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (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 1–17 also are unpatentable based on the remaining challenges. *Cf. In re Gleave*, 560 F.3d 1331, 1338 (Fed. Cir. 2009) (not reaching other ground 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<sup>15</sup>

In summary:

| Claims                     | 35<br>U.S.C. § | Reference(s)/Basis             | Claims<br>Shown<br>Unpatentable | Claims Not<br>Shown<br>Unpatentable |
|----------------------------|----------------|--------------------------------|---------------------------------|-------------------------------------|
| 1–6                        | 102(e)         | Loh '842                       | 1–6                             |                                     |
| 1–6, 9                     | 103(a)         | Loh '842                       | 3–6, 9                          |                                     |
| 7, 8, 10–<br>17            | 103(a)         | Loh '842, Fujiwara             | 7, 8, 10–17                     |                                     |
| 7, 8, 10–<br>17            | 103(a)         | Loh '842, Uraya <sup>16</sup>  |                                 |                                     |
| 1–6                        | 102(e)         | Loh '819                       |                                 |                                     |
| 1–6, 9                     | 103(a)         | Loh '819                       |                                 |                                     |
| 1–6, 9                     | 103(a)         | Loh '819 Andrews               |                                 |                                     |
| 7, 8, 10–<br>17            | 103(a)         | Loh '819 Fujiwara              |                                 |                                     |
| 7, 8, 10–<br>17            | 103(a)         | Loh '819,<br>Fujiwara, Andrews |                                 |                                     |
| 7, 8, 10–<br>17            | 103(a)         | Loh '819 and<br>Uraya          |                                 |                                     |
| 7, 8, 10–<br>17            | 103(a)         | Loh '819, Uraya,<br>Andrews    |                                 |                                     |
| <b>Overall<br/>Outcome</b> |                |                                | 1–17                            |                                     |

<sup>15</sup> Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

<sup>16</sup> As explained above, because our determinations above address all challenged claims, we do not address the additional grounds.

#### IV. ORDER

Accordingly, it is:

ORDERED that claims 1–17 of the '297 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.

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