

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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SEOUL SEMICONDUCTOR CO., LTD, and NORTH AMERICA SEOUL  
SEMICONDUCTOR INC.,  
Petitioner,

v.

SHARP KABUSHIKI KAISHA and ENPLAS CORPORATION,  
Patent Owner.

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Case IPR2014-00879  
Patent 7,798,679 B2

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Before WILLIAM A. CAPP, JAMES B. ARPIN, and  
JEREMY M. PLENZLER, *Administrative Patent Judges*.

PLENZLER, *Administrative Patent Judge*.

FINAL WRITTEN DECISION  
*35 U.S.C. § 318(a) and 37 C.F.R. § 42.73*

I. INTRODUCTION

A. Background

Seoul Semiconductor Co., Ltd. and North America Seoul Semiconductor Inc. (collectively, “Petitioner”) filed a Petition to institute an *inter partes* review of claims 1–7 of U.S. Patent No. 7,798,679 B2 (Ex. 1001, “the ’679 patent”). Paper 1 (“Pet.”). In our Decision on Institution (Paper 11, “Decision to Institute” or “Dec.”), we instituted a trial to review the patentability of claims 1–3 and 5–7 based on the following grounds:

References	Basis	Claims
Yoon <sup>1</sup>	§ 102	1, 3, and 7
Yoon and Wanninger <sup>2</sup>	§ 103	2 and 3
Yoon and Horie <sup>3</sup>	§ 103	5 and 6
Wanninger and Hsieh <sup>4</sup>	§ 103	1–3 and 7
Wanninger, Hsieh, and Horie	§ 103	5 and 6

*Id.* at 19. Petitioner also provided testimony from Jose Sasian, Ph.D. (Ex. 1002, “the Sasian Declaration”).

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<sup>1</sup> U.S. Patent App. Pub. No. 2006/0083000 A1, published Apr. 20, 2006 (Ex. 1004, “Yoon”).

<sup>2</sup> PCT Pub. No. WO 2007/036186 A1, published Apr. 5, 2007 (Ex. 1005, “Wanninger”). Citations to this reference refer to its English translation (Ex. 1006).

<sup>3</sup> Japanese Patent Pub. No. 10-82915, published Mar. 31, 1998 (Ex. 1007, “Horie”). Citations to this reference refer to its English translation (Ex. 1008).

<sup>4</sup> U.S. Patent App. Pub. No. 2007/0091615 A1, published Apr. 26, 2007 (Ex. 1009, “Hsieh”).

Subsequent to institution, Sharp Kabushiki Kaisha and Enplas Corporation (collectively, “Patent Owner”) filed a Patent Owner Response (Paper 18, “PO Resp.”) and, in support, a declaration from Timothy Drabik, Ph.D. (Ex. 2009, “the Drabik Declaration”). Petitioner filed a Reply (Paper 26, “Pet. Reply”) to the Patent Owner Response.

An oral hearing was held on July 14, 2015, and a transcript of the hearing is included in the record (Paper 32, “Tr.”).

We have jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73.

For the reasons that follow, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–3 and 5–7 of the ’679 patent are unpatentable.

*B. Related Proceedings*

Petitioner and Patent Owner indicate that they are unaware of any related proceedings. Pet. 2; Paper 7, 1.

*C. The ’679 Patent*

The ’679 patent is directed to a lighting device including a light-emitting device having a light flux controlling member. Ex. 1001, 1:11–19. Figures 1 and 3 of the ’679 patent, reproduced below, illustrate the light-emitting device and the light flux controlling member.

FIG. 1

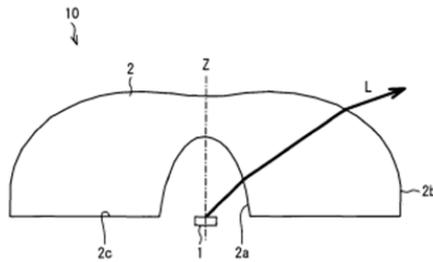


FIG. 3

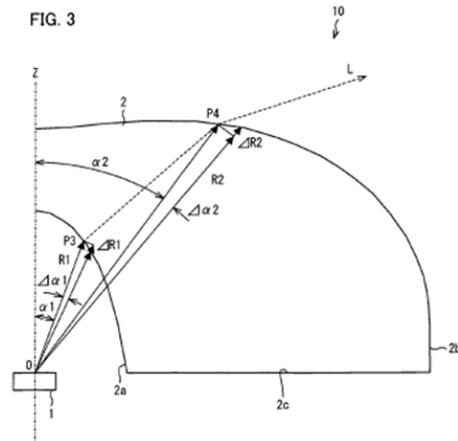


Figure 1 is a cross-sectional view illustrating light emitting device 10 and light flux controlling member 2; Figure 3 is a fragmentary, detailed view of the cross-section of Figure 1.

Light emitting device 10 includes light-emitting element 1 and light flux controlling member 2. *Id.* at 6:25–31. Light flux controlling member 2 includes light incoming surface 2a defining an internal surface and light outgoing surface 2b defining an external surface, with light-emitting element 1 located within an empty space defined by light incoming surface 2a. *Id.* at 6:60–66.

The '679 patent defines the Z-axis as the light axis at the center of light emission for light emitting element 1, and defines the surfaces of light flux controlling member 2 relative to the Z-axis. *Id.* at 6:66–7:21. Specifically, the '679 patent describes the cross-section of light incoming surface 2a as a “bell shape,” with the slope of light incoming surface 2a significantly changing in the vicinity of the Z-axis and having a reduced degree of change in an area away from the Z-axis. *Id.* at 7:5–12. The '679 patent describes the cross-section of light outgoing surface 2b as having a

slope significantly changing in the area away from the Z-axis until it is generally parallel to the Z-axis, with a lesser degree of change in slope in the vicinity of the Z-axis. *Id.* at 7:12–19. The '679 patent illustrates this arrangement in Figure 3, explaining that  $R_1$  (the distance between reference point O at light emitting element 1 and a point on light incoming surface 2a) monotonically decreases in a direction from the Z-axis to bottom surface 2c and that  $R_2$  (the distance between reference point O at light emitting element 1 and a point on light outgoing surface 2b) monotonically increases in a direction from the Z-axis to bottom surface 2c. *Id.* at 7:47–8:51.

The '679 patent explains that the direction of light is changed on both incoming light surface 2a and outgoing light surface 2b, providing lower reflectance of light relative to conventional arrangements, such as that shown in Figure 19. *Id.* at 11:21–29.

#### *D. Illustrative Claim*

Claim 1 is the sole independent claim, with challenged claims 2, 3, and 5–7 depending from claim 1. Claim 1 is illustrative and is reproduced below:

1. A light-emitting device, comprising:  
a light-emitting element and  
a light flux controlling member for controlling light emitted from the light-emitting element,  
the light flux controlling member having (i) a light-incoming surface from which the light from the light-emitting element enters the light flux controlling member and (ii) a light-outgoing surface from which the light being incident on the light-incoming surface is emitted from the light flux controlling member,

the light-incoming surface having a concave curve part that is axisymmetrical with respect to a reference light axis of the light-emitting device, and the light-outgoing surface having (i) a convex curve part that is axisymmetrical with respect to the reference light axis and (ii) a recession continuing to the convex curve part, on a part encompassing an intersection of the reference light axis and the light-outgoing surface;

$R_1$  monotonically decreasing as  $\alpha_1$  increases, at least in a range of  $\alpha_1 < \pi/3$ , where an intersection of the reference light axis and an emission surface of the light-emitting element is a reference point;  $\alpha_1$  is an angle between the reference light axis and a straight line that passes through the reference point and an arbitrary point on the light-incoming surface; and  $R_1$  is a distance between the reference point and the arbitrary point on the light-incoming surface;

$R_2$  monotonically increasing as  $\alpha_2$  increases, at least in a range of  $\alpha_2 < \pi/3$ , where  $\alpha_2$  is an angle between the reference light axis and a straight line that passes through the reference point and an arbitrary point on the light-outgoing surface; and  $R_2$  is a distance between the reference point and the arbitrary point on the light-outgoing surface; and

$A_2 < 1/\sqrt{n^2 - 1}$ , where  $n$  is a refraction index of a material forming the light flux controlling member; and  $A_2 = \Delta R_2 / (R_2 \Delta \alpha_2)$ , where  $\Delta R_2$  is an increment of  $R_2$  and  $\Delta \alpha_2$  is an increment of  $\alpha_2$ .

*Id.* at 17:60–18:33.

## II. EVIDENTIARY MATTERS

### A. *The Sasian Declaration*

Patent Owner contends that the Sasian Declaration should be given little or no weight. PO Resp. 40–46.

Patent Owner discusses portions of Dr. Sasian’s declarations in a number of *inter partes* reviews, including IPR2014-00605, IPR2014-00878, and IPR2014-00879 (this proceeding), and alleges generally, that, “[i]n each case, Sasian’s testimony demonstrates disturbing evidence that suggests that rather than offering his own testimony, Sasian is offering testimony written for him by counsel for Petitioners, and adopting practices and procedures that would not be honored by those of skill in the art.” *Id.* at 40. Patent Owner describes a number of alleged errors in Dr. Sasian’s testimony in IPR2014-00605 and this proceeding. *Id.* at 41–46. Patent Owner also alleges that “what appears in the place of the signature [on Dr. Sasian’s declarations] is a piece of graphic text, an electronic image of a signature.” *Id.* at 44. Because of the alleged errors in the testimony provided in IPR2014-00605 and IPR2014-00879, as well as the signature issue in this proceeding, Patent Owner contends that “[Dr.] Sasian’s testimony is neither trustworthy nor credible and should be accorded little if any weight.” *Id.* at 46.

In its Reply, Petitioner disputes Patent Owner’s allegations. Pet. Reply 16–19.

Patent Owner has not articulated a persuasive reason for giving Dr. Sasian’s Declaration, as a whole, little or no weight in our analysis. It is generally understood that some attorney involvement in the preparation of an expert report or declaration is permissible as long as the expert

substantially participated in the preparation thereof, such that it cannot be considered to be “ghost written” by an attorney. *See Manning v. Crockett*, No. 95C3117, 1999 WL 342715, at \*3 (N.D. Ill. May 18, 1999); *see also Trigon Ins. Co. v. United States*, 204 F.R.D. 277, 293 (E.D. Va. 2001) (discussing the decision in *Manning*). Patent Owner has not demonstrated persuasively that Dr. Sasian’s declaration was “ghost written.” *Long Term Capital Holdings v. United States*, No. 01-CV-1290, 2003 WL 21269586, at \*4 (D. Conn. May 6, 2003). We may determine the appropriate weight to be accorded the evidence presented, including expert opinion, based on the disclosure of the underlying facts or data, upon which that opinion is based. Thus, we decline to make a determination about Dr. Sasian’s opinion, as a whole. Rather, in our analysis, we consider, as they arise, relevant portions of Dr. Sasian’s testimony and determine the appropriate weight to accord that particular testimony.

*B. The Drabik Declaration*

Petitioner contends that the Drabik Declaration should be given little weight. Pet. Reply 19–20.

Petitioner contends that “Dr. Drabik identifies no relevant experience or education,” and, despite the vast scope of his alleged expertise, “Dr. Drabik’s declaration identifies no [relevant] experience in non-imaging optics, illumination optics, or even lenses in general.” *Id.* at 20 (citing Ex. 2009 ¶¶ 7–16).

As with Dr. Sasian’s opinion, we decline to make a determination as to Dr. Drabik’s opinion, as a whole. As noted above, we have the discretion to determine the appropriate weight to be accorded to the evidence presented, including expert opinion, based on the disclosure of the

underlying facts or data, upon which the opinion is based. Thus, as with Dr. Sasian's testimony, in our analysis, we consider relevant portions of Dr. Drabik's testimony, as they arise, and determine the appropriate weight to accord that particular testimony.

### III. ANALYSIS

#### A. Claim Construction

We construe all terms, whether or not expressly discussed here, using the broadest reasonable interpretation in light of the '679 patent Specification. *See* 37 C.F.R. § 42.100(b); *see also In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1278–80 (Fed. Cir. 2015) (“Congress implicitly approved the broadest reasonable interpretation standard in enacting the AIA,” and “the standard was properly adopted by PTO regulation.”). Applying that standard, we interpret the claim terms of the '679 patent according to their ordinary and customary meaning in the context of the patent's written description. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

The only limitation construed expressly in our Decision to Institute is “ $A_2 < 1/\sqrt{n^2 - 1}$ , where  $n$  is a refraction index of a material forming the light flux controlling member; and  $A_2 = \Delta R_2 / (R_2 \Delta \alpha_2)$ , where  $\Delta R_2$  is an increment of  $R_2$  and  $\Delta \alpha_2$  is an increment of  $\alpha_2$ .” Dec. 7. Neither party disputes that construction, nor are we apprised of any other reason to change our construction of that limitation. We determine that no other term requires an express construction in order to conduct properly our analysis of the applied art.

*B. Legal Principles – Patent Drawings as Prior Art*

Patent drawings not designated as being drawn to scale cannot define the precise proportions of the elements and cannot be relied upon to show particular sizes if the specification is completely silent on the issue.

*Hockerson-Halberstadt, Inc. v. Avia Grp. Int'l, Inc.*, 222 F.3d 951, 956 (Fed. Cir. 2000). That does not mean, however, “that things patent drawings show clearly are to be *disregarded*.” *In re Mraz*, 455 F.2d 1069, 1072 (CCPA 1972). A drawing is evaluated on the basis of what it reasonably discloses and suggests to a person of ordinary skill in the art. *In re Aslanian*, 590 F.2d 911, 914 (CCPA 1979). It has long been the case that “[d]escription for the purposes of anticipation can be by drawings alone as well as by words.” *In re Bager*, 47 F.2d 951, 953 (CCPA 1931).

In *Mraz*, the claims at issue required that mating portions of roll members (for removing edge burrs from thin metal strips) define a strip-receiving peripheral groove with inwardly converging inclined surfaces at an angle, with respect to a plane perpendicular to the axis of the roll member, “not exceeding 15°.” *Mraz*, 455 F.2d at 1070. The principal reference (Wilson) disclosed “edge rolls” that were provided for removing the burrs from side edges of thin metal strips. *Id.*

Figure 3 of Wilson, as depicted in *Mraz*, is reproduced below.

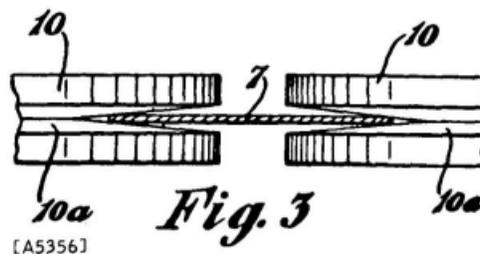


Figure 3 from *Mraz* depicts “edge rolls” 10 and thin metal strip 7. *Id.* at 1071. Without reference to expert testimony, the Court found that “[t]he half-angle of the V-shaped groove 10a measures about 6° on this drawing,” although noting that “the specification says nothing about the angle.” *Id.* The Court further found that the Wilson reference “focuses on the edge rolls, showing them with great particularity and showing the grooves thereon to have an angularity well within the range recited in appellant’s claims.” *Id.* at 1072. In other words, although patent drawings are not working drawings, that does not mean that “things patent drawings show clearly are to be *disregarded*.” *Id.*

*C. Anticipation by Yoon – Claims 1, 3, and 7*

Petitioner contends that the subject matter of claims 1, 3, and 7 is anticipated by Yoon. Pet. 20–31. We have reviewed the Petition, the Patent Owner Response, and Petitioner’s Reply, as well as the relevant evidence discussed in those papers. We are persuaded that the subject matter of claims 1, 3, and 7 is anticipated by Yoon. The parties’ dispute focuses on “the light-incoming surface having a concave curve part” and the limitations directed to “R<sub>1</sub>” and “R<sub>2</sub>” recited in claim 1. Patent Owner does not address specifically Petitioner’s contentions with respect to the other limitations recited in claim 1, or those recited in dependent claims 3 and 7.

*1. “the light-incoming surface having a concave curve part”*

Petitioner cites the lens of the light emitting diode (“LED”) depicted in Figure 14 of Yoon as disclosing “the light-incoming surface having a concave curve part,” as recited in claim 1. Pet. 21–23 (citing Ex. 1004, Fig. 14, ¶ 165).

Figure 14 of Yoon is reproduced below.

FIG.14

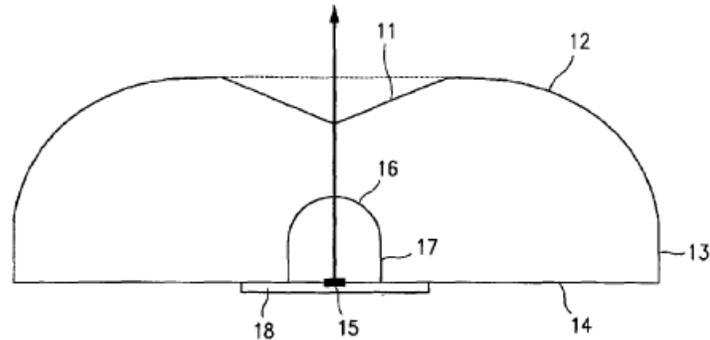


Figure 14 of Yoon is a cross-sectional view of an LED. Yoon states that “[i]t is preferable that the curved central surface 16 of the central hollow portion has a *convex* shape when viewed from the light emitting chip 15.” Ex. 1004 ¶ 165 (emphasis added).

The parties’ dispute regarding this limitation focuses on whether the inner surface of Yoon’s lens (formed by curved circumferential surface 17 and curved central surface 16) is a “concave curve part” as required by claim 1. Specifically, Patent Owner contends that Yoon discloses a *convex* light-incoming surface, rather than a *concave* light-incoming surface. PO Resp. 21–29. The basis for Patent Owner’s contention is that the word “convex” is used in paragraph 165 of Yoon to describe curved central surface 16. *Id.* at 23. Petitioner additionally notes the description of surface 12 being described as convex, and its use in the Korean priority document (Ex. 2008), to support its position that the use of convex to describe surface 16 was not in error. *Id.* at 25–29. Petitioner contends that Figure 14 of Yoon illustrates central curved surface 16 as “a concave light-

incoming surface *as that term is used in the '679 patent.*” Pet. Reply 2–4 (citing Ex. 1014, 128:19–129:21; Ex. 2004, 78:15–20, 79:12–16, 66:6–9).

Drawings and pictures can anticipate claims if they clearly show the structure which is claimed. *See Mraz*, 455 F.2d at 1072. When the reference is a utility patent, it does not matter that the feature shown is unintended or unexplained in the specification. The drawings must be evaluated for what they reasonably disclose and suggest to one of ordinary skill in the art. *Aslanian*, 590 F.2d at 914 (“a drawing in a utility patent can be cited against the claims of a utility patent application even though the feature shown in the drawing was unintended or unexplained in the specification of the reference”). Regardless of the language used in paragraph 165 of Yoon, there is no dispute that Figure 14 of Yoon discloses curved central surface 16 as being *concave* when viewed from light emitting chip 15 (i.e., extending *into* Yoon’s base 14, similar to the ’679 patent’s light-incoming surface extending into bottom surface 2c). *See* Tr. 26:18–20 (At oral hearing, Patent Owner’s counsel agreed that “figure [14] shows a concave curve for 16 . . . 16 is definitely concave.”).

Moreover, we are persuaded that the additional description of Yoon’s LED is consistent with curved central surface 16 being *concave* (i.e., extending into base 14). For example, Yoon explains that “this light emitting diode further comprises a central hollow portion upwardly formed from a base 14,” when describing the region where curved central surface 16 is located. Ex. 1004 ¶ 164. During his deposition, when asked what indicates that the reference to “convex” in paragraph 165 of Yoon is incorrect, Dr. Sasian testified that it is “the function, the divergence, the recited divergence of the surface.” Ex. 2004, 79:12–14. The divergence

referenced by Dr. Sasian is based on the discussion found in paragraph 165 of Yoon, which describes the function of Yoon's curved central surface 16 as "uniformly dispers[ing] the light ray emitted from the light emitting chip 15 to a wider region." Dr. Drabik's testimony supports the testimony from Dr. Sasian noted above. For example, when Dr. Drabik was asked how a convex light-incoming surface could produce the divergence described by Yoon, he explained that

if I had a convex central Surface 16 with a sufficient curvature, then that, then rays could be -- this is a hypothetical. I'm not suggesting that this is what is intended. But in a hypothetical, if I had a prominence facing downward to light source 15, in other words the, a downward-facing bump on the dielectric that had sufficient curvature, then it could, for example, focus a fan of rays leaving Element 15 at a point not far above itself, and then they would, after achieving the focus they would begin to diverge again and fan out, and that would, that would qualify as dispersion to a wider region.

Ex. 1014, 140:1–12. As Petitioner notes (Pet. Reply 3 n.2), however, this hypothetical appears inconsistent with the further disclosure of Yoon, which explains that "the light ray emitted from the light emitting chip 15 is always refracted at the curved central surface 16 of the central hollow portion in the receding direction from the main axis of the lens" (Ex. 1004 ¶ 168).

Regardless of whether it is possible for surface 16 to provide the divergence described in Yoon when convex, we are not apprised of a reason to believe that surface 16 being concave (as shown in Figure 14) is inconsistent with the goal of divergence. Based on the testimony from both Dr. Sasian and Dr. Drabik, it appears that surface 16 being concave is most consistent with the goal of divergence. At oral hearing, when asked whether there was any further description in Yoon inconsistent with the illustration in

Figure 14 (i.e., surface 16 being concave), Patent Owner could identify nothing. *See* Tr. 30:10–32:23; *see also* Tr. 29:8–16 (changing “convex” to “concave” or changing the point of view of the drawing would remove the asserted inconsistency).

Based on the evidence before us, we are persuaded that Figure 14 of Yoon, cited in the Petition, discloses a “light-incoming surface having a concave curve part,” as recited in claim 1.

## 2. “ $R_1$ ” and “ $R_2$ ” limitations

Claim 1 additionally requires that “ $R_1$ ,” the distance between the “light-emitting element” and the “light-incoming surface,” monotonically decreases over a range of 60 degrees from the reference light axis, and that “ $R_2$ ,” the distance between the “light-emitting element” and the “light-outgoing surface,” monotonically increases over a range of 60 degrees from the reference light axis (hereinafter referred to as the “ $R_1$ ” and “ $R_2$ ” limitations, respectively).

Petitioner contends that the “ $R_1$ ” and “ $R_2$ ” limitations are disclosed by Yoon, based on observing the shape of surfaces 16, 17 on the inner surface of Yoon’s lens and the shape of surfaces 11, 12, 13 on the outer surface of Yoon’s lens. Pet. 25–27. Petitioner provides measurements to support its contentions. *Id.* Petitioner additionally cites Yoon’s corresponding description of the inner and outer surfaces of its lens. Pet. 13–15 (citing Ex. 1004 ¶¶ 146, 148, 165).

Patent Owner responds that “[t]he **only** basis for Petitioners’ position that Yoon anticipates the challenged claims of the ’679 Patent are measurements of dimensions of a Figure – not Figure 14 of Yoon but a digitized version of that Figure prepared by Sasian who ‘was careful’ in

measuring it.” PO Resp. 31. This is an incorrect characterization of the challenge on which trial was instituted. As Petitioner notes (Pet. Reply 7), it cited Yoon’s description of Figure 14 in paragraphs 146, 148, and 165 (*see* Pet. 13–15), and that description is relied on explicitly in our Decision to Institute (*see* Dec. 10). Our Decision to Institute also expressly indicates that in its Preliminary Response, “Patent Owner fails to address the express disclosure of Yoon noted by Petitioner describing the drawings.” *Id.* at 11. Again, Patent Owner does not address the description in paragraphs 146, 148, and 165 of Yoon (*see, e.g.*, PO Resp. 31), leaving Petitioner’s contentions regarding the “ $R_1$ ” and  $R_2$ ” limitations largely unrebutted.<sup>5</sup>

Petitioner considers Yoon’s curved central surface 16 as corresponding to the “light-incoming surface” recited in claim 1, and Yoon’s curved centermost surface 11 and curved center-edge surface 12 as corresponding to the “light-outgoing surface” recited in claim 1. Pet. 21–24. In addition to Figure 14 of Yoon depicting surfaces 11, 12, 16 meeting the requirements of the “ $R_1$ ” and  $R_2$ ” limitations recited in claim 1, Yoon explains that “a distance from a point of the light emitting surface of the light emitting chip 15 to a point of the curved center-edge surface 12 is always shorter than the radius of curvature for the corresponding point of the curved center-edge surface 12 of the lens” (Ex. 1004 ¶ 146) and “a distance from a point of the light emitting surface of the light emitting chip 15 to a point of the curved central surface 16 of the central hollow portion is always longer than the radius of curvature of the corresponding point of the curved

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<sup>5</sup> In our Scheduling Order, we cautioned Patent Owner “that any arguments for patentability not raised in the response will be deemed waived.” Paper 12, 2–3.

central surface 16” (*id.* ¶ 165). Yoon further describes the function of surfaces 11, 12, 16. For example, Yoon explains that “the light ray emitted from the light emitting chip 15 is always refracted at the curved centermost surface 11 and the curved center-edge surface 12 in the receding direction from the main axis of the lens” (Ex. 1004 ¶ 162) and the shape of curved central surface 16 “is to uniformly disperse the light ray emitted from the light emitting chip 15 to a wider region” (*id.* ¶ 165).

Although Patent Owner does not address Yoon’s description of Figure 14 in its Response, it was addressed by Patent Owner’s declarant, Dr. Drabik, during his deposition, where his testimony supports Petitioner’s contentions. With respect to the “ $R_1$ ” limitation, for example, when asked whether the distance from the light source to the light-incoming surface must decrease with increasing angles in order for the light-incoming surface to deflect light away from the light axis, Dr. Drabik replied “[t]hat appears to be the case.” Ex. 1014, 95:7–96:11. Similarly, with respect to the “ $R_2$ ” limitation, when asked whether the distance from the light source to the light-outgoing surface must increase with increasing angles in order for the incoming-light surface to deflect light away from the light axis, Dr. Drabik replied “that appears to be true.” *Id.* at 98:20–99:16. Similar testimony resulted from the deposition of Petitioner’s declarant, Dr. Sasian. *See* Ex. 2004, 49:12–21, 121:11–15.

Based on the combination of Yoon’s Figure 14 and the descriptions noted above, we are persuaded that one skilled in the art would understand Yoon as disclosing the “ $R_1$ ” and “ $R_2$ ” limitations.

Patent Owner’s additional arguments regarding Petitioner’s measurements of Yoon’s Figure 14 (PO Resp. 29–40) are unpersuasive,

because we do not rely on Dr. Sasian's measurements in reaching our determination.

For the reasons set forth above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the subject matter of claims 1, 3, and 7 of the '679 patent is anticipated by Yoon.

*D. Obviousness over Yoon and Wanninger – Claims 2 and 3*

Claims 2 and 3 depend from claim 1, and Patent Owner does not dispute specifically Petitioner's contentions with respect to these claims. In fact, Patent Owner does not even address claims 2 and 3, other than alleging "nor have Petitioners presented adequate evidence that Claims 2 and 3 are rendered obvious by Yoon taken in view of . . . Wanninger." PO Resp. 1.

Based on our review of the argument and evidence supporting Petitioner's challenge to claims 2 and 3 (*see* Pet. 32–36 (citing, *e.g.*, Ex. 1006, 5–6, 13–15, Figs. 1, 4; Ex. 1002 ¶ 65)), we are persuaded that Petitioner has established, by a preponderance of the evidence, that the subject matter of those claims would have been obvious over the combination of Yoon and Wanninger.

*E. Obviousness over Yoon and Horie – Claims 5 and 6*

Claims 5 and 6 depend from claim 1, and Patent Owner does not advance any meaningful arguments with respect to these claims, and, instead, appears to argue that Horie does not cure alleged deficiencies in the challenge to claim 1 based on anticipation by Yoon. *See* PO Resp. 46–47. As noted above, we are not persuaded of deficiencies in Petitioner's challenge to claim 1.

Based on our review of the argument and evidence supporting Petitioner's challenge to claims 5 and 6 (*see* Pet. 37–40 (citing, *e.g.*, Ex. 1008, Figs. 1–3, 18, ¶¶ 2, 3, 17, 24–28, 41; Ex. 1002 ¶ 72)), we are persuaded that Petitioner has established, by a preponderance of the evidence, that the subject matter of those claims would have been obvious over the combination of Yoon and Horie.

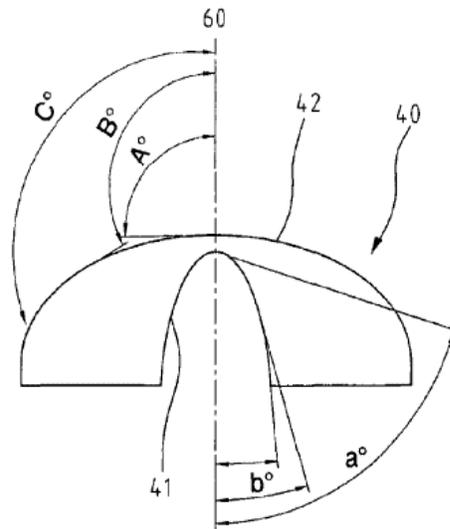
*F. Obviousness over Wanninger and Hsieh – Claims 1–3 and 7*

Petitioner contends that claims 1–3 and 7 would have been obvious over Wanninger and Hsieh. Pet. 40–54. We have reviewed the Petition, the Patent Owner Response, and Petitioner's Reply, as well as the relevant evidence discussed in those papers. We are persuaded by Petitioner's contentions regarding the teachings of Wanninger and Hsieh, and that one skilled in the art would have combined those teachings. *See* Pet. 40–54. Accordingly, we are persuaded that the subject matter of claims 1–3 and 7 would have been obvious over Wanninger and Hsieh.

The parties' dispute focuses on the “R<sub>1</sub>” and “R<sub>2</sub>” limitations recited in claim 1. Petitioner cites Wanninger as teaching each limitation of claim 1, except the “R<sub>1</sub>” limitation. Pet. 40–47. Petitioner cites Hsieh as teaching the “R<sub>1</sub>” limitation. *Id.* at 49–51. Patent Owner does not dispute that one skilled in the art would have combined the teachings of Wanninger and Hsieh, or specifically address Petitioner's contentions with respect to the other limitations recited in claim 1, or those recited in dependent claims 2, 3, and/or 7.

1. “ $R_1$ ” limitation

Petitioner cites light incoming surface 41 in Hsieh as teaching the  $R_1$  limitation recited in claim 1. *Id.* at 50. Figure 5 of Hsieh illustrates light incoming surface 41, and is reproduced below.



**FIG. 5**

Figure 5 of Hsieh is a section view of an LED dome lens. Petitioner contends that “Hsieh discloses a bell-shaped light-incoming surface 41 that refracts light away from the center axis of the lens.” *Id.* (citing Ex. 1009, Figs. 5, 6, ¶¶ 53, 54). Petitioner contends that “Figs. 5 and 6 of Hsieh show that the distance from the light emitting element to the bell-shaped light-incoming surface 41 is greatest directly perpendicular to light-emitting element and decreases monotonically with increasing angle up to and including 60 degrees (*i.e.*,  $\pi/3$ ) from a vertical line.” *Id.* at 50–51 (citing Ex. 1002 ¶¶ 106–110).

Patent Owner responds that Petitioner relies only on the Figures of Hsieh for the  $R_1$  limitation, and Hsieh does not describe or suggest that

limitation. PO Resp. 35. Patent Owner, however, does not address the description of Figure 5 in Hsieh, or what is clearly shown in the drawing.

When describing Figure 5, Hsieh describes surface 41 as “cone-shaped” with “the outward curved plane 41 progressively decreas[ing] in curvature from the center axis 60 to the outer periphery, as shown by the included angles at different points along the outward curved plane,  $\text{angle}_a > \text{angle}_b > \text{angle}_c$ , where the included angle is the angle measurement between the center axis 60 and the tangent line along the curved plane.”<sup>6</sup> Ex. 1009 ¶ 51; *see also id.* ¶ 54 (“For the light incident plane 41, the curvature decreases toward the outer periphery, so the light beams traveling through the light incident plane 41 closer to the center axis 60 are more likely to be deflected than those traveling farther away from the center axis 60 on the lateral sides.”).

We are persuaded that this description of Figure 5 in Hsieh and the corresponding angles shown in the drawing teach the  $R_1$  limitation recited in claim 1.

## 2. “ $R_2$ ” limitation

As for the  $R_2$  limitation, Petitioner cites Wanninger’s concave region 620 and convex region 621 as corresponding to the “recession” and “convex curve part,” respectively, of the light outgoing surface in the  $R_2$  limitation recited in claim 1. Pet. 44. Petitioner contends that “Figs. 1 and 4 of Wanninger show that the light-outgoing surface is closest to the light-emitting element at the point where that surface intersects the vertical axis

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<sup>6</sup> Reference “angle c” is not labeled in Figure 5, but is understood to be the unlabeled angle depicted directly above “angle b.”

and is further away as the angle from the vertical axis increases.” *Id.* at 44–45 (citing Ex. 1002 ¶ 86).

Figure 1 of Wanninger is reproduced below.

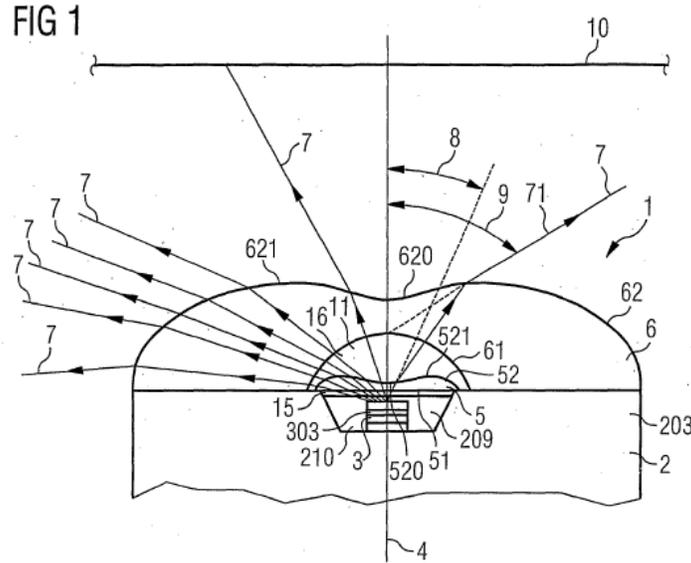


Figure 1 is a schematic, cross-sectional view of illumination arrangement 1 including optical element 6, which defines radiation entrance surface 61 and radiation exit surface 62. Ex. 1006, 12–13. Radiation exit surface includes concave region 620 and convex region 621, cited by Petitioner as corresponding to the light outgoing surface recited in claim 1.

Patent Owner responds by alleging that Petitioner relies only on measurements of a figure in Wanninger. PO Resp. 32. Similar to Petitioner’s contentions regarding Yoon and Hsieh, however, Petitioner does not rely solely on measurements of a figure. Patent Owner does not address adequately what is clearly shown in the drawings and described in the corresponding text related to those drawings.

In addition to clearly illustrating the distance between semiconductor chip 3 and convex region 621 increasing with an increasing angle from

optical axis 4 (up to at least 60 degrees), as Petitioner notes, Figure 1 of Wanninger “expressly and clearly depict[s] how rays are diverged away from the light axis.” Pet. Reply 15. Petitioner contends that this confirms that the distance between semiconductor chip 3 and convex region 621 increases as noted above. *See id.* (noting testimony from Dr. Drabik and Dr. Sasian related to divergent lens surface). It is clear that the distance from radiation semiconductor chip 3 to concave region 620 increases as the angle with respect to optical axis 4 increases. Radiation arrows 7 also clearly depict rays diverging from optical axis 4 when exiting convex region 621. The testimony related to divergent lens surfaces noted by Petitioner is that discussed above relative to the challenge based on Yoon, where both Dr. Drabik and Dr. Sasian agree that the distance from the light source to the light-outgoing surface must increase with increasing angles in order for the incoming-light surface to deflect light away from the light axis. *See* Ex. 1014, 98:20–99:16; Ex. 2004, 121:11–15.

For the reasons set forth above, we are persuaded that one skilled in the art would understand Wanninger as teaching the “ $R_2$ ” limitation.

Patent Owner’s additional arguments regarding Petitioner’s measurements of the figures in Wanninger and Hsieh (PO Resp. 29–40) are unpersuasive, because we do not rely on Dr. Sasian’s measurements in reaching our determination.

For the reasons set forth above, we conclude that Petitioner has shown, by a preponderance of the evidence, that the subject matter of claims 1–3 and 7 of the ’679 patent would have been obvious over Wanninger and Hsieh.

*G. Obviousness over Wanninger, Hsieh, and Horie – Claims 5 and 6*

Claims 5 and 6 depend from claim 1, and Patent Owner does not advance any meaningful arguments with respect to the limitations of these claims, and, instead, appears to argue that Horie does not cure alleged deficiencies in the challenge to claim 1 based on obviousness over Wanninger and Hsieh. *See* PO Resp. 46–47. As noted above, we are not persuaded of deficiencies in Petitioner’s challenge to claim 1.

Based on our review of the arguments and evidence supporting Petitioner’s challenge to claims 5 and 6 (*see* Pet. 54–57 (citing, *e.g.*, Ex. 1008, Figs. 1–3, 18, ¶¶ 2, 3, 17, 24–28, 41; Ex. 1002 ¶ 119)), we are persuaded that Petitioner has established, by a preponderance of the evidence, that the subject matter of those claims would have been obvious over the combination of Wanninger, Hsieh, and Horie.

IV. SUMMARY

We are persuaded that Petitioner has demonstrated, by a preponderance of the evidence, that claims 1–3 and 5–7 of the ’679 patent are unpatentable.

V. ORDER

For the reasons given, it is

ORDERED that claims 1–3 and 5–7 of the ’679 patent are unpatentable; and

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

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For PETITIONER:

Michael B. Eisenberg  
David W. Wallace  
michael.eisenberg@hklaw.com  
david.wallace@hklaw.com

For PATENT OWNER:

Mark R. Labgold, Ph.D.  
Steven Kelber  
Patrick J. Hoeffner  
mlabgold@labgoldlaw.com  
sbkelber@aol.com  
phoeffner@labgoldlaw.com