

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD. and
SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioner,

v.

MANUFACTURING RESOURCES INTERNATIONAL, INC.,
Patent Owner.

IPR2023-00199
Patent 8,854,595 B2

Before JAMESON LEE, JO-ANNE M. KOKOSKI, and
JOHN A. HUDALLA, *Administrative Patent Judges*.

HUDALLA, *Administrative Patent Judge*.

JUDGMENT

Final Written Decision
Determining All Challenged Claims Unpatentable
Dismissing Petitioner's Motion to Strike
35 U.S.C. § 318(a); 37 C.F.R. § 42.5(a)

Samsung Electronics Co., Ltd and Samsung Electronics America, Inc.
(collectively “Petitioner” or “Samsung”) filed a Petition (Paper 3, “Pet.”)
requesting an *inter partes* review of claims 1, 4, 7, and 8 (the “challenged
claims”) of U.S. Patent No. 8,854,595 B2 (Ex. 1001, “the ’595 patent”).

IPR2023-00199
Patent 8,854,595 B2

Manufacturing Resources International, Inc. (“Patent Owner” or “MRI”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). Taking into account the arguments presented by Patent Owner in the preliminary record, we determined that the information presented in the Petition established that there was a reasonable likelihood that Petitioner would prevail with respect to its unpatentability challenges. Pursuant to 35 U.S.C. § 314, we instituted this proceeding on June 20, 2023, as to all challenged claims and all grounds of unpatentability presented in the Petition. Paper 9 (“Dec. on Inst.”).

During the course of trial, Patent Owner filed a Patent Owner Response (Papers 18¹, 35², “PO Resp.”), and Petitioner filed a Reply to the Patent Owner Response (Papers 30¹, 37², “Pet. Reply”). Patent Owner also filed a Sur-reply (Paper 38, “PO Sur-reply”). A consolidated oral hearing with IPR2023-00220 was held on March 21, 2024, and a transcript of the hearing is included in the record. Paper 53 (“Tr.”).

Petitioner filed a declaration of Robert Smith-Gillespie (Ex. 1002) with its Petition. Patent Owner filed a declaration of Michael N. Gershowitz (Ex. 2006) with its Response. Petitioner also filed the transcript of the deposition of Mr. Gershowitz. Ex. 1041.

Petitioner filed a motion to strike Patent Owner’s Exhibits 2055, 2056, and 2058–2061 that were filed with Patent Owner’s Sur-reply. Paper 44 (“Strike Mot.”). Patent Owner filed an opposition (Paper 46, “Strike Opp.”).

¹ This paper was sealed in accordance with the Protective Order entered in this case. *See* Papers 47 (granting Motion to Seal), 48 (Protective Order).

² This paper is the public version.

IPR2023-00199
Patent 8,854,595 B2

We have jurisdiction under 35 U.S.C. § 6. This decision is a Final Written Decision under 35 U.S.C. § 318(a) as to the patentability of claims 1, 4, 7, and 8 of the '595 patent. For the reasons discussed below, Petitioner has demonstrated by a preponderance of the evidence that claims 1, 4, 7, and 8 of the '595 patent are unpatentable. We also *dismiss as moot* Petitioner's Motion to Strike.

I. BACKGROUND

A. *Real Parties-in-Interest*

Petitioner identifies Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., Samsung SDS Co., Ltd., Samsung SDS America, Inc., Coates Signco Pty Limited, Coates US Inc., and Industrial Enclosure Corporation d/b/a Palmer Digital Group as the real-parties-in-interest. Pet. 1. Patent Owner identifies Manufacturing Resources International, Inc. as the sole real party-in-interest. Paper 5, 2.

B. *Related Matters*

According to the parties, the '595 patent is the subject of the following district court litigation: *Manufacturing Resources, Inc. v. Samsung Electronics Co.*, No. 2:22-cv-00320 (E.D. Tex.). Pet. 2; Paper 5, 2. The parties also identify as a related matter the following proceeding before the United States International Trade Commission (ITC) involving the '595 patent: *In re Certain Outdoor and Semi-Outdoor Electronic Displays, Products Containing Same, and Components Thereof*, Investigation No. 337-TA-1331. Pet. 2; Paper 5, 2.

IPR2023-00199
Patent 8,854,595 B2

Petitioner also notes that the '595 patent was also involved in a case styled *Manufacturing Resources Int'l, Inc. v. Civiq Smartscapes, LLC*, No. 17-269-RGA (D. Del.) (“the Delaware action”). Pet. 2.

Patent Owner additionally identifies the following related *inter partes* review proceedings: IPR2023-00220, IPR2023-00221, IPR2023-00254, and IPR2023-00255. Paper 5, 2.

C. The '595 patent

The '595 patent relates to cooling systems for electronic displays. Ex. 1001, 1:46–48, code (57). The sole named inventor is William Dunn. *Id.* at code (75). The Specification of the '595 patent explains that “cooling devices for electronic displays of the past have generally used convective heat dissipation systems that function to cool an entire interior of the display by one or more fans and fins,” and such systems “functioned satisfactorily with ten or twelve inch screens.” *Id.* at 2:8–11, 2:20–21. The Specification further explains that “many displays are in need of screens having sizes greater than or equal to twenty-four inches” and “some outdoor applications call for seventy inch screens and above.” *Id.* at 2:21–25. According to the '595 patent, “[w]ith increased heat production with the larger screens and radiative heat transfer from the sun through the display window,” the cooling systems of the past “are no longer adequate.” *Id.* at 2:25–29.

Against this backdrop, the '595 patent describes embodiments where a constricted convection channel is used to force cooling air against a posterior surface of the electronic display. *Id.* at code (57). Fans may be used to propel or pull air through the constricted convection channel in a substantially uniform manner. *Id.* In addition, the cooling system may

IPR2023-00199
 Patent 8,854,595 B2

include an external housing with an air entrance end and an exhaust end, and a constricted convection plate preferably mounted to the posterior display surface. *Id.* at 2:45–51. The '595 patent further describes that the convection cooling channel may be adapted to receive air entering the entrance aperture and to expel air through the exit aperture. *Id.* at 2:55–59.

Figure 4 of the '595 patent is reproduced below.

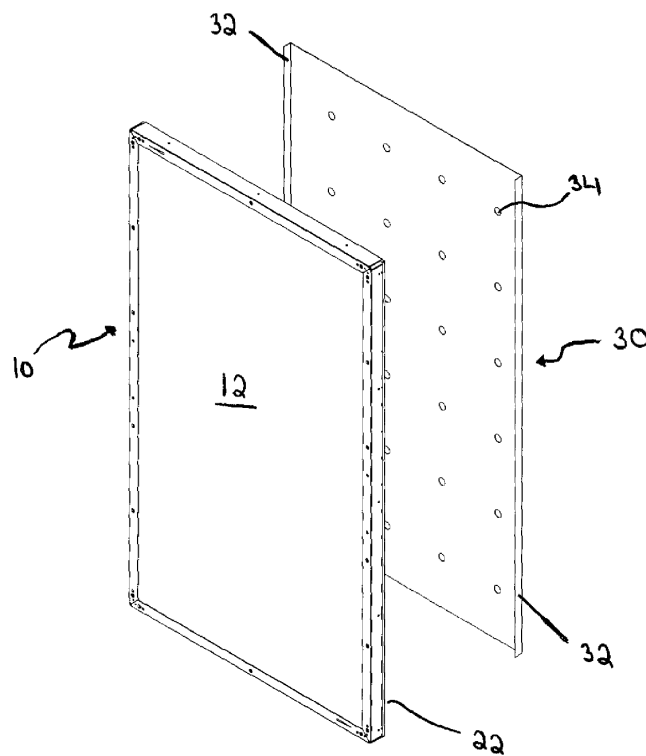


Figure 4 is an exploded view of an exemplary display using an exemplary constricted convection plate. *Id.* at 3:27–29. As shown in Figure 4, constricted convection plate 30 may be attached to display posterior 22. *Id.* at 5:25–26.

IPR2023-00199
Patent 8,854,595 B2

Figure 5A of the '595 patent is reproduced below.

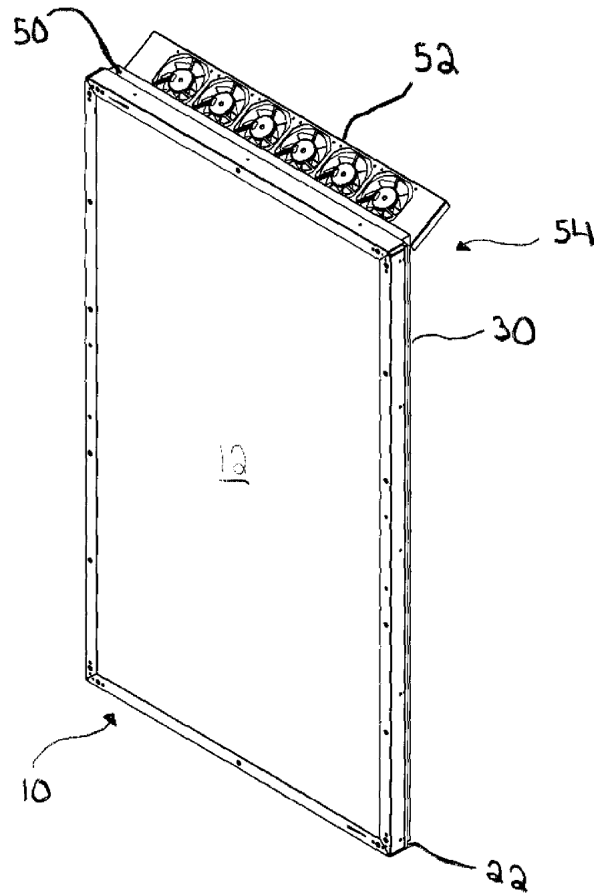


Figure 5A is a front perspective view of a fan and display in an exemplary embodiment using an exemplary constricted convection plate. *Id.* at 3:31–32. Figure 5A shows constricted convection plate 30 mounted to display posterior 22. *Id.* at 5:34–35. According to the '595 patent, constricted convection plate 30 and display posterior 22 define constricted convection cooling channel 50 immediately behind display posterior 22. *Id.* at 5:37–39.

The '595 patent further describes that

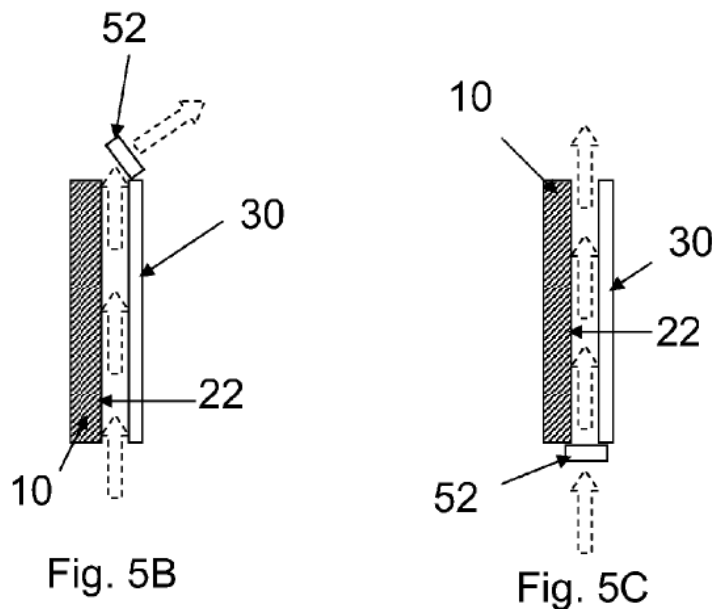
constricted convection cooling system 54 may include a means for increasing the speed at which air travels through the constricted convection cooling channel 50. This means may include one or more fans 52 which may be positioned near an

IPR2023-00199
 Patent 8,854,595 B2

opening of the constricted convection cooling channel 50. The fans 52 may either force the air through the constricted convection channel 50 or pull the air through the constricted convection channel 50. Alternatively, a plurality of fans may be used to both push and pull air through the constricted convection cooling channel 50. The use of one or more fans 52 may provide increased velocity of the air traveling through the constricted convection cooling channel 50, thus increasing the speed with which heat is transferred from the display posterior 22.

Id. at 5:45–58.

Figures 5B and 5C of the '595 patent are reproduced below.



Figures 5B and 5C show side views of additional embodiments for the constricted convection system. *Id.* at 6:1–2. As illustrated in Figure 5B, one or more fans 52 are used to draw ambient air between posterior display surface 22 and constricted convection plate 30. *Id.* at 6:2–5. In the embodiment depicted in Figure 5C, one or more fans 52 are used to force

IPR2023-00199
Patent 8,854,595 B2

ambient air between posterior display surface 22 and constricted convection plate 30. *Id.* at 6:5–7.

The application that led to the '595 patent was filed on March 26, 2009, and claims priority to, *inter alia*, a provisional application that was filed on March 3, 2008. Ex. 1001, codes (22), (60). Petitioner applies the March 3, 2008, date for qualifying the asserted references as prior art. Pet. 7.

D. Illustrative Claims

Of the challenged claims, claims 1 and 4 are independent. Claims 1 and 4 are illustrative of the challenged claims and are reproduced below.

1. A system for cooling an electronic display having a posterior display surface and contained within a housing, the system comprising:

a constricted convection plate placed posterior to the posterior display surface;

two side panels placed adjacent to the constricted convection plate and the posterior display surface, defining a constricted convection channel having an entrance and an exit; and

a fan placed to draw air from outside of the housing through the constricted convection channel.

Ex. 1001, 9:63–10:6.

4. A liquid crystal display (LCD) comprising:

a liquid crystal stack;

a backlight assembly behind the liquid crystal stack and comprising:

a metal core printed circuit board (PCB) having front and back sides;

IPR2023-00199
Patent 8,854,595 B2

- a plurality of LEDs mounted on the front side of the PCB;
- a posterior surface on the rear side of the PCB;
- a constricted convection plate placed behind the posterior surface of the PCB, defining a constricted convection channel having an entrance and an exit; and
- a fan positioned to draw air through the constricted convection channel.

Id. at 10:13–27.

E. Prior Art

Petitioner relies on the following prior art:

Japanese Unexamined Patent Application Publication No. H11-68363, published Mar. 9, 1999 (Ex. 1008, “Takahashi”);³

U.S. Patent Application Publication No. 2003/0043091, published Mar. 6, 2003 (Ex. 1004, “Takeuchi”);

Korean Published Unexamined Patent Application Publication No. 10-2006-0016469, published Feb. 22, 2006 (Ex. 1010, “Na”);⁴

U.S. Patent No. 7,800,706 B2, filed July 16, 2007 (Ex. 1005, “Kim”); and

U.S. Patent Publication Application No. 2007/0171353 A1, published July 26, 2007 (Ex. 1006, “Hong”).

³ Takahashi is a Japanese-language publication (Ex. 1007) that was filed with an English-language translation (Ex. 1008) and an affidavit attesting to the accuracy of the translation, as required by 37 C.F.R. § 42.63(b) (Ex. 1008, 6). Our citations to Takahashi herein refer to the translation.

⁴ Na is a Korean-language publication (Ex. 1009) that was filed with an English-language translation (Ex. 1010) and an affidavit attesting to the accuracy of the translation, as required by 37 C.F.R. § 42.63(b) (Ex. 1010, 23). Our citations to Na herein refer to the translation.

IPR2023-00199
Patent 8,854,595 B2

F. The Instituted Grounds

We instituted *inter partes* review of claims 1, 4, 7, and 8 of the '595 patent on the following grounds (Dec. on Inst. 52), which are all the grounds presented in the Petition (Pet. 4):

Claims Challenged	35 U.S.C. §	References/Basis
1	103(a) ⁵	Takeuchi
1	103(a)	Kim
4, 7	103(a)	Kim, Hong
8	103(a)	Kim, Hong, Takahashi
1	103(a)	Na, Kim
4, 7, 8	103(a)	Na, Hong

II. ANALYSIS

A. Legal Standards

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 the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *See 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

⁵ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102 and 103. Because the '595 patent claims priority to an application filed before March 16, 2013 (the effective date of the relevant amendments), the pre-AIA versions of §§ 102 and 103 apply.

IPR2023-00199
Patent 8,854,595 B2

differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We also recognize that prior art references must be “considered together with the knowledge of one of ordinary skill in the pertinent art.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)).

B. Level of Ordinary Skill in the Art

Citing testimony from Mr. Smith-Gillespie, Petitioner asserts that a person of ordinary skill in the art (“POSITA”) at the priority date of the ’595 patent would have had “a bachelor’s degree in a pertinent discipline, such as mechanical engineering, physics, product design, or a related field,” and “2–4 years of experience in working with electronic displays.” Pet. 6–7 (citing Ex. 1002 ¶ 36). Petitioner further states that such a person would have had an understanding of product design issues and failure modes associated with electronic displays. *Id.* at 7 (citing Ex. 1002 ¶ 36). Alternatively, Petitioner asserts that a person of ordinary skill in the art would have had “5–7 years of experience in the field working with electronic displays and have a similar understanding of product design issues and failure modes associated with electronic displays.” *Id.*

Citing testimony from Mr. Gershowitz, Patent Owner asserts that a person of ordinary skill in the art would have had “a bachelor’s degree in a pertinent discipline, such as mechanical or electrical engineering, physics, applied physics, or a related field” and “2-4 years of experience working with electronic displays, including thermal management associated with

IPR2023-00199
Patent 8,854,595 B2

them.” PO Resp. 8 (citing Ex. 2006 ¶ 35). Alternatively, Patent Owner asserts that an ordinarily skilled artisan “would have had 4-6 years of experience in the field and would have developed a similar understanding of thermal management associated with electronic displays.” *Id.* Patent Owner put forth similar arguments in its Preliminary Response, in which Patent Owner explained the differences between the parties’ definitions as follows: “While the POSITA has experience with thermal management, he or she does not necessarily have an understanding of product design issues and failure modes associated with electronic displays.” Prelim. Resp. 10–11 (citing Pet. 6–7; Ex. 2004, 12–13).

Taking into account Patent Owner’s arguments in the preliminary record, we adopted the following definition of the level of ordinary skill in our Decision on Institution:

[A] POSITA would have had a bachelor’s degree in a pertinent discipline, such as mechanical engineering, physics, applied physics, product design, or a related field, and would also have had 2–4 years of experience working with electronic displays, including the thermal management, product design issues, and failure modes, associated with such displays, or 5–7 years of experience in the field working with electronic displays and would have developed a similar understanding of thermal management, product design issues, and failure modes, associated with electronic displays.

Dec. on Inst. 11. The parties’ positions have not changed since the time of institution, and we discern no reason to change the definition. Thus, we apply the same definition. We are satisfied that this definition comports with the level of skill necessary to understand and implement the teachings of the ’595 patent and the asserted prior art. Notwithstanding, we note that

IPR2023-00199
Patent 8,854,595 B2

our analysis would not change if we adopted either party's proposed definition *in toto*.

C. Claim Interpretation

In an *inter partes* review, we construe each claim using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

37 C.F.R. § 42.100(b) (2023). Accordingly, our claim construction standard is the same as that of a district court. *See id.* Under the standard applied by district courts, claim terms are generally given their plain and ordinary meaning, as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). “There are only two exceptions to this general rule: 1) when a patentee sets out a definition and acts as his own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012).

Petitioner argues, *inter alia*, that certain constructions adopted in the Delaware action and the ITC should also be applied here. Pet. 11; Pet. Reply 2–3. Patent Owner responds to Petitioner's arguments and also makes certain claim construction arguments as part of its analysis of the merits. PO Resp. 8–11; PO Sur-reply 2. We now consider the parties' arguments.

IPR2023-00199
Patent 8,854,595 B2

1. “*posterior display surface*”

The parties agree that, in accordance with the court’s construction in the Delaware action and the ITC’s construction, “posterior display surface” in claim 1 should be construed as the “rear-facing surface of the display assembly.” *See* Pet. 11; PO Resp. 9–11; Ex. 1011, 1; Ex. 1012, 6–8; Ex. 1034, 40–42.

In our Decision on Institution, we did not construe “posterior display surface” because “the parties [did] not identify any disputed issue material to the outcome of this Decision” that turned on the construction of that term. Dec. on Inst. 13. We also noted that Petitioner did not explain why we should construe the term as the “rear-facing surface of the display assembly.” *Id.* at 12. The full trial record likewise includes no explanation about why we should adopt the Delaware action/ITC construction. Instead, the parties only indicate approval of those tribunals’ prior analyses. *See* Pet. 11; PO Resp. 9–11; Pet. Reply 3. Given that no issues in this trial turn on whether “rear-facing surface of the display assembly” is the construction of “posterior display surface,” we again need not adopt this construction.⁶ *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803

⁶ We note that our analysis below would be the same even if we were to construe “posterior display surface” as the “rear-facing surface of the display assembly.”

IPR2023-00199
Patent 8,854,595 B2

(Fed. Cir. 1999))). Notwithstanding, we provide the following comments regarding the recited “posterior display surface.”

The Specification of the ’595 patent states that “[i]n an exemplary embodiment, the display posterior 22 may be the posterior surface of a backlight assembly.” Ex. 1001, 4:52–53; *see also id.* at 2:51–54 (similar disclosure). In turn, the Specification states that “[t]he backlight assembly may comprise a printed circuit board (PCB) with a plurality of LEDs mounted to the *anterior* surface.” *Id.* at 4:53–55 (emphasis added). Thus, according to the ’595 patent, the “posterior display surface” of a backlight assembly may be the opposite side of the surface on which the LEDs are mounted.

2. “*constricted convection channel*”

Claim 1 recites “a constricted convection plate placed posterior to the posterior display surface” and “two side panels placed adjacent to the constricted convection plate and the posterior display surface, defining a constricted convection channel having an entrance and an exit.” Ex. 1001, 9:66–10:4. Claim 4 includes similar limitations. *See id.* at 10:23–25. Petitioner contends that we should follow the court in the Delaware action and the ITC, which both construed “constricted convection channel” as a “constricted channel through which air may flow to remove heat from the posterior display surface.” Pet. 11 (citing Ex. 1011, 1–2; Ex. 1012, 10–11); Pet. Reply 2 (citing Ex. 2010, 35).

Patent Owner states that “no material dispute turns on that construction” of “constricted convection channel.” PO Resp. 9. Notwithstanding, Patent Owner contends that an ordinarily skilled artisan

IPR2023-00199
Patent 8,854,595 B2

would have understood that “the claimed ‘channel’ has an exit and a single entrance.”⁷ *Id.* at 58 (citing Ex. 2006 ¶¶ 75–76). In support of this contention, Mr. Gershowitz cites the “example embodiments shown in Figures 5B–5F of the ’595 Patent, each of which includes a single entrance through which air flows to an exit.” Ex. 2006 ¶ 76 (citing Ex. 1001, Figs. 5B–5F). He also testifies that apertures 34 in the constricted convection plate “are blocked off before the display device is put back into use after servicing is complete.” *Id.* (citing Ex. 1001, 6:24–29). Elsewhere in its papers, Patent Owner argues that such apertures are preferably plugged before operation because “airflow through access apertures is undesired and avoided, not a feature.” PO Sur-reply 12 (citing Ex. 1001, 5:5–12, 6:24–29; Ex. 2006 ¶¶ 73, 132). Patent Owner also notes that the apertures are intended to allow access to hardware. *Id.*

In its Reply, Petitioner argues that Patent Owner “attempts to improperly further limit” the “constricted convection channel.” Pet. Reply 3. Petitioner argues that “these attempts to narrow the claims are not supported by the claim language, specification, or any other intrinsic or extrinsic evidence.” *Id.*

We agree with Petitioner that nothing in the intrinsic record limits the “constricted convection channel” to a single entrance. Mr. Gershowitz’s testimony cites “example embodiments” in Figures 5B–5F as limiting the “constricted convection channel” to a single entrance, but it is improper to import a limitation from embodiments in the drawing figures without a clear

⁷ We note that Patent Owner does not argue that the channel must have a single exit.

IPR2023-00199
Patent 8,854,595 B2

indication in the intrinsic record that the patentee intended the claims to be so limited. *See Polaris Innovations Ltd. v. Brent*, 48 F.4th 1365, 1377 (Fed. Cir. 2022) (quoting *Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 913 (Fed. Cir. 2004)). We are not aware of anything in the intrinsic record that supports Patent Owner’s proposed limitation. In addition, each independent claim recites “an entrance” after the transitional phrase “comprising.” *See* Ex. 1001, 9:63–10:4, 10:14–25. With extremely limited exceptions not present here, the “indefinite article ‘a’ or ‘an’ in patent parlance carries the meaning of ‘one or more’ in open-ended claims containing the transitional phrase ‘comprising.’” *Convolve, Inc. v. Compaq Computer Corp.*, 812 F.3d 1313, 1321 (Fed. Cir. 2016) (quoting *KCJ Corp. v. Kinetic Concepts, Inc.*, 223 F.3d 1351, 1356 (Fed. Cir. 2000)). Thus, the structure of the claims does not support limiting the recited “entrance” to a single entrance.

Regarding apertures in the constricted convection plate, the ’595 patent states that “[t]he constricted convection panel 30 may also be constructed to include access apertures 34,” though they “*may* be plugged before operation to maintain directed contact between the refrigerated air and the posterior display surface 22.” Ex. 1001, 5:5–12 (emphasis added); *see also id.* at 6:24–29 (similar disclosure). As such, plugging the apertures is optional. Indeed, Patent Owner acknowledges that the “constricted convection plate” “*may* include access apertures through which some air may pass.” PO Sur-reply 11; *see also* PO Resp. 66–67 (similar acknowledgement). Thus, Mr. Gershowitz’s testimony regarding the plugging the apertures does not support limiting the number of entrances to the constricted convection channel.

IPR2023-00199
Patent 8,854,595 B2

For these reasons, we decline to limit the number of entrances to the “constricted convection channel” to a single entrance.

Regarding the Delaware action/ITC construction, we did not construe “constricted convection channel” in our Decision on Institution because “the parties [did] not identify any disputed issue material to the outcome of this Decision” that turned on the construction of that term. Dec. on Inst. 13. We also noted that Petitioner did not explain why we should construe the term as the “constricted channel through which air may flow to remove heat from the posterior display surface.” *Id.* at 12. The full trial record likewise includes no explanation about why we should adopt the Delaware action/ITC construction. Given that no issues in this trial turn on Petitioner’s proposed construction, we again need not adopt this construction.⁸ *See Realtime Data*, 912 F.3d at 1375.

3. *“posterior surface on the rear side of the PCB”*

Patent Owner argues that “posterior surface on the rear side of the PCB” must be distinct from the “rear side of the PCB” itself. PO Resp. 62 (citing Ex. 2006 ¶ 128). In support of this argument, Patent Owner cites testimony from Mr. Gershowitz that an ordinarily skilled artisan would have “underst[oo]d from the plain language of the claims that the ‘posterior surface’ of claim 4 is distinct from ‘the rear side of the PCB’ (which is another surface) and must be placed ‘on the rear side of the PCB’ (i.e.,

⁸ We note that our analysis below would be the same even if we were to construe “constricted convection channel” as a “constricted channel through which air may flow to remove heat from the posterior display surface.”

IPR2023-00199
Patent 8,854,595 B2

behind the PCB and placed against it).” *Id.* at 63 (citing Ex. 2006 ¶ 128). Patent Owner also cites the Specification of the ’595 patent as stating that “heat which is generated by the LEDs may be transferred to the posterior surface of the [] backlight assembly, and subsequently removed by air within the constricted convection channel.” *Id.* (alteration by Patent Owner) (quoting Ex. 1001, 4:57–60) (citing Ex. 1001, 4:53–55). Patent Owner additionally argues that considering the “posterior surface” to be the same as the “rear side” would render the “posterior surface” language superfluous. *See id.* at 62–63 (citing *Wasica Fin. GmbH v. Cont’l Auto. Sys., Inc.*, 853 F.3d 1272, 1288 (Fed. Cir. 2017)); PO Sur-reply 24.

Petitioner argues that an ordinarily skilled artisan “would have understood that the rear outermost surface of the PCB is the recited ‘posterior surface.’” Pet. Reply 20 (citing Pet. 83; Ex. 1002 ¶ 243).

At the outset, we note that the words “back side[]” and “rear side” appear nowhere outside of the claims in the ’595 patent. This fact alone tends to undermine Patent Owner’s suggestion that the “posterior surface” must be distinct from the “rear side.” In addition, Patent Owner’s cited portions of the Specification merely refer to the “posterior surface” as being the surface opposite that on which the LEDs are mounted to which heat from the LEDs is transferred. *See* Ex. 1001, 4:53–55, 4:57–60. They are inconclusive as to whether the “posterior surface” must be distinct from the “rear side.” Further, Mr. Gershowitz’s testimony in support of a “distinct” construction is based on his interpretation of the words “on the” in claim 4’s recited “posterior surface *on the* rear side of the PCB.” Ex. 2006 ¶ 128. Specifically, he testifies that “[i]f the posterior surface was the rear side of the PCB, the claim would have said so.” *Id.* He does not cite any support in

IPR2023-00199
Patent 8,854,595 B2

the Specification of the '595 patent for his interpretation. *See id.* Given that his testimony amounts to speculation divorced from the context of the Specification, Mr. Gershowitz's testimony is entitled to little weight.

We also have considered Mr. Smith-Gillespie's testimony in support of Petitioner's contention that an ordinarily skilled artisan "would have understood that the rear outermost surface of the PCB is the recited 'posterior surface.'" Pet. Reply 20 (citing Pet. 83; Ex. 1002 ¶ 243). He cites a passage in the Specification of the '595 patent that states: "The PCB may comprise a metal core PCB and the posterior surface of the PCB may be metallic so that air within the constricted convection channel may cool the metallic posterior surface (and subsequently the backlight assembly) more easily and efficiently." Ex. 1002 ¶ 243 (emphasis omitted) (quoting Ex. 1001, 4:60–65). We accord Mr. Smith-Gillespie's testimony more weight than Mr. Gershowitz's testimony given that Mr. Smith-Gillespie's testimony is rooted in disclosures about metal core PCBs in the '595 patent. It also gives some credence to the notion that the "posterior surface" and the "rear side" could be one and the same.

Based on the record before us, we do not agree with Patent Owner that claim 4 requires the "posterior surface" to be distinct from the "rear side."

4. *"access apertures"*

Claim 8 recites "a plurality of access apertures through the constricted convection plate." Ex. 1001, 10:38–40. Patent Owner cites the Specification of the '595 patent as stating that the access apertures "allow access to hardware found on the display posterior 22" and "allow access to hardware located behind the constricted convection plate 30." PO Resp. 66

IPR2023-00199
Patent 8,854,595 B2

(quoting Ex. 1001, 5:6–10, 6:25–27). Patent Owner also cites the Specification’s statement that the access apertures “may be plugged before operation to maintain directed contact between the refrigerated air and the posterior display surface 22.” *Id.* (quoting Ex. 1001, 5:10–12). Based on these disclosures, Patent Owner contends that an ordinarily skilled artisan would have understood that “‘access apertures’ are intended for allowing access to hardware through the constricted convection plate (e.g., wiring passing through the apertures) and that airflow through the plate is an undesirable side effect that can be mitigated with plugs.” *Id.* at 66–67 (citing Ex. 2006 ¶ 132). Thus, Patent Owner argues that “access apertures” that merely allow air access are “inconsistent with the plain meaning of the term ‘access apertures’ as used in the claims and specification.” *Id.*

Petitioner argues that “there is no requirement in the claims or specification that the claimed ‘access apertures’ be plugged in use.” Pet. Reply 20 (citing Ex. 1001, 5:10–13; Ex. 1041, 16:13–14:15 (Mr. Gershowitz agreeing with this premise)).

We find the Specification’s mention of hardware access to be merely exemplary. *See* Ex. 1001, 5:6–10, 6:25–27. The Specification does not state that “access” through the apertures must relate to hardware access or any other particular type of access. Further, Petitioner is correct that the Specification suggests that the apertures need not be plugged in use (*see* Ex. 1001, 5:10–13 (access apertures “may be plugged”)), which would allow airflow through the apertures. For these reasons, we decline to limit “access apertures” based on the things to which the apertures allow access.

IPR2023-00199
Patent 8,854,595 B2

5. *Other Terms*

We determine that no other aspects of the challenged claims require explicit construction. *See Realtime Data*, 912 F.3d at 1375.

D. *Obviousness Ground Based on Na and Kim*

Petitioner contends the subject matter of claim 1 would have been obvious over the combination of Na and Kim. Pet. 61–77; Pet Reply 18–19. Patent Owner disputes Petitioner’s contentions. PO Resp. 53–62, 68–78; PO Sur-reply 21–24, 25–27.

1. *Na*

Na is a Korean patent application publication directed to “a backlight unit capable of improving a cooling effect and a liquid crystal display device including the same.” Ex. 1010, 2. “The backlight unit includes a light generator that generates light, and a storage container where the light generator is accommodated and an intake unit through which external air is sucked and an exhaust unit through which internal air is discharged are formed.” *Id.* at 3.

IPR2023-00199
Patent 8,854,595 B2

Na's Figure 1 is reproduced below.

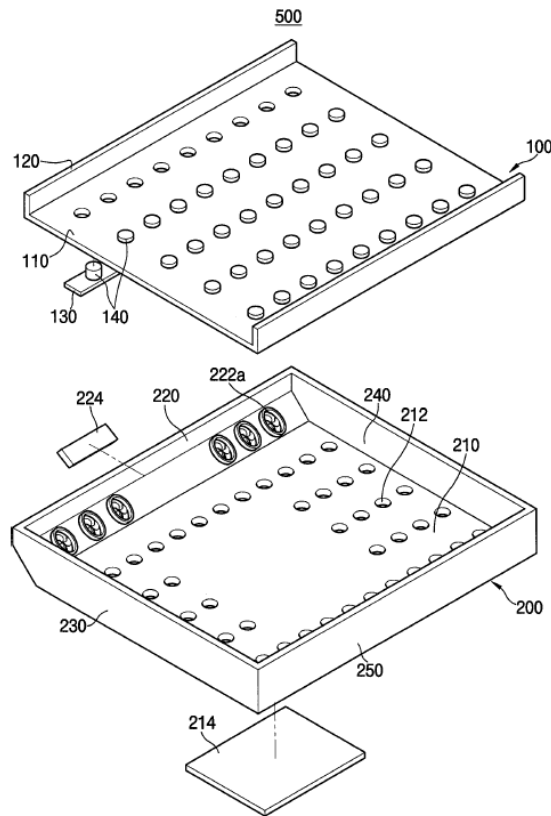


Figure 1 is an exploded perspective view of one embodiment of a backlight unit described in Na. Ex. 1010, 1. Backlight unit 500 includes areal light source device 100 and storage container 200. *Id.* at 4. Areal light source device 100 includes reflective plate 110, sidewall 120, driving substrate 130, and a plurality of LED light sources 140. *Id.* A plurality of coupling holes 112 are formed in reflective plate 110 so that LED sources 140 can be coupled. *Id.* Sidewall 120 is formed on the edge portion of reflective plate 110 in order to couple areal light source device 100 to storage container 200. *Id.*

Storage container 200 accommodates areal light source device 100 and includes bottom plate 210, first sidewall 220, second sidewall 230, third

IPR2023-00199
 Patent 8,854,595 B2

sidewall 240, and fourth sidewall 250. Ex. 1010, 4. First through fourth sidewalls 220, 230, 240, and 250 “extend from the edge portions of the bottom plate 210, respectively, to form a storage space and an inner space.” *Id.* First driving circuit 214 is disposed on bottom plate 210 and drives areal light source device 100, and through-holes 212 are formed in portions of bottom plate 210 “except for the portion where the first driving circuit 214 is disposed.” *Id.* Na explains that through-holes 214 “function as an intake unit through which external air is sucked.” *Id.* A plurality of fans 222a are formed on first sidewall 220, and are operated to flow air from the inner space to the outside to transfer the heat generated by areal light source 100 from the inner space to the outside. *Id.* Na explains that “fans 222a function as an exhaust unit for discharging internal air. *Id.*

Na’s Figure 3 is reproduced below.

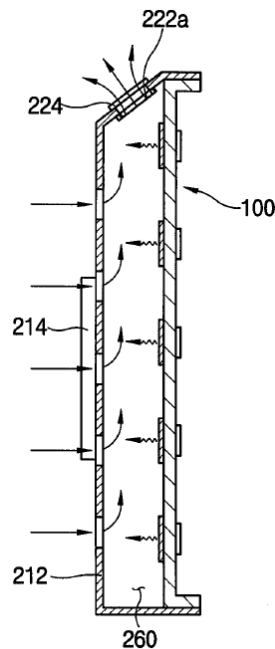


Figure 3 depicts a side view of the backlight unit shown in Figure 1 showing the cooling process for the backlight unit. Ex. 1010, 1. LED array

IPR2023-00199
Patent 8,854,595 B2

substrate 110 of areal light source device 100 is driven to generate heat, increasing the temperature of the air in inner space 260 between areal light source device 100 and storage container 200. *Id.* at 5. The heated air is discharged to the outside of backlight unit 500 by a plurality of fans 222a. *Id.* Discharging the heated air lowers the pressure in inner space 260, and “low-temperature air cooler than the high-temperature air in the inner space 260 is introduced from the outside of the backlight unit 500 through the through-holes 212.” *Id.* Na explains that “the processes of discharging high-temperature internal air and introducing low-temperature external air are continuously repeated, and as a result, the heat generated in the areal light source device 100 is cooled by the flow of air.” *Id.*

Petitioner contends that Na qualifies as prior art under 35 U.S.C. § 102(b) based on its publication date.⁹ Pet. 17. Patent Owner does not contest the prior art status of Na. We determine that Na qualifies as prior art under 35 U.S.C. § 102(b) because Na’s publication date of February 22, 2006, is more than one year before the earliest effective filing date of the challenged claims, which is March 3, 2008. Ex. 1001, code (60); Ex. 1010, code (43).

2. *Kim*

Kim is a U.S. patent directed to “a cooling fan unit with improved cooling efficiency by efficiently cooling heat generated from a backlight

⁹ Petitioner mistakenly states that Na was published on February 26, 2006, rather than February 22, 2006. *See* Ex. 1010, code (43). We consider this to be a harmless error given that it does not affect our analysis.

IPR2023-00199
 Patent 8,854,595 B2

unit, and a display apparatus having the same.” Ex. 1005, 1:46–49. In particular, Kim describes “a display apparatus having a casing in which an opening part is formed” that includes a liquid crystal display, a backlight unit, a shield cover, and a cooling fan unit. *Id.* at 1:57–67.

Figure 5 of Kim is reproduced below.

FIG. 5

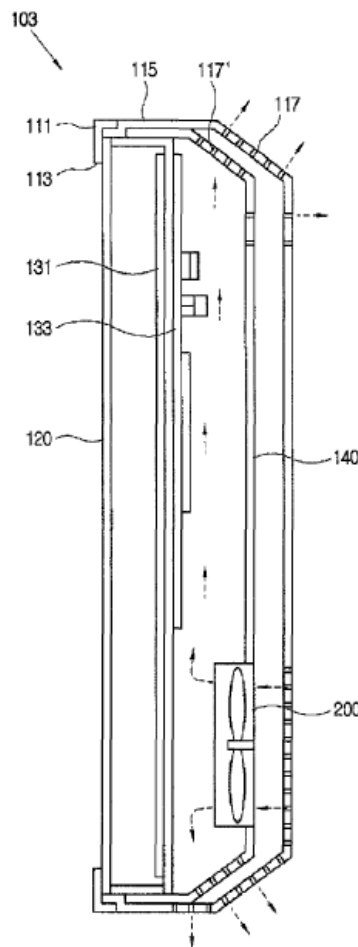


Figure 5 is schematic view of a cooling system described in Kim. Ex. 1005, 3:50. Display body 103 includes liquid crystal display panel 120, backlight unit 130 (not labeled) comprising light source 131, circuit board 133, shield

IPR2023-00199
Patent 8,854,595 B2

cover 140, and cooling fan unit 200. *Id.* at 4:4–6, 4:33–35. Front casing 111 (with opening part 113) supports liquid crystal display panel 120 and backlight unit 130. *Id.* at 4:9–15. Rear casing 115, on the lateral and rear side of liquid crystal display panel 120, has a plurality of air slits 117 through which air produced by cooling fan 210 (not labeled) comes in and out. *Id.* at 4:22–24.

Shield cover 140, on the rear side of backlight unit 130, is supported by at least one of backlight unit 130 and the casing, and a space is formed between shield cover 140 and backlight unit 130. Ex. 1005, 4:52–55. Shield cover 140 has a plurality of air slits 117' through which flowing air produced by cooling fan 210 comes in and out. *Id.* at 4:59–61. Cooling fan unit 200 is placed in a lower central portion of shield cover 140, and can alternatively be placed in a central or upper portion of shield cover 140 if necessary. *Id.* at 5:38–41.

Kim explains that “cooling fan 210 generates cooling air to cool the heat generating parts such as the light source 131 and the circuit board 133 of the backlight unit 130.” Ex. 1005, 5:24–26. “[C]ooling fan 210 may draw in the cooling air from the outside into the heat generating parts or discharge the cooling air to the outside through the heat generating parts depending on its rotation direction.” *Id.* at 5:42–45. In addition, a plurality of cooling fans 210 “may be provided . . . in consideration of the size of the backlight unit 130, the capacity of the cooling fan 210, etc.” *Id.* at 5:31–33.

Petitioner contends that Kim qualifies as prior art under 35 U.S.C. § 102(e) based on its filing date. Pet. 14. Patent Owner does not contest the prior art status of Kim.

IPR2023-00199
Patent 8,854,595 B2

The trial record includes no evidence of an invention date other than the earliest possible effective filing date of the challenged claims. Thus, we determine that Kim qualifies as prior art under 35 U.S.C. § 102(e) because Kim’s filing date of July 16, 2007, is before the earliest possible effective filing date of the challenged claims, which is March 3, 2008. Ex. 1001, code (60); Ex. 1005, code (22).

3. *Claim 1*

a. Preamble (1[pre])

The preamble of claim 1 recites “[a] system for cooling an electronic display having a posterior display surface and contained within a housing.” Ex. 1001, 9:63–64. Petitioner maps the recited “electronic display” to Na’s liquid crystal display panel 840, optical sheet 820, and areal light source device 100. Pet. 62–63 (citing Ex. 1002 ¶ 200; Ex. 1010, 8, Fig. 13). Petitioner notes that Na’s areal light source device 100 includes “a reflective plate 110, a sidewall 120, a driving substrate 130, and a plurality of light emitting diode [LED] light sources 140.” *Id.* at 64 (citing Ex. 1010, 4, Fig. 1). Petitioner further notes that Na’s backlight unit 100 has reflective plate 110 positioned below liquid crystal display panel 840, and the lower surface of reflective plate 110 faces away from LCD panel 840 and toward storage container 200. As such, Petitioner contends that “the lower (rear) surface of reflective plate 110 forms a rear-facing surface of a ‘display assembly’ created from the combination of areal light source 100 and the liquid crystal display panel 840 and is thus a ‘posterior display surface.’” *Id.* at 65 (emphasis omitted) (citing, *inter alia*, Ex. 1002 ¶ 203, Ex. 1011, 1, 4, 8).

IPR2023-00199
Patent 8,854,595 B2

Regarding the recited “system for cooling an electronic display,” Petitioner cites Kim’s teaching of “a cooling fan unit that cools a backlight unit of a display apparatus [an ‘electronic display having a posterior surface’] comprising a casing [‘a housing’], the backlight unit that is supported by the casing and comprises light emitting diodes (LEDs), and a shield cover” Pet. 32 (emphasis omitted; alterations by Petitioner) (quoting Ex. 1005, 3:21–30), 65–66 (referring to earlier analysis). Regarding the recited housing, Petitioner cites Kim’s casing 110, which includes front casing 111 and rear casing 115. *Id.* at 65–66 (citing Ex. 1002 ¶ 204; Ex. 1005, 4:8–12); *see also id.* at 32–34 (similar analysis). As discussed in greater detail below (*see infra* § II.D.3.e), Petitioner proposes adding Kim’s housing to Na’s display assembly and cooling system. *See* Pet. 74–77.

Patent Owner does not dispute Petitioner’s analysis of the preamble. We are persuaded that Na’s liquid crystal display panel 840, optical sheet 820, and areal light source device 100 teach the recited “electronic display.” *See, e.g.*, Ex. 1002 ¶ 200; Ex. 1010, 8, Fig. 13. We also are persuaded that the rear surface of Na’s reflective plate 110 teaches the recited “posterior display surface.” *See, e.g.*, Ex. 1002 ¶ 203, Ex. 1011, 1, 4, 8. We additionally are persuaded that Kim’s “cooling fan unit that cools a backlight unit of a display apparatus” teaches the recited cooling system.¹⁰

¹⁰ Although Petitioner does not cite Na specifically for teaching a “system for cooling an electronic display,” Na is likewise directed to “a backlight unit capable of improving a cooling effect and a liquid crystal display device including the same.” Ex. 1010, 2. Petitioner acknowledges as much when discussing its rationale for combining Na and Kim. *See* Pet. 74–77.

IPR2023-00199
Patent 8,854,595 B2

See, e.g., Ex. 1005, 3:21–30. Finally, we are persuaded that Kim’s casing 110 teaches the recited “housing.” *See, e.g.*, Ex. 1002 ¶ 204; Ex. 1005, 4:8–12. Because Petitioner shows persuasively that the combination of Na and Kim teaches the subject matter of the preamble, we need not determine whether the preamble is limiting.¹¹ *See Realtime Data*, 912 F.3d at 1375.

b. Limitation 1[a]

Claim 1 further recites “a constricted convection plate placed posterior to the posterior display surface.” Ex. 1001, 9:66–67. Petitioner cites bottom plate 210 of Na’s storage container 200 for teaching the recited “constricted convection plate.” Pet. 68 (citing Ex. 1010, 5, Fig. 1). Petitioner contends storage container 200 “forms a cavity, inner space 260, through which air is drawn to cool the backlight unit.” *Id.* Petitioner notes that outside air is introduced to inner space 260 via through-holes 212. *Id.* Petitioner further notes that fans 222a in first sidewall 220 draw air from inner space 260 to the outside, and the cooling effect is increased by forced convection.¹² *Id.* (citing Ex. 1010, 4, 7–8). In light of these teachings, Petitioner contends that an ordinarily skilled artisan “would have understood

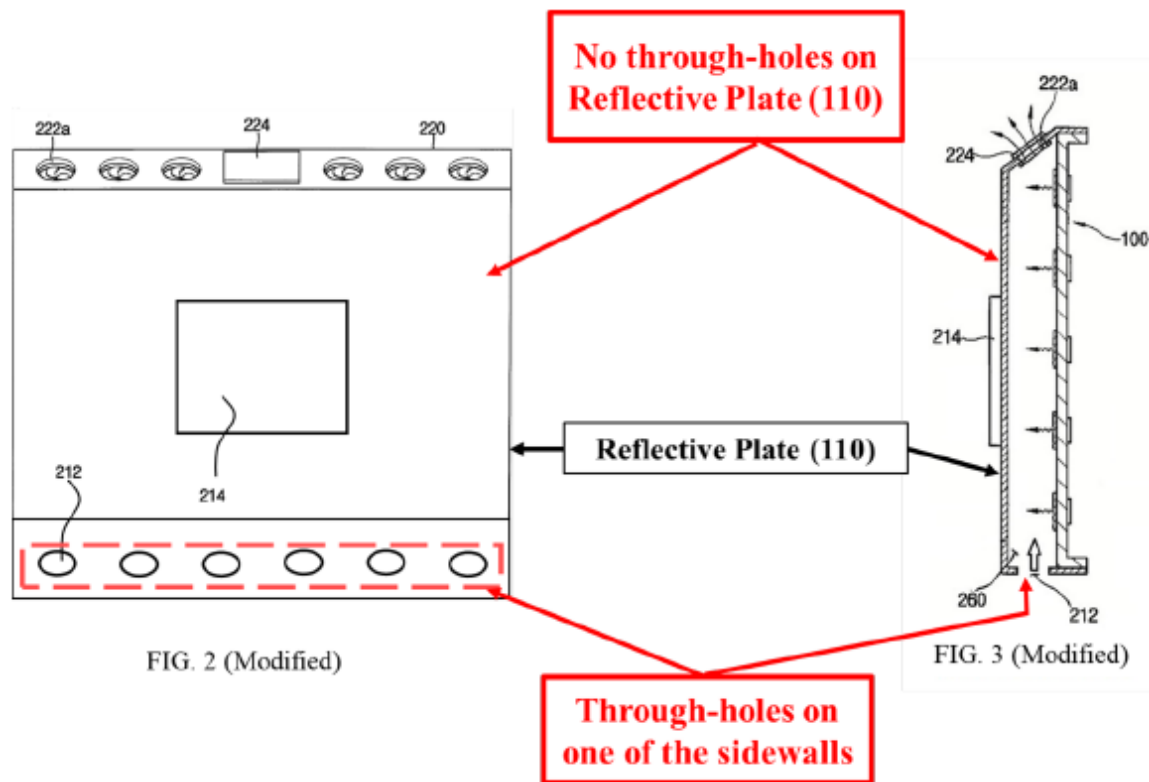
¹¹ We discuss the merits of Petitioner’s rationale for combining Na and Kim below. *See infra* § II.D.3.e.

¹² The Petition appears to include an inaccurate quotation and citation relative to “forced convection.” *See* Pet. 68 (citing Ex. 1010, 5). Na discusses “forced convection” due to fans in other places, however. *See* Ex. 1010, 7–8

IPR2023-00199
Patent 8,854,595 B2

that the bottom plate 210 constricts airflow in order to achieve the desired convective cooling effect.”¹³ *Id.* (citing Ex. 1002 ¶ 209).

Petitioner also posits an alternative arrangement of Na’s bottom plate 210 for teaching the recited “constricted convection plate.” *See* Pet. 68–69. To explain this alternative arrangement, Petitioner includes modified and annotated versions of Na’s Figures 2 and 3, which are reproduced below.



Id. at 69. Figures 2 and 3 depict a top plan view and a side view, respectively, of the backlight unit disclosed in Na. Ex. 1010, 3, 5. Petitioner has added annotations mistakenly indicating “Reflective Plate (110),”

¹³ This statement in the Petition is phrased as if it were testimony. *See* Pet. 68 (“it is my opinion”). We consider this to be harmless error and treat it as Petitioner’s contention.

IPR2023-00199
Patent 8,854,595 B2

though the context makes clear that these annotations are actually meant to indicate Na's bottom plate 210.¹⁴ Pet. 69. Petitioner has not formed through-holes in bottom plate 210 in the modified drawing figures, as is noted in Petitioner's annotations. *Id.* In addition, Petitioner has modified the drawing figures to include "[t]hrough-holes on one of the sidewalls," as is indicated by the annotations. *Id.* Petitioner appears to have added the through-holes to sidewall 250 (i.e., the sidewall opposite sidewall 220 with fans 222a), though reference number 250 does not appear in Petitioner's modified and annotated versions of Na's Figures 2 and 3. *See id.*

Petitioner contends an ordinarily skilled artisan would have understood Na to include the alternative arrangement based on Na's express teaching that "the through-holes may be further formed in the first to fourth sidewalls, or may be formed only in the first to fourth sidewalls." Pet. 68–69 (citing Ex. 1002 ¶ 210; Ex. 1010, 5). Petitioner also notes Mr. Gershowitz's testimony that "[t]he configurations taught by Na involve modifying one or more of the sidewalls 220-250 to add through-holes, either in addition to the through-holes 212 in the bottom plate 210 or using a bottom plate 210 that does not have through holes 212." Pet. Reply 19 (emphasis omitted; alteration by Petitioner) (quoting Ex. 2006 ¶ 124).

¹⁴ Indeed, Petitioner updated the modified and annotated versions of Na's Figures 2 and 3 in its hearing demonstratives to correct the mistakes. *See* Paper 51, 52. Although we will not consider the corrected versions from the demonstratives, we still understand Petitioner's alternative arrangement as modifying bottom plate 210. We note that Patent Owner has the same understanding. *See* PO Resp. 58 (describing Petitioner's alternative arrangement as not having through-holes in the bottom plate).

IPR2023-00199
Patent 8,854,595 B2

Finally, Petitioner contends that Na’s bottom plate 210 is “placed posterior to the posterior display surface” because it faces (and is posterior to) the rear-facing surface of areal light source 100. Pet. 69 (citing Ex. 1002 ¶ 210).

Patent Owner argues that bottom plate 210 of Na’s storage container 200 does not teach “a constricted convection plate placed posterior to the posterior display surface” because bottom plate 210 is a surface within the interior of Na’s backlight assembly. See PO Resp. 53–56. In support of this argument, Patent Owner cites Na’s statement with respect to Figure 13 that “liquid crystal display device 800 includes a backlight unit 500” together with Na’s disclosure of backlight unit 500 as including bottom plate 210 of storage container 200. *Id.* at 53–54 (emphasis omitted) (citing Ex. 1010, 8, Figs. 1, 13); *see also* PO Sur-reply 22 (similar argument). According to Patent Owner, the most posterior portion on the outside of a display module with a backlight is “the posterior surface of a backlight assembly.” PO Sur-reply 23 (citing Ex. 2006 ¶¶ 119–120). As such, Patent Owner argues that Petitioner should have identified bottom plate 210, rather than reflective plate 110, as the posterior display surface. PO Resp. 56 (citing Ex. 2006 ¶¶ 122–124); *see also* PO Sur-reply 23 (citing Ex. 1010, Fig. 13) (similar argument).

Patent Owner’s argument against Petitioner’s mapping of the recited “posterior display surface” to Na’s teachings hinges on Na’s description that storage container 200 is part of Na’s “backlight unit.” See Ex. 1010, 8. Patent Owner’s argument also assumes that Na’s “backlight unit” including storage container 200 is the same thing as the recited “electronic display” in claim 1. We do not agree with Patent Owner on that account. In particular,

IPR2023-00199
Patent 8,854,595 B2

Petitioner maps the recited “electronic display” to Na’s liquid crystal display panel 840, optical sheet 820, and areal light source device 100. Pet. 62–63. Notably, Na’s storage container 200 is not part of that mapping. Moreover, the ’595 patent expressly contemplates that the “posterior display surface” of the “electronic display” can be the opposite side of the surface on which LEDs are mounted. *See supra* § II.C.1. That is exactly what Petitioner has mapped here insofar as the rear side of Na’s reflective plate 110 is the opposite side of the surface on which Na’s LED light sources 140 are mounted. *See* Pet. 67–68 (citing Ex. 1010, 4, Fig. 3). Thus, we are persuaded that the rear side of Na’s reflective plate 110 teaches the recited “posterior display surface” (*see, e.g.*, Ex. 1002 ¶ 203, Ex. 1011, 1, 4, 8). For similar reasons, we reject Patent Owner’s argument that Na’s bottom plate 210 must be the “posterior display surface” (PO Resp. 56; PO Sur-reply 23), because that argument is premised on the language of Na, not the challenged claims.

As discussed in greater detail below, we also are persuaded that Na’s bottom plate 210—as modified such that it does not include through-holes—teaches the recited “constricted convection plate.” *See, e.g.*, Ex. 1002 ¶ 210; Ex. 1010, 5, Fig. 1. We further address this finding and Patent Owner’s arguments against the “constricted” nature of the “constricted convection plate” (*see* PO Resp. 56–61; PO Sur-reply 23–24) in conjunction with our analysis of the recited “constricted convection channel” in the next section.

c. Limitation 1[b]

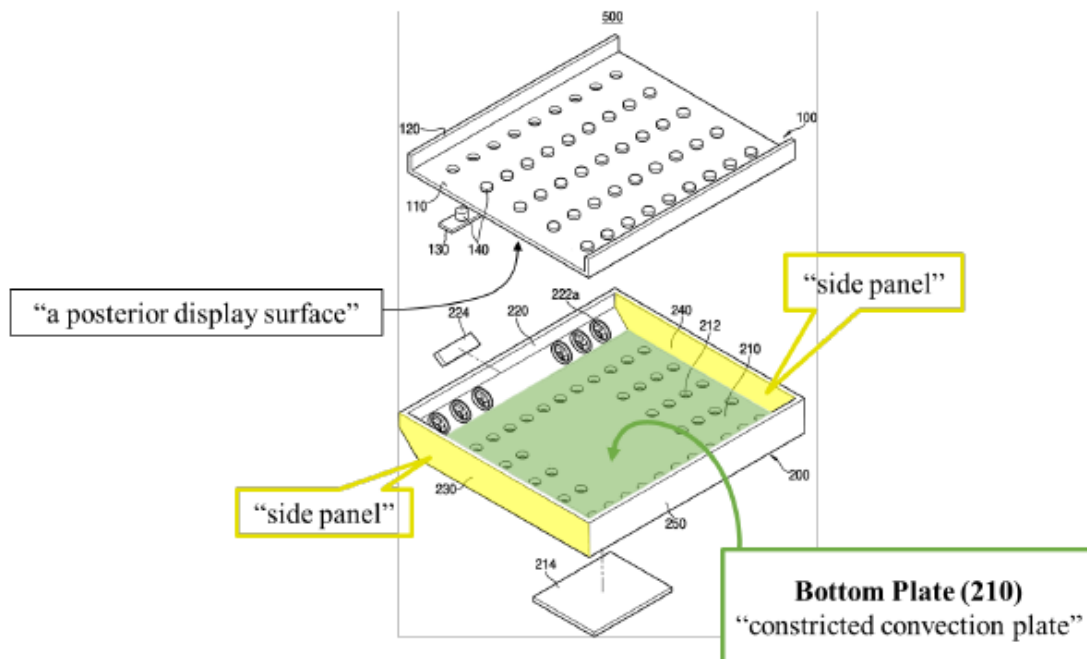
Claim 1 further recites “two side panels placed adjacent to the constricted convection plate and the posterior display surface, defining a

IPR2023-00199
Patent 8,854,595 B2

constricted convection channel having an entrance and an exit.” Ex. 1001, 10:1–4. Petitioner cites Na’s first to fourth sidewalls 220, 230, 240, and 250, which extend from the edge portions of bottom plate 210, for teaching “side panels placed adjacent to the constricted convection plate.” Pet. 70–71 (citing Ex. 1002 ¶ 214; Ex. 1010, 4, Fig. 1). Petitioner contends that,

[a]long with the bottom plate 210, these four sidewalls produce a “constricted channel through which air may flow to remove heat from the posterior display surface,” as reflected by the arrows shown in Figure 3 in the inner space 260 formed between the bottom plate 210 of Na’s storage container 210, and the rear-facing surface of Na’s areal light source 100 (the “posterior display surface”).

Id. at 71 (citing Ex. 1010, 4–5, Figs. 1–3, 13). To further explain its contentions for the “two side panels,” Petitioner provides an annotated version of Na’s Figure 1, which is reproduced below.



Id. In this annotated version of Na’s Figure 1, Petitioner has shaded the “side panel[s]” in yellow and the “constricted convection plate” in green.

IPR2023-00199
Patent 8,854,595 B2

Petitioner also has identified the “posterior display surface.” *Id.* Petitioner contends that Na’s sidewalls teach the recited “side panels” regardless of whether they include through-holes because the claims do not require solid side panels. Pet. Reply 19.

According to Petitioner, air is introduced from the outside of backlight unit 500 into inner space 260 via through-holes 212 (i.e., the recited “entrance”). Pet. 72 (citing Ex. 1010, 4–5). For the recited “exit,” Petitioner cites Na’s teaching that fans 222a “are operated to flow air from the inner space to the outside” and “function as an exhaust unit [‘exit’] for discharging internal air.” *Id.* at 72–73 (emphasis omitted) (alteration by Petitioner) (citing Ex. 1010, 4¹⁵).

Patent Owner criticizes Petitioner’s mapping of the “constricted convection channel” because Na’s bottom plate 210 allegedly has an array of fifty through-holes 212 that function as the recited “entrance.” PO Resp. 57 (citing Pet. 72). Patent Owner explains that “[a]irflow is not constricted by a porous plate with fifty large through-holes dispersed throughout it.” *Id.* (citing Ex. 2006 ¶¶ 122–123). In contrast, Patent Owner argues that an ordinarily skilled artisan “would understand the claimed ‘channel’ has an exit and a single entrance.” *Id.* at 58 (citing Ex. 2006 ¶¶ 75–76). Patent Owner also argues that “Na’s teaching of numerous distinct air inputs teaches away from the claimed constricted convection channel.” *Id.* (citing Ex. 2006 ¶¶ 122–123).

¹⁵ Petitioner mistakenly cites to page 5 of Na, but the context makes clear that Petitioner intended to cite page 4.

IPR2023-00199
 Patent 8,854,595 B2

Patent Owner also disputes that Petitioner’s alternative arrangement where there are no through-holes in Na’s bottom plate 210 teaches the recited “constricted convection channel.” PO Resp. 58–59. Patent Owner argues that this arrangement would still include “through holes on the left and right sides (230, 240),” which would allow air to “flow freely through the side walls 230, 240, 250 in three directions towards the fans in sidewall 220.” *Id.* at 59 (citing Ex. 2006 ¶¶ 124–125). Furthermore, Patent Owner disputes Petitioner’s rationale for not including through-holes in the bottom plate because Na allegedly only contemplates not including through-holes in the sidewalls. *Id.* at 59–60 (quoting Ex. 1010, 5) (“the through-holes may be formed on a bottom plate and in any one or more of the first to fourth sidewalls” (emphasis by Patent Owner)). According to Patent Owner, an ordinarily skilled artisan would have understood Na to teach modifications such that there are “(i) holes in the bottom plate 210 and one or more sidewalls (220, 230, 240, 250), or (ii) no through-holes in the bottom plate 210 but holes in all four sidewalls (i.e., through-holes ‘only in the first to fourth sidewalls’).” *Id.* at 60 (citing Ex. 2006 ¶¶ 124–125).

We do not agree with Patent Owner’s arguments. As stated above, we are persuaded that Na’s bottom plate 210, when modified such that it does not include through-holes, teaches the recited “constricted convection plate.” *See, e.g.*, Ex. 1002 ¶ 210; Ex. 1010, 5, Fig. 1. This modification is suggested by the following passage of Na:

[A]lthough the through-holes are formed on the bottom plate, the through-holes may be further formed in the first to fourth sidewalls, or may be formed only in the first to fourth sidewalls. That is, the through-holes may be formed on a bottom plate and in any one or more of the first to fourth sidewalls.

IPR2023-00199
Patent 8,854,595 B2

Ex. 1010, 5. Although the two sentences in this passage might be somewhat ambiguous when read together, we find that the express statement that through-holes “may be formed *only* in the first to fourth sidewalls” supports Petitioner’s proposed modification to exclude through-holes in the bottom plate. *See* Ex. 1002 ¶ 210; Ex. 1010, 5. And regardless of any ambiguity in this passage, we find that an ordinarily skilled artisan would have known based on the passage to form or not form through-holes in the bottom plate and sidewalls. *See id.* Our findings are supported by the direct testimony of Mr. Gershowitz, who stated that “[t]he configurations taught by Na involve modifying one or more of the sidewalls 220-250 to add through-holes, either in addition to the through-holes 212 in the bottom plate 210 or *using a bottom plate 210 that does not have through holes 212.*” Ex. 2006 ¶ 124 (emphasis added). We also decline to narrowly read this passage as only supporting exclusion of through-holes from the sidewalls, because “[a] person of ordinary skill is also a person of ordinary creativity, not an automaton.” *KSR*, 550 U.S. at 421.

We also are persuaded that Na’s inner space 260 teaches the recited “constricted convection channel.” *See, e.g.*, Ex. 1010, 4–5, Figs. 1–3, 13. Petitioner persuasively shows that this channel is defined by sidewalls 220, 230, 240, and 250 (i.e., the recited “side panels”), the rear surface of reflective plate 110 (i.e., the recited “posterior display surface”), and bottom plate 210 (i.e., the recited “constricted convection plate”). *See id.* Regarding the “constricted” nature of the channel, Petitioner puts forth persuasive evidence about Na’s fans creating “forced convection” in inner space 260. *See, e.g., id.* at 4–5, 7–8. Na also teaches that, “[i]n general, the heat transfer effect by a forced convection phenomenon is greater than the

IPR2023-00199
Patent 8,854,595 B2

heat transfer effect by a free convection phenomenon.” *Id.* at 7. Based on these teachings, we are persuaded by Petitioner’s contention that an ordinarily skilled artisan “would have understood that the bottom plate 210 constricts airflow in order to achieve the desired convective cooling effect.” Pet. 68; Ex. 1002 ¶ 209. This is particularly true given Petitioner’s proposed modification to not include through-holes 212 in bottom plate 210 based on Na’s teachings. *See* Pet. 68–69.

Patent Owner also disputes that Na discloses the recited “side panels” of claim 1. PO Resp. 60–61. Specifically, Patent Owner argues that Na’s teaching of through-holes being formed ““only in the first to fourth sidewalls’ and not the bottom plate” pertains to embodiments having through-holes with fans in all sidewalls. *See id.* (citing Ex. 1010, 5–6, Figs. 4–6). In support of this, Patent Owner mentions Mr. Smith-Gillespie’s testimony relative to claim 7 that “[i]n those situations where the through-holes are located on the sidewalls, the fans are undoubtedly located near such through-holes which act as exits of the constricted convection channel.” *Id.* (quoting Ex. 1002 ¶ 260). Patent Owner contrasts such embodiments with the embodiment in Na’s Figure 1, which is cited by Petitioner and features solid side walls. *Id.* at 60 (citing, *inter alia*, Pet. 71).

We are persuaded that Na’s first to fourth sidewalls 220, 230, 240, and 250 teach the recited “side panels,” and we note they are adjacent to bottom plate 210 (the recited “constricted convection plate”) and the rear-facing surface of reflective plate 110 (the recited “posterior display surface”). *See, e.g.*, Ex. 1002 ¶ 214; Ex. 1010, 4, Figs. 1, 3. Although Patent Owner attempts to limit Petitioner’s contentions to the sidewall through-hole arrangement of particular embodiments, Na teaches a range of

IPR2023-00199
Patent 8,854,595 B2

options with respect to the number of sidewalls that include through-holes. Ex. 1010, 5 (“[T]he through-holes may be formed . . . in any one or more of the first to fourth sidewalls.”). For example, Petitioner specifically cites Na’s Figure 1 embodiment, as recognized by Patent Owner (PO Resp. 60), and this embodiment has solid side panels 230, 240. *See* Pet. 71 (reproducing Ex. 1010, Fig. 1). We also agree with Petitioner (Pet. Reply 19) that claim 1 does not require the side panels to be solid. Finally, we do not agree with Patent Owner (*see* PO Resp. 60–61 (quoting Ex. 1002 ¶ 260)) that Mr. Smith-Gillespie’s testimony about the interplay of fans and through-holes relative to a different claim somehow limits how we should read Na’s teachings. Thus, Patent Owner’s arguments are unavailing.

Regarding the recited “entrance” and “exit” of the “constricted convection channel,” Na teaches that through-holes 212 “function as an intake unit through which external air is sucked.” Ex. 1010, 4. We are persuaded that this teaches the recited “entrance.” Na also teaches that “fans 222a function as an exhaust unit for discharging internal air” and “fans 222a are operated to flow air from the inner space to the outside.” *Id.* We are persuaded that this teaches the recited “exit.” We note that in Petitioner’s alternative arrangement based on Na, fans 222a are disposed on sidewall 220, and through-holes 212 are disposed on opposite sidewall 250. *See* Pet. 69; Ex. 1002 ¶ 210.

For these reasons, we find that Na teaches “two side panels placed adjacent to the constricted convection plate and the posterior display surface, defining a constricted convection channel having an entrance and an exit.”

IPR2023-00199
Patent 8,854,595 B2

d. Limitation 1[c]

Claim 1 further recites “a fan placed to draw air from outside of the housing through the constricted convection channel.” Ex. 1001, 10:5–6. Petitioner cites Na’s fans 222a and contends that they draw external air into inner space 260 and discharge air from inner space 260 to the outside. Pet. 73–74 (citing Ex. 1010, 4–6, Figs. 1–3). Regarding the air being drawn “from outside of the housing,” Petitioner references, *inter alia*, Kim’s teaching of cooling fan 210 “draw[ing] in the cooling air from the outside into the heat generating parts or discharg[ing] the cooling air to the outside through the heat generating parts depending on its rotation direction.” Pet. 42 (quoting Ex. 1005, 5:42–45) (citing Ex. 1005, 8:16–20), 73 (relying on analysis from the Kim and Kim–Hong grounds); *see also id.* at 41 (citing Ex. 1002 ¶ 148; Ex. 1005, 7:57–62, Figs. 2, 5) (“Kim discloses in its Figure 2 embodiment that ambient air enters the constricted convection channel through fan 210 and exits through the plurality of air slits 117’ located on either end of the cooling channel.”). As such, Petitioner contends that an ordinarily skilled artisan “would have understood Kim to disclose or render obvious a fan that draws air from outside the housing.” *Id.* at 42 (citing Ex. 1002 ¶ 152).

Patent Owner does not dispute Petitioner’s showing for this limitation. We are persuaded that Na’s fans 222a teach the recited “fan” and note that fans 222a draw external air into inner space 260 and discharge air from inner space 260 to the outside. *See, e.g.*, Ex. 1010, 4–6, Figs. 1–3. We note that Petitioner’s alternative arrangement based on Na accomplishes this airflow using fans 222a on sidewall 220 opposite through-holes on sidewall 250. *See* Pet. 69; Ex. 1002 ¶ 210. Furthermore, we are persuaded that an

IPR2023-00199
Patent 8,854,595 B2

ordinarily skilled artisan would have known to draw air from outside of Kim's casing (i.e., the recited "housing") in Petitioner's proposed combination of Kim with Na. *See, e.g.*, Ex. 1002 ¶¶ 148, 152; Ex. 1005, 5:42–45, 7:57–62, 8:16–20, Figs. 2, 5.

e. Rationale for the Combination

Petitioner contends that an ordinarily skilled artisan would have been motivated "to improve Na's 'backlight unit and a liquid crystal display [LCD] device' of Na by adding an outer housing, as disclosed by Kim." Pet. 74 (citing Ex. 1002 ¶ 223; Ex. 1010, code (57)). Noting Na's similarities to Kim, Petitioner contends that it would have been "a natural extension of function to provide a housing external to the display assembly of Na with its cooling system to form a fully packaged LCD electronic display, using Kim's outer housing and front frame." *Id.* at 74–75 (citing Ex. 1002 ¶ 224). Petitioner notes that Na's driving circuits 214 and 224 are exposed to ambient air so it would have been obvious to protect these circuits "by adding an external housing behind bottom plate 210 and further displacing the hot air generated, as contemplated by Kim." *Id.* at 75 (citing Ex. 1002 ¶ 225). Petitioner contends that

it would be advantageous to not only convey cooling air through the inner space 260 formed between the bottom plate 210 and the rear surface of Na's areal light source 100 (the "posterior display surface") to outside of the sidewalls of the storage container 200, but to also displace the now heated air outside of the entire display encased by the external housing, as contemplated by Kim.

Id. at 75–76 (emphasis omitted) (citing Ex. 1002 ¶ 226). As such, Petitioner contends an ordinarily skilled artisan would have been "motivated to combine

IPR2023-00199
Patent 8,854,595 B2

the advantages of Na’s cooling system that efficiently displaces heat generated by the display assembly and discharges it outside the storage container with the advantages of Kim’s solution which further discharges the unwanted heat outside the housing.” *Id.* at 76 (citing Ex. 1002 ¶ 228). Petitioner additionally contends that “Na’s known technique as modified by Kim’s would function in the same way as before, with predictable results” and an ordinarily skilled artisan “would have had a reasonable expectation of success that the combination of the two complimentary cooling techniques would work as intended.” *Id.* (citing Ex. 1002 ¶ 227).

Patent Owner does not dispute Petitioner’s rationale for combining Kim with Na. We are persuaded that an ordinarily skilled artisan would have modified Na’s system to include Kim’s casing, which would advantageously protect Na’s driving circuits and form a fully packaged LCD electronic display. *See, e.g.,* Ex. 1002 ¶¶ 224–225. We also are persuaded that an ordinarily skilled artisan would have expected success in making the combination given Kim’s complementary method of discharging heated air outside of a device casing. *See, e.g.,* Ex. 1002 ¶¶ 224–225. This is supported by Kim’s teaching of discharging air from the heat generating parts of a backlight unit to the outside through corresponding air slits 117’ in shield cover 140 and air slits 117 in rear casing 115. *See, e.g.,* Ex. 1005, 7:57–62, Fig. 2.

f. Secondary Considerations of Nonobviousness

“[E]vidence rising out of the so-called ‘secondary considerations’ must always when present be considered en route to a determination of obviousness.” *Transocean Offshore Deepwater Drilling, Inc. v. Maersk*

IPR2023-00199
Patent 8,854,595 B2

Drilling USA, Inc., 699 F.3d 1340, 1349 (Fed. Cir. 2012) (quoting *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538 (Fed. Cir. 1983)). “For objective evidence of secondary considerations to be accorded substantial weight, its proponent must establish a nexus between the evidence and the merits of the *claimed invention*.” *In re Huai-Hung Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011). Patent Owner contends that “real-world evidence shows that, despite its expertise and enormous resources, Samsung was not able to develop a successful outdoor LCD display for over ***ten years*** and then achieved remarkable commercial success immediately after adopting [Patent Owner’s] innovative approach.” PO Resp. 68. Accordingly, Patent Owner puts forth evidence of secondary considerations of nonobviousness. *See id.* at 68–78; PO Sur-reply 25–27. We now consider Patent Owner’s asserted evidence.

(1) *Failure of Others*

Patent Owner argues that Samsung “failed to identify an effective solution” to the “enormous thermal challenge” for outdoor displays. PO Resp. 69. Specifically, Patent Owner argues that Samsung began outdoor LCD display development in 2005, but was not able to introduce an actual display product to the market by the priority date of the ’595 patent, March 3, 2008. *Id.* at 69–70 (citing Ex. 2029, 45:22–46:15; Exs. 2033–2037 (Samsung patents and patent applications)). Patent Owner cites the testimony of former Samsung engineer Sung Ki Kim regarding Samsung’s development activities for the proposition that Samsung had a “***decade of failures*** between 2005 and 2015” before launching its OHF product line. *Id.* at 70 (citing Ex. 2029, 46:16–47:22, 49:9–17, 51:1–9, 53:1–4).

IPR2023-00199
Patent 8,854,595 B2

Petitioner argues that Samsung did not fail. Pet. Reply 21. According to Petitioner, “Sung Ki Kim’s testimony that Samsung started researching outdoor displays around 2005 but did not launch a product until 2010–2012 does not establish ‘a decade of failures.’” *Id.* (citing PO Resp. 69–70). Petitioner argues that “[t]here is no evidence that Samsung worked on the display continuously during that time or that it had any difficulties.” *Id.* Petitioner also disputes Patent Owner’s showing regarding “failure of others” because Patent Owner did not establish that “these prior attempts failed because the devices lacked the claimed features.” *Id.* (quoting *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1313 (Fed. Cir. 2006)).

The record evidence on Samsung’s alleged failure includes certain Samsung patents and patent applications arising from before the time of the ’595 patent. *See* Exs. 2033–2037. Two of them are the Na and Kim references that Petitioner asserts in the instant ground. *Compare* Ex. 1010 (Na), *with* Ex. 2036, *and* Ex. 1005 (Kim), *with* Ex. 2037. Given our findings above of persuasive evidence that the combination of Na and Kim teaches the limitations of claim 1 (*see, e.g., supra* § II.D.3.a–d), Petitioner’s development efforts could not have failed completely as suggested by Patent Owner. We also note that Samsung marketed an outdoor display product in the 2010–2012 time frame, which also undermines at least part of Patent Owner’s “decade of failures” narrative. Ex. 2029, 46:12–47:22. Finally, Patent Owner makes no attempt to show how Samsung’s development efforts failed because of a lack of claimed features. *See Ormco*, 463 F.3d at 1313. Indeed, Patent Owner characterizes the solution to the alleged failures as “effective cooling” (PO Sur-reply 26), which is unmoored from the recitations of claim 1.

IPR2023-00199
Patent 8,854,595 B2

Because the evidence of record supports neither that Samsung was unsuccessful nor that Samsung’s development efforts failed due to a lack of claimed features, we accord this evidence little to no weight.

(2) *Satisfaction of a Long-Felt Need*

Patent Owner notes that, in the early 2000s, large LCD display screens “faced new thermal challenges, particularly when used in an outdoor environment.” PO Resp. 68–69 (citing Exs. 2025, 2026, 2038, 2047). Patent Owner cites a 2015 Samsung white paper as stating how companies had “wanted their messages outdoors” but “were challenged by a variety of issues during the early years.” *Id.* at 69 (quoting Ex. 2025, 3). Patent Owner also notes how the same Samsung white paper states that “[t]he biggest obstacle was heat—from inside and from the sun. Direct sunlight and its amplified heat could alter the properties of LCD crystals—the display layer of screens—and discolor or cause black blotches.” *Id.* (quoting Ex. 2025, 3). The same Samsung white paper also states that outdoor environments posed “enormous engineering challenges.” *Id.* (emphasis omitted) (quoting Ex. 2025, 3). Patent Owner contends that “[y]ears of research efforts were undertaken by Samsung and others in the electronic display industry to address the enormous thermal challenge.” *Id.* Patent Owner further contends that “no one . . . was successful” in developing a cooling solution “until Mr. Dunn conceived of his invention.” *Id.* at 78.

Petitioner disputes Patent Owner’s assertion that there was a need for outdoor displays with cooling technology, because “the claims are not so limited.” Pet. Reply 21 (citing *ABT Sys., LLC v. Emerson Elec. Co.*, 797 F.3d 1350, 1362 (Fed. Cir. 2015); PO Resp. 68–69). Petitioner also argues

IPR2023-00199
Patent 8,854,595 B2

that Patent Owner neither identifies any evidence of a long-felt but unmet need that has any nexus to the challenged claims, nor shows how the challenged claims satisfy any alleged need. *Id.*

In its Sur-reply, Patent Owner argues that Petitioner “confuses the *long-felt need* with the *claimed invention* that meets the need.” PO Sur-reply 25–26 (citing *Volvo Penta of the Americas, LLC v. Brunswick Corp.*, 81 F.4th 1202 (Fed. Cir. 2023)). Patent Owner also disputes Petitioner’s assertion based on *ABT Systems* because “unlike here, the prior art taught an HVAC system with periodic fans that met the alleged unmet need.” *Id.* at 26 n.3 (citing *ABT Systems*, 797 F.3d at 1362).

Patent Owner broadly defines the alleged long-felt need as a need for “displays with effective cooling to enable use outdoors.” PO Sur-reply 25. Even if we were to assume that a long-felt need for effective outdoor cooling existed in the art,¹⁶ and regardless of whether the challenged claims are or are not limited to outdoor cooling, we agree with Petitioner (Pet. Reply 21) that Patent Owner fails to adduce evidence showing how the claimed invention satisfied the alleged need for effective outdoor cooling. *See*

¹⁶ We find Patent Owner’s articulation of the alleged long-felt need to be vague and subjective. In addition, we note that Patent Owner acknowledges (PO Resp. 69–70) prior art from Samsung showing it was known to cool displays for outdoor use. *See, e.g.*, Ex. 2033 ¶ 3 (Samsung patent application directed to “a display device that is usable outdoors and prevents . . . a rise in temperature of a display part”); Ex. 2035, 1:18–20, 2:32–47 (Samsung patent directed to “a liquid crystal display device to be installed outdoors” that includes a heat radiating member and fans). This undermines Patent Owner’s articulation of the alleged need. Notwithstanding, we dispose of Patent Owner’s arguments based on the lack of nexus evidence, as discussed below.

IPR2023-00199
Patent 8,854,595 B2

Sjolund v. Musland, 847 F.2d 1573, 1582 (Fed. Cir. 1988) (holding that a proponent of objective evidence of long-felt need must show that “the *claimed invention* satisfied a long felt need”). Patent Owner states in conclusory fashion that “[d]espite the demand for outdoor displays, no one (including Samsung, despite having attempted to develop outdoor displays at least by 2005) was successful until Mr. Dunn conceived of his invention.” PO Resp. 78. Patent Owner cites no evidence for this proposition, so Patent Owner’s assertions regarding Mr. Dunn’s invention satisfying the alleged need are based on unsupported attorney argument. Accordingly, “we conclude that the nexus between the claimed invention and the purported long-felt, unmet need is too attenuated to provide a persuasive rationale for nonobviousness.” *In re Karpf*, 758 F. App’x 960, 965 (Fed. Cir. 2019).

For these reasons, we accord Patent Owner’s evidence of satisfying a long-felt need little to no weight.

(3) Copying

As further objective evidence that the challenged claims are nonobvious, Patent Owner contends that Samsung’s 46- and 55-inch OHF products copied the system of claim 1. PO Resp. 70–75; PO Sur-reply 26. Patent Owner cites two documents and testimony from Samsung employees regarding Samsung’s teardown and analysis of large-format and mid-sized versions of [REDACTED] products. PO Resp. 74–75 (citing Ex. 2029, 139:7–16; Ex. 2031, 77:13–81:16; Exs. 2042, 2043). Patent Owner also puts forth annotated pictures of Patent Owner’s teardown of a Samsung OHF product that allegedly show how “the cooling system for the LCD panel in the Samsung OHF product utilizes a constricted convection plate and meets all

IPR2023-00199
Patent 8,854,595 B2

elements of claim 1.” *Id.* at 72–73 (citing Ex. 2019, 265:13–24; Ex. 2020). Patent Owner additionally puts forth evidence from a marketing presentation to [REDACTED], a Samsung user manual, and a Samsung installation guide to support its contentions about how the OH product allegedly practices claim 1. *Id.* at 70–75 (citing Ex. 2021, 120; Ex. 2038, 11–22; Ex. 2053). Patent Owner contends this is probative objective evidence of copying because copying merely “requires duplication of features of the patentee’s work based on access to that work.” PO Sur-reply 26 (quoting *Institut Pasteur & Universite Pierre Et Marie Curie v. Focarino*, 738 F.3d 1337, 1347–48 (Fed. Cir. 2013)).

Petitioner counters that Samsung had already fully designed the cooling scheme for its OH products by the time of Samsung’s teardown and analysis of [REDACTED] products. Pet. Reply 22 (citing Ex. 1042, 612:11–13, 613:14–614:18; Ex. 2040; Ex. 2042, 65). Petitioner also argues that Patent Owner has not identified any features of [REDACTED] products that Samsung allegedly copied. *Id.* at 22 (citing *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004)).

We agree with Petitioner that the evidence from Samsung’s teardown exercise includes a comparison chart between Samsung’s products and [REDACTED] products—and in particular their mid-size 55-inch products—which suggests that Samsung’s OH products were already designed at the time of Samsung’s competitive teardown and analysis of [REDACTED] products. *See* Ex. 2042, 65; *cf.* Ex. 1042, 613:14–25 (Mr. Lee testifying that the same comparison chart indicates that the large-format Samsung product has been completed due to its inclusion in this chart). Thus, the evidence of record

IPR2023-00199
Patent 8,854,595 B2

does not support that Samsung copied the torn-down products when making its OH products.

Further, even if we were to assume that Samsung had access to [REDACTED] products prior to making its own products, the record does not include any evidence or analysis from Patent Owner showing any feature of [REDACTED] products that Samsung duplicated. Nor has Patent Owner put forth evidence of substantial similarity between Samsung's products and [REDACTED] products. *See Medtronic, Inc. v. Teleflex Innovations S.a.r.l.*, 70 F.4th 1331, 1340 (Fed. Cir. 2023) (“Evidence of access and substantial similarity is evidence of copying.”). “Copying requires *duplication of features of the patentee’s work* based on access to that work, lest all infringement be mistakenly treated as copying.” *Institut Pasteur*, 738 F.3d at 1347–48 (emphasis added). At best, Patent Owner has put forth the broad contours of an infringement analysis, which is insufficient to show duplication. *See* PO Resp. 72 (“[T]he cooling system for the LCD panel in the Samsung OHF product utilizes a constricted convection plate and meets all elements of claim 1.”), 74 (“Samsung’s 46-inch and 55-inch OHF products practice claim 1, [and] are coextensive with claim 1.”), 75 (“Thereafter, Samsung released its new OHF products which infringe the challenged claims.”).

For these reasons, we accord Patent Owner’s evidence of copying little to no weight.

(4) *Commercial Success*

Patent Owner contends that “Samsung’s infringing 46-inch and 55-inch OHF products (and subsequent OHA and OHB products) achieved the commercial success its earlier efforts could not.” PO Resp. 76. In

IPR2023-00199
Patent 8,854,595 B2

particular, Patent Owner contrasts Samsung's predecessor OHD products' [REDACTED] in U.S. sales over several years with the over [REDACTED] in U.S. sales achieved by Samsung's 55-inch OHF product in a single year.¹⁷ *Id.* (citing Ex. 2040). Based on the same analysis discussed above relative to Samsung's alleged copying, Patent Owner contends that "Samsung's 46-inch and 55-inch OHF products practice claim 1, are coextensive with claim 1, and there is a nexus between the secondary considerations evidence and MRI's claimed invention." *Id.* at 74.

Although Petitioner does not dispute that Samsung's products have been a commercial success, Petitioner argues that Patent Owner has not attempted to establish a nexus between Samsung's products and the challenged claims. Pet. Reply 22. Petitioner also argues that Patent Owner is not entitled to a presumption of nexus based on coextensiveness. *Id.* at 22–23 (citing *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019)). Petitioner characterizes Patent Owner's arguments about coextensiveness as being conclusory, particularly because neither Patent Owner nor Mr. Gershowitz has analyzed the significance of unclaimed features in Samsung's products. *Id.* at 23 (citing *Fox Factory*, 944 F.3d at 1374–75). And Petitioner cites numerous such unclaimed features in

¹⁷ Patent Owner also puts forth market share evidence (PO Resp. 76–77 (citing Ex. 2041, 29–30)), but Petitioner disputes the relevance of this evidence because it pertains to products outside the scope of Patent Owner's commercial success assertions (i.e., Samsung's 75-inch products). Pet. Reply 24. Although we agree with Petitioner that Patent Owner has not cited the commercial success of any 75-inch products, we need not resolve this issue given our finding below that Patent Owner fails to adduce evidence showing coextensiveness with any product.

IPR2023-00199
Patent 8,854,595 B2

Samsung’s products, including “Magic glass,” “Slim Design,” “IP 56” certification, “High Contrast Ratio,” “Brightness Greater than 3,500 nits,” and “Remote Management.” *Id.* (citing Ex. 1044; Ex. 2038, 7). Thus, Petitioner contends that “these products are not coextensive with the Challenged Claims” and Patent Owner “has not established a nexus between Samsung’s sales and the Challenged Claims.” *Id.* at 24 (citing *Ormco*, 463 F.3d at 1312).

In its Sur-reply, Patent Owner criticizes Petitioner’s alleged unclaimed features in its products as relating to “its *current* (i.e., 2023) OHA, OHB series products.” PO Sur-reply 26. In contrast, Patent Owner contends that “the relevant point in time for assessing the claimed cooling system’s impact on sales was the introduction of the OHF series,” at which time Samsung’s “OH-series sales immediately increased nearly two orders of magnitude.” *Id.* at 26–27 (citing PO Resp. 76–77). Patent Owner contends that Petitioner “identifies no differences between OHD and OHF other than the new utilization of claim 1’s cooling system.” *Id.* at 27. Patent Owner also contends that “but for the cooling system of claim 1 the continued success of the OHA and OHB products would have been impossible because the products would not have been operable outdoors.” *Id.*

We agree with Petitioner that Patent Owner has not attempted to prove a direct nexus between the alleged commercial success and the challenged claims. As such, Patent Owner necessarily must rely on a presumption of nexus, which “applies for objective indicia when the patentee shows that the asserted objective evidence is tied to a specific product and that product ‘embodies the claimed features, and is coextensive

IPR2023-00199
Patent 8,854,595 B2

with them.”” *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018) (quoting *Brown & Williamson Tobacco Corp. v. Philip Morris Inc.*, 229 F.3d 1120, 1130 (Fed. Cir. 2000)). Yet Patent Owner includes no analysis or evidence to support its assertion that “Samsung’s 46-inch and 55-inch OHF products . . . are coextensive with claim 1.” PO Resp. 74. Instead, Patent Owner relies on broad-brush assertions that Samsung’s products practice claim 1. *See id.* at 70–75. Our reviewing court has rejected such “attempt[s] to reduce the coextensiveness requirement to an inquiry into whether the patent claims broadly cover the product that is the subject of the evidence of secondary considerations.” *Fox Factory*, 944 F.3d at 1377.

Moreover, Patent Owner has not put forth any evidence or analysis showing that claimed features of Samsung’s products, rather than unclaimed features, led to Samsung’s commercial success. *See Ormco*, 463 F.3d at 1312 (“[I]f the commercial success is due to an unclaimed feature of the device, the commercial success is irrelevant.”). On the other hand, Petitioner has put forth at least some evidence of unclaimed features that Samsung touted to one potential customer and in a brochure. *See, e.g.*, Ex. 1044, 2–4; Ex. 2038, 7. Although Patent Owner asks us to discount this evidence because it only relates to current-day OHA and OHB products rather than OHF products (PO Sur-reply 26–27), we decline to do so. Patent Owner cites the OHA and OHB products as part of its commercial success assertions. PO Resp. 76 (“Samsung’s infringing 46-inch and 55-inch OHF products (*and subsequent OHA and OHB products*) achieved the commercial success” (emphasis added)). In addition, one of the two exhibits cited by Petitioner is Exhibit 2038, which Patent Owner itself characterizes

IPR2023-00199
Patent 8,854,595 B2

as “a March 2017 presentation pitching its *OHF product* to its customer [REDACTED]” *Id.* at 70–71 (emphasis added). Thus, Petitioner’s evidence suggests the sort of unclaimed features that may have driven some of the commercial success cited by Patent Owner. Nevertheless, in the absence of any record evidence of coextensiveness, we cannot rule in or out any particular factor as driving commercial success.

Based on all of these considerations, we find that the evidence of record does not support coextensiveness between the challenged claims and any of Samsung’s commercially successful products. Thus, Patent Owner is not entitled to a presumption of nexus. Accordingly, we accord Patent Owner’s evidence of commercial success little to no weight.

(5) *Industry Praise*

As evidence of industry praise for the ’595 patent, Patent Owner cites an email from Samsung employee Romulus Stoian to Mr. Dunn, the inventor of the ’595 patent, in which Mr. Stoian called what Mr. Dunn had done at MRI “impressive and unique.” PO Resp. 77 (citing Ex. 2001). Patent Owner also cites Mr. Stoian’s statement that MRI had entered “a virgin space.” *Id.* Patent Owner additionally cites Mr. Stoian’s email as evidence that “Samsung itself has acknowledged there was no market for outdoor electronic displays until MRI’s pioneering inventions paved the way for a market that otherwise would not exist.” PO Sur-reply 27 (citing PO Resp. 77; Ex. 2001). Patent Owner further cites testimony in the ITC from John Palmer, “a Samsung customer and integrator of Samsung OHF displays for end users,” who allegedly “testified that Samsung’s products were

IPR2023-00199
Patent 8,854,595 B2

requested by customers (and believed by Palmer to be superior) because of their built-in cooling systems.” PO Resp. 78 (citing Ex. 2032, 118:6–119:8).

Petitioner calls Mr. Stoain’s email “generic” and argues that it “does not identify any specific technical feature of MRI’s products, let alone a specific product that embodies, and is coextensive with, the elements of the Challenged Claims.” Pet. Reply 24. Petitioner also argues that Patent Owner mischaracterizes John Palmer’s testimony to the extent it does not indicate whether patented features are responsible for the success of the cooling system. *Id.*

We agree with Petitioner that Patent Owner has not established a nexus between its proffered evidence of industry praise and the challenged claims. For example, while Mr. Stoian’s email is certainly laudatory of Mr. Dunn and MRI, the passages cited by Patent Owner are tied to MRI’s “*new business model* based on turnkey solutions for DOOH [Digital Out-Of-Home displays].” Ex. 2001 (emphasis added). Further, the email does not mention any features of the challenged claims. *See id.* And nothing in the record ties Mr. Stoian’s (and by extension, Samsung’s) laudatory statements to the challenged claims. Similarly, Mr. Palmer praised Samsung’s displays, and he insinuated that Samsung displays function well in hot and cold conditions, but none of his ITC testimony is tied to any particular feature of the challenged claims. *See* Ex. 2032, 118:6–119:8. In the absence of any nexus evidence tying the asserted industry praise to the challenged claims, we accord Patent Owner’s proffered evidence of praise little to no weight.

IPR2023-00199
Patent 8,854,595 B2

(6) *Licensing*

Patent Owner argues that third parties have “recognized MRI’s innovations by licensing the ’595 Patent and paying royalties for use of the claimed inventions.” PO Resp. 77. In particular, Patent Owner cites licensing and joint venture agreements between MRI and “Samsung’s primary competitor LG.” *Id.* (citing Exs. 2049, 2050). Patent Owner also cites other licenses with Megatech and [REDACTED]. *Id.* at 77–78 (citing Exs. 2051, 2052).

Petitioner argues that Patent Owner does not attempt to establish a nexus between the licensing activity and the ’595 patent. Pet. Reply 25. According to Petitioner, “MRI’s licenses [REDACTED] [REDACTED] list numerous other intellectual property rights.” *Id.* (citing Exs. 2049, 2051, 2052; *Shoes by Firebug LLC v. Stride Rite Children’s Grp., LLC*, 962 F.3d 1362, 1372–73 (Fed. Cir. 2020)).

Of the agreements cited by Patent Owner, the [REDACTED]
[REDACTED]
[REDACTED] See Ex. 2052, 1–3. The
Megatech license [REDACTED]
[REDACTED]
[REDACTED] See Ex. 2051, 10. MRI’s license and joint venture agreements with
LG appears to be [REDACTED]
[REDACTED] See, e.g., Ex. 2049, 1–2 [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

IPR2023-00199
Patent 8,854,595 B2

Because the agreements encompass intellectual property rights beyond the '595 patent, the agreements on their face do not establish a nexus to the challenged claims. *See Shoes by Firebug*, 962 F.3d at 1372.

Patent Owner puts forth no other evidence to support a finding of nexus. In the absence of such nexus evidence, we accord Patent Owner's evidence of licensing little or no weight.

(7) *Conclusion Regarding Secondary Considerations of Nonobviousness*

Having considered the entire trial record, we accord Patent Owner's asserted evidence of secondary considerations of nonobviousness little or no weight.

g. Patent Owner's Argument Regarding Mr. Smith-Gillespie's Testimony

Patent Owner argues that Mr. Smith-Gillespie's testimony is entitled to little weight given that it "largely parrots the Petition without any elaboration or supporting evidence." PO Resp. 68 (citing *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9, 15¹⁸ (PTAB Aug. 24, 2022) (precedential)). In *Xerox*, the Board gave a declarant's testimony little weight where it merely repeated a petitioner's conclusory assertions and it did not include any technical reasoning or underlying factual support. *Xerox*, Paper 9 at 15. In conformity with *Xerox*, we have accorded appropriate weight to the declarants' testimony in our analysis based on,

¹⁸ Patent Owner mistakenly cites to page 18, but the context makes clear that Patent Owner intended to cite page 15.

IPR2023-00199
Patent 8,854,595 B2

inter alia, whether such testimony is supported by underlying evidence. We decline to discount Mr. Smith-Gillespie’s testimony based solely on similarities with the Petition.

h. Conclusion Regarding Claim 1

Petitioner has shown persuasively that the combination of Na and Kim teaches all limitations of claim 1. Petitioner also has put forth persuasive reasons for combining these references with a reasonable expectation of success. We additionally have considered Patent Owner’s evidence of secondary considerations of nonobviousness, and we accord it little or no weight. Thus, we determine that Petitioner has shown by a preponderance of the evidence that the subject matter of claim 1 would have been obvious over the combination of Na and Kim.

E. Obviousness Ground Based on Na and Hong

Petitioner contends the subject matter of claims 4, 7, and 8 would have been obvious over the combination of Na and Hong. Pet. 77–92; Pet. Reply 20. Patent Owner disputes Petitioner’s contentions. PO Resp. 62–67, 68–78; PO Sur-reply 24, 25–27.

1. Hong

Hong is a U.S. patent application publication directed to “a liquid crystal display device.” Ex. 1006 ¶ 2. Figure 3 of Hong is reproduced below.

IPR2023-00199
Patent 8,854,595 B2

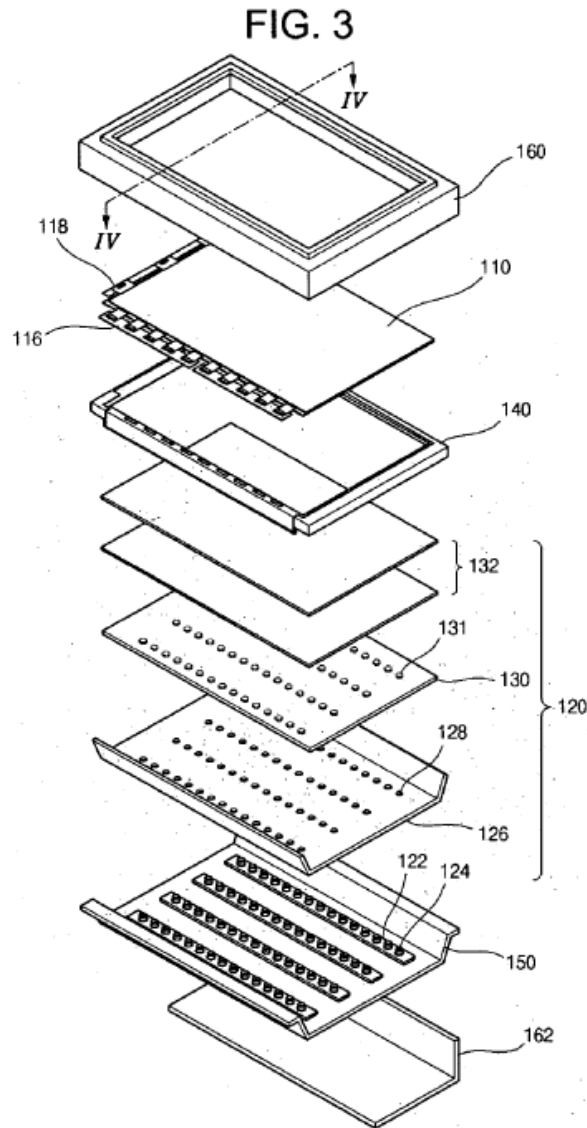


Figure 3 is an exploded perspective view illustrating an LCD device using an LED. Ex. 1006 ¶ 22. Backlight assembly 120 and liquid crystal panel 110 are disposed over an inner surface of bottom case 150. *Id.* ¶ 25. Backlight assembly 120 includes a plurality of LEDs 124, reflecting sheet 126, light guide plate 130, and optical sheets 132. *Id.* ¶ 29. Main supporter 140, which is coupled to bottom case 150, has a rectangular frame shape and supports backlight assembly 120 and liquid crystal panel 110. *Id.*

IPR2023-00199
Patent 8,854,595 B2

¶ 26. Gate PCB 118 and source PCB 116 are connected to liquid crystal panel 110. *Id.* ¶ 27. LEDs 124 are arranged on a plurality of base PCBs 122, which are arranged in parallel on bottom case 150. *Id.* ¶ 29. Base PCB 122 may include a metal core printed circuit board (MCPCB) to absorb and transfer heat produced at LEDs 124. *Id.*

Petitioner contends that Hong qualifies as prior art under, *inter alia*, 35 U.S.C. § 102(e) based on its filing date. Pet. 19. Patent Owner does not contest the prior art status of Hong.

The trial record includes no evidence of an invention date other than the earliest possible effective filing date of the challenged claims. Thus, we determine that Hong qualifies as prior art under 35 U.S.C. § 102(e) because Hong’s filing date of December 13, 2006, is before the earliest possible effective filing date of the challenged claims, which is March 3, 2008. Ex. 1001, code (60); Ex. 1006, code (22).

2. Claim 4

a. Preamble

The preamble of claim 4 recites “[a] liquid crystal display (LCD).” Ex. 1001, 10:14. Petitioner notes that the title of Na references a liquid crystal display and that Na mentions liquid crystal displays throughout its disclosure. Pet. 77 (citing Ex. 1010, 1–4, 8–9, Figs. 13, 14). Patent Owner does not dispute Petitioner’s analysis of the preamble. We are persuaded that Na discloses liquid crystal displays. *See, e.g.*, Ex. 1010, 1–4, 8–9, Figs. 13, 14. Because Petitioner shows persuasively that Na teaches the subject matter of the preamble, we need not determine whether the preamble is limiting. *See Realtime Data*, 912 F.3d at 1375.

IPR2023-00199
Patent 8,854,595 B2

b. Limitation 4[a]

Claim 4 further recites “a liquid crystal stack.” Ex. 1001, 10:15. Petitioner cites Na’s teaching of liquid crystal display panel 840, which includes “thin film transistor (TFT) substrate 842, a liquid crystal 844, a color filter substrate 846, and a driving module 848.” Pet. 78–79 (citing Ex. 1010, 8, Fig. 13). Patent Owner does not dispute Petitioner’s analysis of this limitation. We are persuaded that Na’s liquid crystal display panel 840, which includes “thin film transistor (TFT) substrate 842, a liquid crystal 844, a color filter substrate 846, and a driving module 848” constitute a liquid crystal stack. *See, e.g.*, Ex. 1010, 8, Fig. 13.

c. Limitation 4[b]

Claim 4 further recites “a backlight assembly behind the liquid crystal stack and comprising: a metal core printed circuit board (PCB) having front and back sides; a plurality of LEDs mounted on the front side of the PCB; [and] a posterior surface on the rear side of the PCB.” Ex. 1001, 10:16–21. For the “backlight assembly,” Petitioner cites Na’s backlight unit 500, which includes areal light source device 100 and storage container 200. Pet. 80 (citing Ex. 1010, 4, Fig. 1). Petitioner also notes that areal light source device 100 includes reflective plate 110, sidewall 120, driving substrate 130, and a plurality of light emitting diode light sources 140. *Id.* (citing Ex. 1010, 4). Petitioner contends that Na’s backlight unit is beneath liquid crystal display panel 840 (i.e., the “liquid crystal stack”) and its optical sheet 820. *Id.* at 80–81 (citing Ex. 1002 ¶ 240; Ex. 1010, 8, Fig. 13). Petitioner also cites Hong’s teaching of backlight assembly 120 and liquid

IPR2023-00199
Patent 8,854,595 B2

crystal panel 110, with the former necessarily being disposed behind the latter. *Id.* at 84–85 (citing Ex. 1002 ¶ 245; Ex. 1006 ¶¶ 25, 33, Fig. 3).

Patent Owner does not dispute Petitioner’s contentions regarding the recited “backlight assembly.” We are persuaded that Na’s backlight unit 500, which is beneath crystal display panel 840 and its optical sheet 820, teaches the recited “backlight assembly.” *See, e.g.*, Ex. 1002 ¶ 240; Ex. 1010, 4, 8, Figs. 1, 13. We also are persuaded that Hong teaches that its backlight assembly 120 is behind liquid crystal panel 110. *See, e.g.*, Ex. 1002 ¶ 245; Ex. 1006 ¶¶ 25, 33, Fig. 3.

Regarding the recited “metal core printed circuit board (PCB)” and “LEDs,” Petitioner contends that an ordinarily skilled artisan “would have understood Na’s driving substrate 130 to be a circuit board” with front and back sides. Pet. 82 (citing Ex. 1002 ¶ 241). Petitioner notes that light sources 140 are mounted on the front side of driving substrate 130. *Id.* at 81–82 (citing Ex. 1010, 4, 6–7, Fig. 1). Petitioner also notes that driving substrate 130 performs multiple tasks, including “delivering electrical power to the LEDs and connecting to other electronic components like driving circuit unit 224,” so Petitioner contends an ordinarily skilled artisan would have known it to be a printed circuit board (PCB). *Id.* at 82–83 (citing Ex. 1002 ¶ 242; Ex. 1010, 4, Fig. 2). Petitioner also cites Hong’s teaching of backlight assembly 120 including LEDs 124, which “may be arranged on a plurality of base PCBs 122.” *Id.* at 85 (citing Ex. 1006 ¶ 29, Fig. 3). Petitioner also cites Hong’s teaching that “base PCB 122 may include a MCPCB (metal core printed circuit board) which may effectively absorb and transfer heat produced at the LED 124.” *Id.* (citing Ex. 1006 ¶ 29). Petitioner notes that “base PCB 122 is placed on an inner surface of the

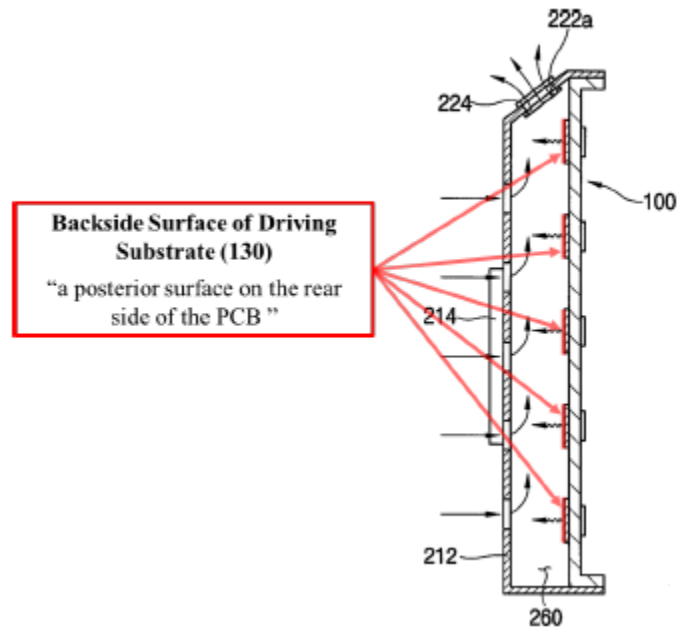
IPR2023-00199
Patent 8,854,595 B2

bottom case 150, and the LEDs 124 are placed on the base PCB 122.” *Id.* (citing Ex. 1006 ¶ 33). As such, Petitioner contends that “Hong discloses a ‘back side’ of the PCB, which faces the inner surface of the bottom case 150 and a ‘front side’ of the PCB, on which a plurality of LEDs 124 are mounted.” *Id.* (emphasis omitted) (citing Ex. 1002 ¶¶ 247–248; Ex. 1006 ¶¶ 29, 33, Fig. 4).

Patent Owner does not dispute Petitioner’s contentions about the recited “metal core printed circuit board (PCB)” or about LEDs being mounted on the front side of the board. We are persuaded that an ordinarily skilled artisan would have known that Na’s driving substrate 130 is a printed circuit board with light sources 140 that are mounted on the front side. *See, e.g.*, Ex. 1002 ¶¶ 241–242; Ex. 1010, 4, 6–7, Figs. 1, 2. Furthermore, we are persuaded that Hong teaches a metal core printed circuit board with LEDs 124 placed on base PCB 122 (i.e., the recited “front side”). *See, e.g.*, Ex. 1002 ¶¶ 247–248; Ex. 1006 ¶¶ 29, 33, Fig. 4.

Regarding the “posterior surface on the rear side of the PCB,” Petitioner cites Na’s “outmost surface of the rear side of the portion of driving substrate 130 facing the inner space 260.” Pet. 83 (citing Ex. 1002 ¶ 244; Ex. 1010, 4–5, Fig. 3). To further explain its position, Petitioner provides an annotated version of Na’s Figure 3, which is reproduced below.

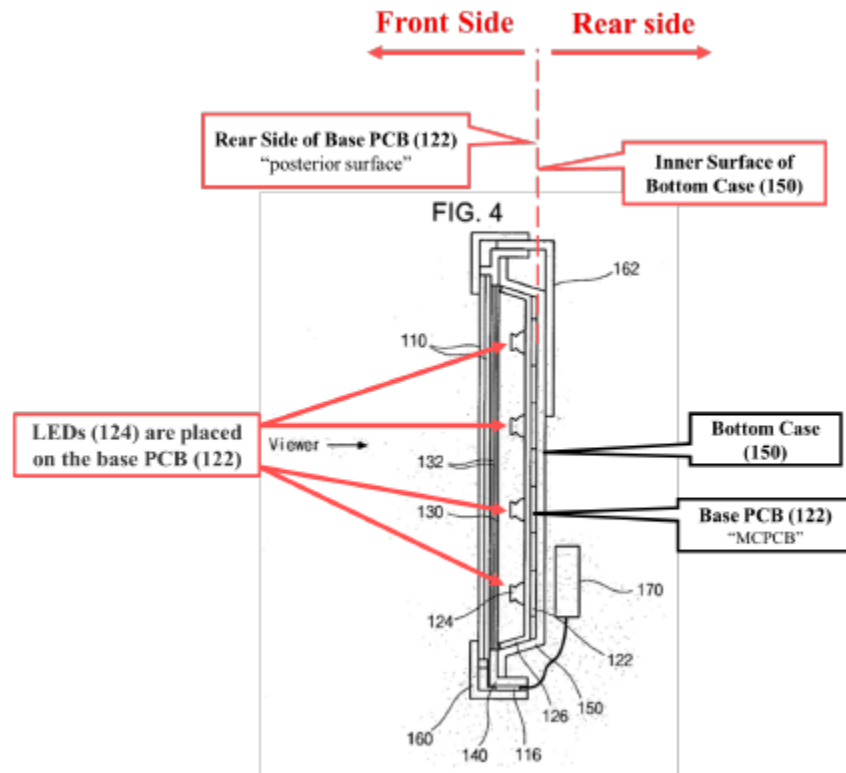
IPR2023-00199
 Patent 8,854,595 B2



In this annotated version of Na’s Figure 3, Petitioner has indicated its mapping of the recited “posterior surface on the rear side of the PCB” in red. *Id.*

Petitioner also cites Hong for teaching the “posterior surface on the rear side of the PCB.” *See* Pet. 86. Petitioner contends that “the ‘posterior surface’ of Hong’s metal core PCB has a ‘back side,’ which is the side of the PCB 122 which ‘is placed on an inner surface of the bottom case 150.’” *Id.* (emphasis omitted) (citing Ex. 1006 ¶ 33, Fig. 4). To further explain its position, Petitioner provides an annotated version of Hong’s Figure 4, which is reproduced below.

IPR2023-00199
 Patent 8,854,595 B2



In this annotated version of Hong’s Figure 4, Petitioner has indicated, *inter alia*, its mapping of the recited “posterior surface on the rear side of the PCB” in red. *Id.*

Patent Owner argues that “posterior surface on the rear side of the PCB” must be distinct from the “rear side of the PCB” itself. PO Resp. 62 (citing Ex. 2006 ¶ 128). As such, Patent Owner argues that “Petitioner’s identification of the ‘posterior surface on the rear side of the PCB’ in Na as the ‘rear side of the PCB’ itself is incorrect.” *Id.* at 63. As discussed above (*see supra* § II.C.3), we do not agree with Patent Owner that claim 4 requires the “posterior surface” to be distinct from the “rear side.” Accordingly, we are persuaded by Petitioner’s showing that Na’s “outmost surface of the rear side of the portion of driving substrate 130 facing the inner space 260” teaches the “posterior surface on the rear side of the PCB.” *See, e.g.,*

IPR2023-00199
Patent 8,854,595 B2

Ex. 1010, 4–5, Fig. 3. We also are persuaded that the back side of Hong’s metal core PCB, which is placed on an inner surface of bottom case 150, teaches this same limitation. *See, e.g.*, Ex. 1006 ¶ 33, Fig. 4.

d. Limitation 4[c]

Claim 4 further recites “a constricted convection plate placed behind the posterior surface of the PCB, defining a constricted convection channel having an entrance and an exit.” Ex. 1001, 10:23–25. Petitioner relies on the same analysis from Na discussed above with respect to claim 1 in the Na–Kim ground. Pet. 87. Patent Owner also relies on the same arguments discussed above. PO Resp. 62, 64; PO Sur-reply 24. For the same reasons discussed above, we are persuaded by Petitioner’s contentions. *See supra* § II.D.3.b–c.

e. Limitation 4[d]

Claim 4 further recites “a fan positioned to draw air through the constricted convection channel.” Ex. 1001, 10:26–27. Petitioner relies on the same analysis from Na discussed above with respect to claim 1 in the Na–Kim ground. Pet. 87. Patent Owner does not dispute Petitioner’s contentions. For the same reasons discussed above, we are persuaded by Petitioner’s contentions. *See supra* § II.D.3.d.

f. Rationale for the Combination

Petitioner notes common teachings in Na and Hong regarding the use of printed circuit boards located underneath an LCD panel containing a plurality of LEDs to power the relevant backlight units. Pet. 88 (citing

IPR2023-00199
Patent 8,854,595 B2

Ex. 1006 ¶¶ 25, 29, 33; Ex. 1010, 4, Figs. 1–3). Petitioner also notes that Na’s air-cooling arrangement and Hong’s metal core PCB heat transfer feature “are complementary and aimed at producing more thermally efficient LCD devices that reduce undesirable heat build-up in the backlight unit.” *Id.* (citing Ex. 1002 ¶ 268; Ex. 1006 ¶ 29; Ex. 1010, 4–5, Figs. 1–3, 13). Accordingly, Petitioner contends that an ordinarily skilled artisan would have been

motivated to employ Na’s solution cooling the backlight unit via the use of a constricted convection channel employing fans and through-holes, along with Hong’s more thermally efficient MCPCB, because the combination employs known prior art methods to yield predictable results, along with an expectation of success for improving backlight performance and LED operating life.

Id. at 89 (citing Ex. 1002 ¶ 269). Specifically, Petitioner proposes substituting “Na’s driving substrate 130 to which LEDs are mounted with Hong’s MCPCB with multiple LEDs mounted to it.” *Id.* Petitioner suggests this substitution would “adapt the display for a higher power LED backlight.” *Id.* at 88 (citing, *inter alia*, Ex. 1002 ¶ 267). Petitioner contends that combining the references’ known techniques would require no change in either reference’s respective function, and that the combination would yield the predictable result of making the LCD display more thermally efficient. *Id.* at 89–90 (citing Ex. 1002 ¶¶ 269–270). Petitioner also contends that the combination would result in a reduced display thickness. *Id.* at 89 (citing Ex. 1002 ¶ 269).

Patent Owner also argues that an ordinarily skilled artisan “would not have been motivated to modify Na to include a metal PCB because of the additional costs involved and the lack of any expected benefit.” PO

IPR2023-00199
Patent 8,854,595 B2

Resp. 64 (citing Ex. 2006 ¶ 129). Patent Owner criticizes as vague Petitioner’s assertions about the combination yielding improved performance and operating life, reduced operating temperatures and heat stress, and reduced display thickness. *Id.* at 64–65 (citing Pet. 89–90; Ex. 1002 ¶¶ 269–271). Patent Owner argues that metal core PCBs are “more suitable for use in display systems with high-power backlights,” whereas Na’s system is allegedly suitable “only for indoor use where only low-power backlights are needed.” *Id.* at 65 (citing Pet. 89; Ex. 1002 ¶ 270; Ex. 2006 ¶¶ 129–130). Patent Owner also argues that Na’s existing cooling system “would have sufficiently cooled its backlights such that the additional cost of an MCPCB would not be warranted.” *Id.* (citing Ex. 2006 ¶ 130). Patent Owner additionally disputes that the combination would have resulted in the benefits identified in the Petition. *Id.* (citing Ex. 2006 ¶¶ 129–130).

In its Reply, Petitioner argues that no one disputes “that by 2008, metal core printed circuit boards (MCPCBs) were well-known and would have been an obvious design choice for an LCD.” Pet. Reply 15 (citing Pet. 53–54; Ex. 1002 ¶¶ 181–182; Ex. 1041, 53:14–54:14); *see also id.* at 22 (relying on the same analysis from the Kim–Hong ground). Specifically, Petitioner notes Mr. Gershowitz’s cross-examination testimony in which he stated that the use of a MCPCB “is a design decision that would be made based upon the thermal solution needed to keep the LEDs at a proper operating temperature.” *Id.* at 15 (quoting Ex. 1041, 55:1–11). Regarding the allegedly higher cost of metal core PCBs, Petitioner cites *Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016), for the proposition that a motivation to combine is not

IPR2023-00199
Patent 8,854,595 B2

necessarily obviated where a given course of action has simultaneous advantages and disadvantages. Pet. Reply 16–17. In a similar vein, Petitioner notes Mr. Gershowitz’s cross-examination testimony that “it would depend upon the specific application whether or not the metal core PCB was warranted because of the increase in cost.” *Id.* at 17 (quoting Ex. 1041, 55:12–19).

Based on the trial record, we agree with Petitioner the use of metal core PCBs was a known design choice to abate heat at the time of the ’595 patent. *See, e.g.*, Ex. 1002 ¶¶ 55–56, 268 (the use of metal core PCBs, which have “higher thermal conductivity [that] will allow roughly several-times higher power dissipation in a component for the same rise in device junction,” was a well-known design choice); Ex. 1041, 55:7–11 (“[T]he metal core PCB, whether it was used or not, is a design decision that would be made based upon the thermal solution needed to keep the LEDs at a proper operating temperature or below an excessive temperature.”). Furthermore, Hong directly suggests the substitution Petitioner proposes. Ex. 1006 ¶ 29 (“The base PCB 122 may include a MCPCB (metal core printed circuit board) which may effectively absorb and transfer heat produced at the LED 124.”). Thus, we are persuaded that an ordinarily skilled artisan would have known to include a metal core PCB in Na’s system as a means of further dissipating heat for higher power LED backlights. *See, e.g.*, Ex. 1002 ¶¶ 267–271.

Patent Owner’s arguments to the contrary are unavailing. First, the evidence of record does not support Patent Owner’s suggestion that Na’s teachings are limited to low-power backlights for indoor use. *See* PO Resp. 65. In particular, Mr. Gershowitz cites Na’s statement that liquid

IPR2023-00199
Patent 8,854,595 B2

crystal displays are used in “portable computers, communication devices, liquid crystal TVs, etc.” (Ex. 2006 ¶ 129 (quoting Ex. 1010, 2)), but this does not show that Na’s teachings are limited to low-power backlights for indoor use. In addition, Petitioner’s obviousness rationale is specifically premised on “adapt[ing Na’s] display for a higher power LED backlight.” Pet. 88; Ex. 1002 ¶ 267. Second, even if metal core PCBs may cost more, Mr. Gershowitz agreed that the use of metal core PCBs may be warranted for certain applications. *See* Ex. 1041, 55:12–19; *see also Allied Erecting*, 825 F.3d at 1381 (holding that simultaneous advantages and disadvantages do not obviate motivation to combine). Thus, Patent Owner’s arguments do not undermine Petitioner’s rationale for the combination of Na and Hong.

g. Secondary Considerations of Nonobviousness

Patent Owner relies on the same evidence of secondary considerations of nonobviousness that we have discussed above with respect to claim 1. *See supra* § II.D.3.f. We further note that Patent Owner did not attempt to establish a nexus between its evidence and any claim in this ground. For the same reasons mentioned above, we accord Patent Owner’s asserted evidence of secondary considerations of nonobviousness little or no weight.

h. Conclusion Regarding Claim 4

Petitioner has shown persuasively that the combination of Na and Hong teaches all limitations of claim 4. Petitioner also has put forth persuasive reasons for combining these references with a reasonable expectation of success. We additionally have considered Patent Owner’s evidence of secondary considerations of nonobviousness, and we accord it

IPR2023-00199
Patent 8,854,595 B2

little or no weight. Thus, we determine that Petitioner has shown by a preponderance of the evidence that the subject matter of claim 4 would have been obvious over the combination of Na and Hong.

3. *Claim 7*

Claim 7 depends from claim 4 and further recites that “the fan is placed near the exit of the constricted convection channel.” Ex. 1001, 10:35–37. Petitioner cites Na’s teaching that fans 222a are formed on first sidewall 220 to exhaust air from inner space 260 (i.e., the recited “constricted convection channel”). Pet. 91–92 (citing Ex. 1010, 4–5, Figs. 1–3). Petitioner contends that, because “fans 222a ‘function as an exhaust unit’ and are located on the sidewall 220 exactly where the high-temperature air ‘is discharged . . . to the outside,’ they necessarily are ‘placed near the exit of the constricted convection channel.’” *Id.* at 92 (citing Ex. 1002 ¶ 259).

Patent Owner relies on the same arguments discussed above for claim 4. PO Resp. 66. We are persuaded by Petitioner’s showing that Na’s fans 222a are disposed in sidewall 222, which is the exit of inner space 260 (i.e., the recited “constricted convection channel”). *See, e.g.*, Ex. 1002 ¶ 259; Ex. 1010, 4–5, Figs. 1–3. Our analysis regarding the rationale for the combination and evidence of secondary considerations of nonobviousness discussed above for claim 4 applies equally for this claim. *See supra* § II.E.2.f–g. Thus, we determine that Petitioner has shown by a preponderance of the evidence that the subject matter of claim 7 would have been obvious over the combination of Na and Hong.

IPR2023-00199
Patent 8,854,595 B2

4. *Claim 8*

Claim 8 depends from claim 4 and recites that the LCD further comprises “a plurality of access apertures through the constricted convection plate.” Ex. 1001, 10:38–40. Petitioner cites Na’s teaching of through-holes 212 in bottom plate 210 and sidewalls 220, 230, 240, and 250. Pet. 93–94 (citing Ex. 1010, 4–5, Fig. 1). Although Na describes through-holes 212 as allowing for air intake, Petitioner contends that an ordinarily skilled artisan would have known that they also would have been useful for accessing other parts of the backlight unit and LCD display. *Id.* at 94–95 (citing Ex. 1002 ¶ 265; Ex. 1010, Fig. 3).

Patent Owner disputes Petitioner’s analysis of the recited “access apertures” to the extent that Na’s through-holes are intended for airflow rather than for hardware. PO Resp. 66–67 (citing Ex. 2006 ¶ 132). Patent Owner also criticizes Mr. Smith-Gillespie’s testimony as making a “bare assertion” that Na’s through-holes could be used for “servicing electrical components and hardware associated with the backlight unit and/or the LCD display.” *Id.* at 67 (quoting Ex. 1002 ¶ 265); *see also* PO Sur-reply 24 (similar argument).

As stated above, we do not agree with Patent Owner that the recited “access apertures” must relate to a particular type of access, such as hardware access. *See supra* § II.C.5. As such, we are persuaded that Na’s through-holes 212 teach the recited “access apertures through the constricted convection plate” because they provide access to at least air. *See, e.g.*, Ex. 1002 ¶ 265; Ex. 1010, 4–5, Fig. 1. Our analysis regarding the rationale for the combination and evidence of secondary considerations of nonobviousness discussed above for claim 4 applies equally for this claim.

IPR2023-00199
Patent 8,854,595 B2

See supra § II.E.2.f–g. Thus, we determine that Petitioner has shown by a preponderance of the evidence that the subject matter of claim 8 would have been obvious over the combination of Na and Hong.

F. Other Obviousness Grounds

Petitioner also contends that (1) the subject matter of claim 1 would have been obvious over Takeuchi; (2) the subject matter of claim 1 would have been obvious over Kim; (3) the subject matter of claims 4 and 7 would have been obvious over the combination of Kim and Hong; and (4) the subject matter of claim 8 would have been obvious over the combination of Kim, Hong, and Takahashi. Pet. 23–61. Because the Na–Kim and Na–Hong obviousness grounds are dispositive as to all challenged claims, we do not reach Petitioner’s other asserted grounds. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir. 2020) (non-precedential) (recognizing that “[t]he Board has the discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims”).

G. Petitioner’s Motion to Strike

Petitioner moves to strike Exhibits 2055, 2056, and 2058–2061 as being improper new evidence filed by Patent Owner with its Sur-reply in contravention of 37 C.F.R. § 42.23(b). Exclude Mot. 1–5. We have not relied on any of these exhibits in rendering this Decision. Accordingly, we *dismiss as moot* Petitioner’s Motion to Strike.

IPR2023-00199
Patent 8,854,595 B2

III. CONCLUSION¹⁹

Petitioner has shown, by a preponderance of the evidence, that the subject matter of claim 1 of the '595 patent would have been obvious over the combination of Na and Kim. Petitioner also has shown, by a preponderance of the evidence, that the subject matter of claims 4, 7, and 8 of the '595 patent would have been obvious over the combination of Na and Kim. We also *dismiss as moot* Petitioner's Motion to Strike.

¹⁹ 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. 16,654 (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).

IPR2023-00199
Patent 8,854,595 B2

In summary:

Claim(s)	35 U.S.C. §	Reference(s)/Basis	Claim(s) Shown Unpatentable	Claim(s) Not shown Unpatentable
1	103(a)	Takeuchi ²⁰		
1	103(a)	Kim ²¹		
4, 7	103(a)	Kim, Hong ²²		
8	103(a)	Kim, Hong, Takahashi ²³		
1	103(a)	Na, Kim	1	
4, 7, 8	103(a)	Na, Hong	4, 7, 8	
Overall Outcome			1, 4, 7, 8	

²⁰ We do not reach this ground because we have determined the challenged claim to be unpatentable under the Na–Kim ground. *See supra* § II.F.

²¹ We do not reach this ground because we have determined the challenged claim to be unpatentable under the Na–Kim ground. *See supra* § II.F.

²² We do not reach this ground because we have determined the challenged claims to be unpatentable under the Na–Hong ground. *See supra* § II.F.

²³ We do not reach this ground because we have determined the challenged claim to be unpatentable under the Na–Hong ground. *See supra* § II.F.

IPR2023-00199
Patent 8,854,595 B2

IV. ORDER

Accordingly, it is
ORDERED that claims 1, 4, 7, and 8 of the '595 patent are
unpatentable;

FURTHER ORDERED that Petitioner's Motion to Strike is *dismissed*
as moot; and

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

IPR2023-00199
Patent 8,854,595 B2

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e) the undersigned hereby certifies that on July 3, 2024 “**PARTIES’ JOINT PROPOSED REDACTIONS TO FINAL WRITTEN DECISION**” were served upon lead counsel for Patent Owner, pursuant to Patent Owner’s agreement to accept such service by email as set forth in Patent Owner’s Mandatory Notices.

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Dated: July 3, 2024

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