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Paper 9
Entered: June 20, 2023

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 MINN CHUNG, *Administrative Patent Judges*.

CHUNG, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

Samsung Electronics Co., Ltd and Samsung Electronics America, Inc. (collectively "Petitioner") 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"). Manufacturing Resources International, Inc. ("Patent Owner") filed a Preliminary Response. Paper 7 ("Prelim. Resp.").

We have authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314; 37 C.F.R. § 42.4(a). Under 35 U.S.C. § 314(a), institution of an *inter partes* review is authorized when "the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." After considering the information presented in the Petition and Preliminary Response, we determine that the information presented establishes that there is a reasonable likelihood that Petitioner would prevail in showing the unpatentability of at least one challenged claim. Accordingly, we institute an *inter partes* review of all challenged claims of the '595 patent, based on all grounds raised in the Petition.

II. BACKGROUND

A. Real Party-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 itself 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 the following proceeding before the United States International Trade Commission involving the '595 patent as related matter: *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.

C. The '595 Patent

The '595 patent relates to cooling systems for electronic displays. Ex. 1001, 1:46–48, code (57). The Specification 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 "[n]ow, 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.*, 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 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 adapted to expel air through the exit aperture. *Id.* at 2:55–59.

Figure 4 of the ’595 patent is reproduced below.

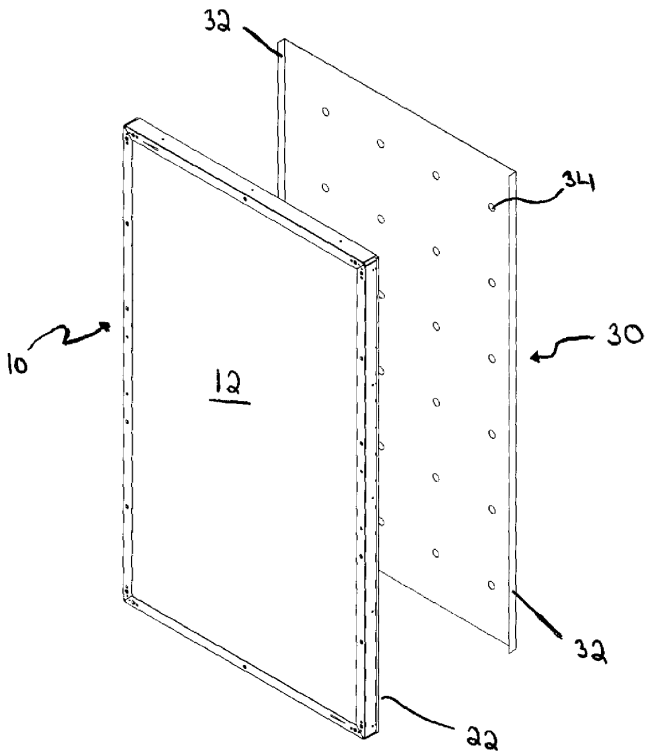


Figure 4 is an exploded view of an exemplary display using an exemplary constricted convection plate. *Id.* at 3:27–29. As shown in Figure 4, constricted convection plate 30 may be attached to display posterior 22. *Id.* at 5:25–26.

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

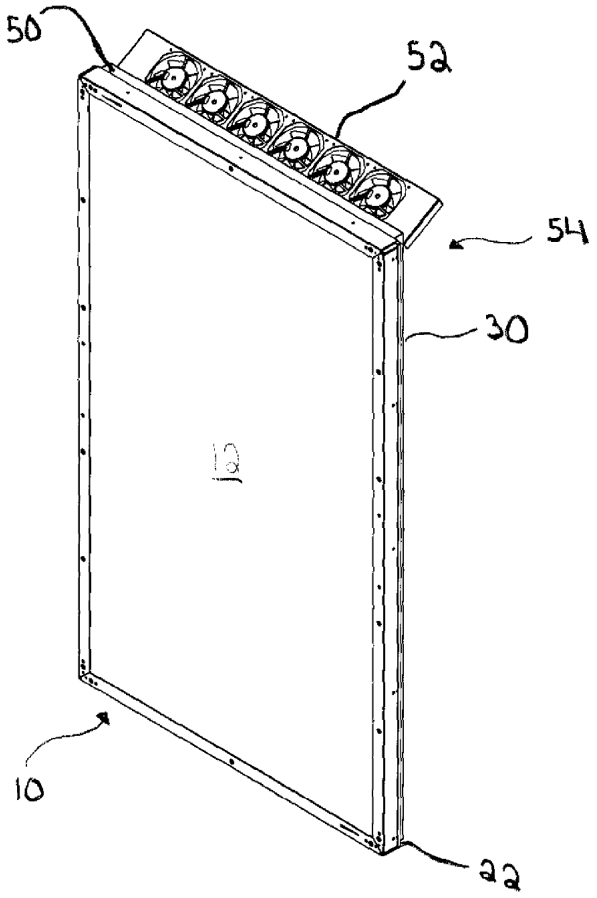


Figure 5A is a front perspective view of a fan and display in an exemplary embodiment using an exemplary constricted convection plate. *Id.* at 3:31–32.

Figure 5A shows constricted convection plate 30 mounted to display posterior 22. *Id.* at 5:34–35. According to the '595 patent, the constricted convection plate 30 and the display posterior 22 define constricted

convection cooling channel 50 immediately behind the display posterior 22.

Id. at 5:37–39.

The '595 patent further describes that

> The 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 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.

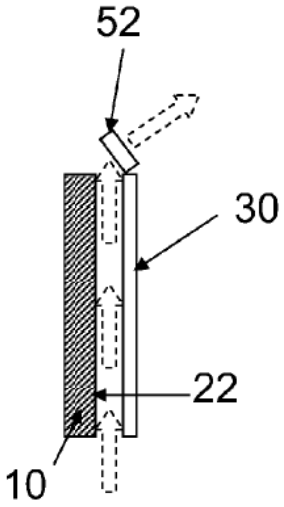


Fig. 5B

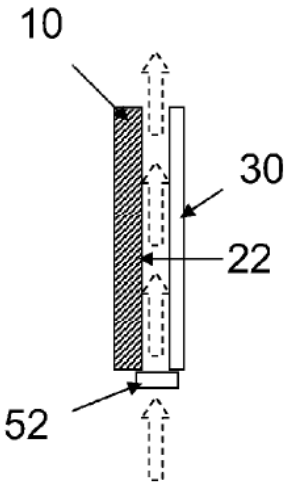


Fig. 5C

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

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;
>
> 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 10:13–26.

E. Prior Art and Declaration Evidence

Petitioner cites the following references in its challenge to patentability:

Japanese Unexamined Patent Application Publication No. H11-68363, published Mar. 9, 1999 (Ex. 1008, "Takahashi");[1]

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");[2]

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

[1] 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) (*id.* at 6). Patent Owner does not dispute the accuracy of the English translation in Exhibit 1008 at this time. Our citations to Takahashi are to the certified English translation.

[2] 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) (*id.* at 23). Patent Owner does not dispute the accuracy of the English translation in Exhibit 1010 at this time. Our citations to Na are to the certified English translation.

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

Petitioner supports its challenge with a declaration from Robert Smith-Gillespie (Ex. 1002, "Smith-Gillespie Declaration"). Patent Owner's Preliminary Response does not rely on the testimony of any declarant.

F. Asserted Grounds of Unpatentability

Petitioner asserts that the challenged claims are unpatentable based on the following grounds (Pet. 4).

Claim(s) Challenged	35 U.S.C. §	Reference(s)
1	103(a)[3]	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

III. ANALYSIS

A. Level of Ordinary Skill in the Art

The level of ordinary skill in the pertinent art at the relevant time is a factor in how we construe patent claims. *See Phillips v. AWH Corp.*, 415

[3] The Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011), amended 35 U.S.C. § 103 effective March 16, 2013. Based on the record before us, we preliminarily determine that the '595 patent has an effective filing date prior to the effective date of the applicable AIA amendment, we refer to the pre-AIA version of § 103.

F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc). It is also one of the factors we consider when determining whether a patent claim is obvious over the prior art. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

To assess the level of ordinary skill, we construct a hypothetical "person of ordinary skill in the art," from whose vantage point we assess obviousness and claim interpretation. *See In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998). This legal construct "presumes that all prior art references in the field of the invention are available to this hypothetical skilled artisan." *Id.* (citing *In re Carlson*, 983 F.2d 1032, 1038 (Fed. Cir. 1993)).

Citing testimony from Mr. Smith-Gillespie, Petitioner asserts that a person of ordinary skill in the art 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). Petitioner asserts that, alternatively, 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 Ex. 1002 ¶ 36).

Patent Owner asserts that a person of ordinary skill in the art ("POSITA") would have had:

> A bachelor's degree in a pertinent discipline, such as mechanical or electrical engineering, physics, applied physics, or a related field. Such a person would also have had 2-4 years of experience

> in working with electronic displays including thermal management associated with electronic displays. Alternatively, a POSITA 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.

Prelim. Resp. 10–11. Patent Owner further states that "[w]hile 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." *Id.* at 11.

Neither party argues that the outcome of the case would differ based on our adoption of any particular definition of the level of ordinary skill in the art. For purposes of this Decision, based on our review of the '595 patent, the types of problems and solutions described in the '595 patent, and cited prior art, we determine that 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.

B. Claim Construction

In an *inter partes* review, we construe a patent 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)." 37 C.F.R. § 42.100(b) (2022). In applying such standard, claim terms are generally given their ordinary and

customary meaning, as would be understood by a person of ordinary skill in the art, at the time of the effective filing date of the patent application and in the context of the entire patent disclosure. *Phillips*, 415 F.3d at 1312–13. "In determining the meaning of the disputed claim limitation, we look principally to the intrinsic evidence of record, examining the claim language itself, the written description, and the prosecution history, if in evidence." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*, 469 F.3d 1005, 1014 (Fed. Cir. 2006) (citing *Phillips*, 415 F.3d at 1312–17).

"posterior display surface" and "constricted convection channel"

The terms "posterior display surface" and "constricted convection channel" are recited in challenged independent claims 1 and 4. Petitioner asserts that in related district court litigation, the district court has construed "posterior display surface" as "rear-facing surface of the display assembly" and "constricted convection channel" as "constricted channel through which air may flow to remove heat from the posterior display surface." Pet. 11 (citing Ex. 1011, 1–2; Ex. 1012, 6–8, 10–11). Petitioner urges us to apply these constructions, but does not explain why they are correct. *See id.*

Patent Owner does not propose its own constructions of "posterior display surface" and "constricted convection channel." *See* Prelim. Resp. 11–12. Nor has Patent Owner alleged that Petitioner's proposed constructions are incorrect. *See id.* Rather, Patent Owner asserts that Petitioner proposes its constructions "without any analysis," and simply asks the Board to adopt the district court's construction "without any discussion or citation to evidence in support of those constructions." *Id.* at 11. Patent Owner asserts that Petitioner has engaged in improper incorporation by

reference from the district court's claim construction reasoning. *Id.* at 11–12.

For purposes of this Decision, we need not construe these terms because the parties do not identify any disputed issue material to the outcome of this Decision that would turn on the constructions. *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 (Fed. Cir. 1999))).

"a fan positioned[/placed] to draw air [from outside of the housing] through the constricted convection channel"

Claim 1 recites "a fan placed to draw air from outside of the housing through the constricted convection channel" and independent claim 4 recites "a fan positioned to draw air through the constricted convection channel." Petitioner asserts that these terms should be construed to mean "a fan positioned to pull air [from outside the housing] through and out of the constricted convection channel" because "[s]uch an interpretation is consistent with usage of the term 'draw' in the specification as well as the plain and ordinary meaning as set forth in general purpose dictionary usage." Pet. 12 (citing Ex. 1002 ¶ 77).

Patent Owner does not propose its own constructions of "a fan placed to draw air from outside of the housing through the constricted convection channel" and "a fan positioned to draw air through the constricted convection channel." *See* Prelim. Resp. 12. Nor has Patent Owner alleged that Petitioner's proposed constructions are incorrect. *See id.* Instead, Patent Owner asserts that Petitioner proposes its constructions "without any

discussion or supporting evidence," which is "insufficient under 37 C.F.R. § 42.104(b)(3)." *Id.*

For purposes of this Decision, we need not construe these terms because the parties do not identify any disputed issue material to the outcome of this Decision that would turn on the constructions. *See Realtime Data*, 912 F.3d at 1375.

No other claim terms need to be construed expressly for purposes of this Decision.

C. Lack of Particularity

Patent Owner argues that Petitioner "do[es] not—for any ground—explain how the references are purported to be combined or how the proposed combinations allegedly teach each element of the claims" and that such "insufficient analysis does not warrant institution." Prelim. Resp. 16. Patent Owner argues that Petitioner has "taken a number of improper shortcuts, rendering their arguments unclear and imprecise, and improperly shifting the burden of deciphering them onto Patent Owner and the Board," and "therefore have failed in their burden of arguing with sufficient particularity." *Id*. at 17. Patent Owner sets out the reasons why it believes that each of the six asserted grounds lack particularity. *Id.* at 18–27.

After considering Patent Owner's arguments, we disagree that Petitioner's challenges lack particularity, because, as discussed below, we understand Petitioner's arguments and asserted combinations. Accordingly, we decline to deny the Petition for lack of sufficient particularity. *See* 35 U.S.C. § 312(a)(3) ("A petition . . . may be considered only if . . . the petition identifies, in writing and with particularity, each claim challenged,

the grounds on which the challenge to each claim is based, and the evidence that supports the grounds for the challenge to each claim . . .").

D. Relevant Principles of Law

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 the subject matter pertains. *KSR Int'l Co. v. Teleflex Inc*., 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations. *Graham*, 383 U.S. at 17–18.

Additionally, the obviousness inquiry typically requires an analysis of "whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness")); *see Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1366–67 (Fed. Cir. 2012) (holding that "some kind of motivation must be shown from some source, so that the [trier of fact] can understand why a person of ordinary skill would have thought of either combining two or more references or modifying one to achieve the patented [invention]")). Petitioner cannot satisfy its burden of proving obviousness by employing

"mere conclusory statements." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

We analyze the asserted grounds based on obviousness with the principles identified above in mind.

E. Asserted Obviousness over Takeuchi

Petitioner asserts that claim 1 is unpatentable under § 103(a) over Takeuchi. Pet. 23–31.

1. Overview of Takeuchi (Ex. 1004)

Takeuchi describes a display system that includes a cooling device. Ex. 1004 ¶ 2.

Figure 1 of Takeuchi is reproduced below.

FIG. 1

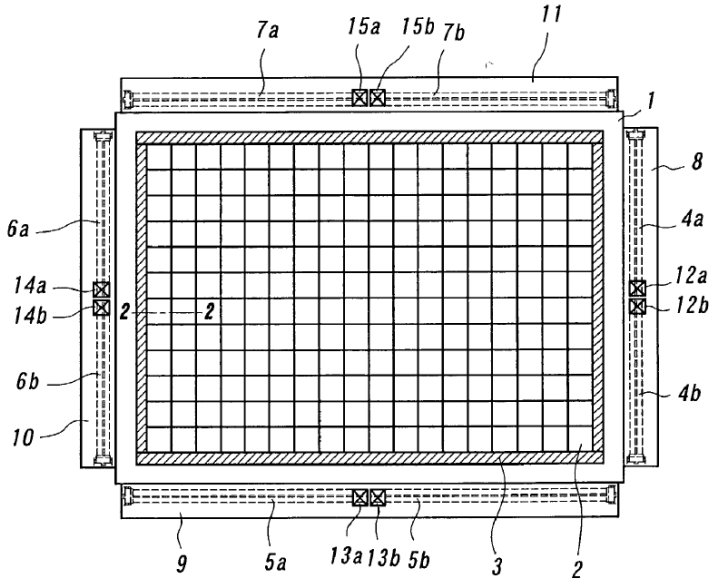


Figure 1 is a front view of an exemplary display system of Takeuchi. *Id.* ¶ 23.

Takeuchi describes that the display system depicted in Figure 1 includes light guide plate 1; light sources 4a, 4b, 5a, 5b, 6a, 6b, 7a, 7b on the sides of the light guide plate 1; reflectors 8, 9, 10, 11 that surround the light sources and the sides of the light guide plate for reflecting light from the light sources; and cooling fans 12a, 12b, 13a, 13b, 14a, 14b, 15a, 15b secured to the sides of the reflectors 8, 9, 10, 11. *Id.*

Figure 5 of Takeuchi is reproduced below.

FIG. 5

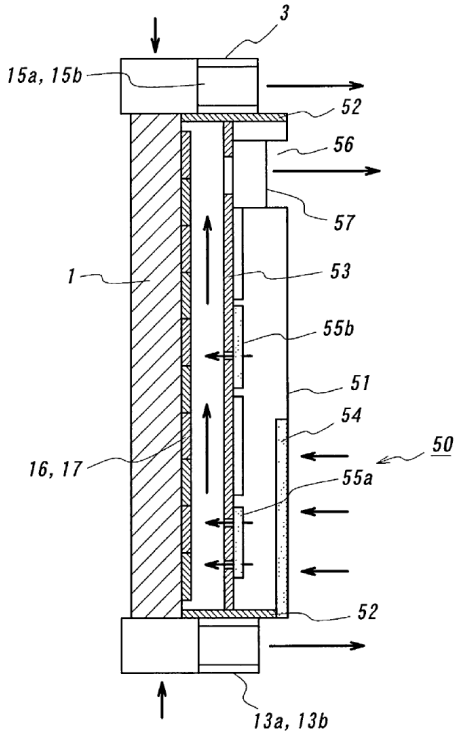


Figure 5 is a sectional view showing a second embodiment of the cooling device of Takeuchi. *Id.* ¶ 20.

Referencing Figure 5, Takeuchi describes that in cooling device 50 of the second embodiment, the back sides of light guide plate 1 and panels 16, 17 are completely covered by rear cover 51. *Id.* ¶ 40. Partition plate 53 of a generally flat shape is placed between the rear cover 51 and the back sides of

the light guide plate 1 and the panels 16, 17. *Id.* According to Takeuchi, partition plate 53 defines a cooling chamber on the back sides of the light guide plate 1 and the panels 16, 17. *Id.*

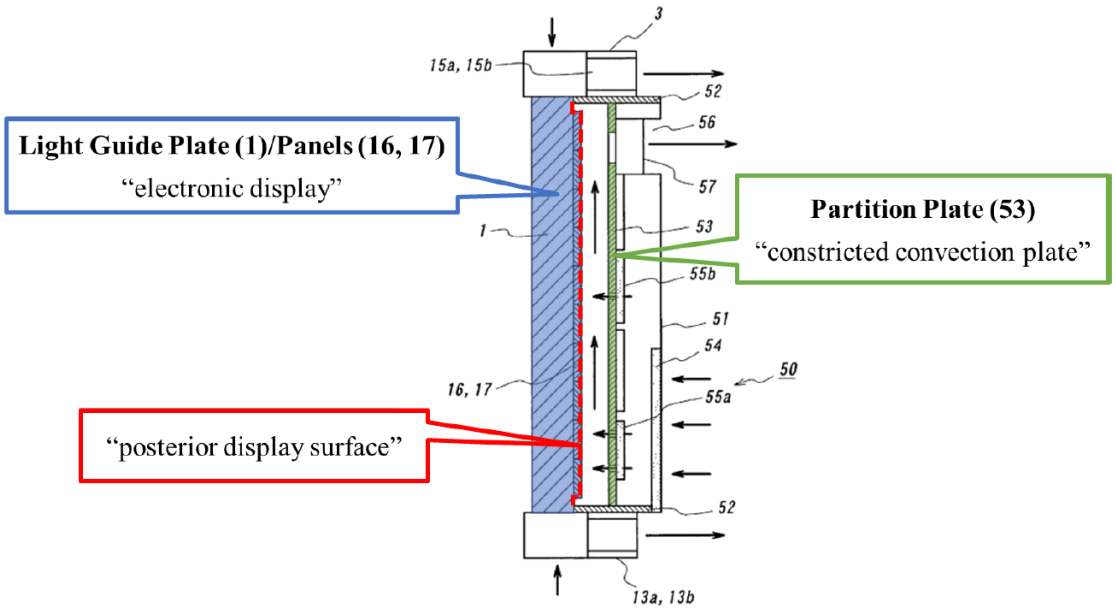
Takeuchi further describes that intake vents with filters 54, 55a, 55b are arranged in the lower and middle portions of the partition plate 53. *Id.* An exhaust vent and blower 57 are provided in the upper portion of the partition plate 53 at a position corresponding to recess portion 56. *Id.* The blower 57 may be comprised of a sirocco fan. *Id.*

Takeuchi describes that blower 57 of the cooling device 50 is operated during the operation of the display system to introduce ambient air through the filters 54, 55a, 55b into the cooling chamber defined by the partition plate 53. *Id.* ¶ 41. According to Takeuchi, the ambient air introduced into the cooling chamber flows from the lower side toward the upper side of the chamber, cooling the light guide plate 1 and the panels 16, 17 from the back sides. *Id.* The air is then sucked into the blower 57 and exhausted from the recess portion 56 of the rear cover 51 to outside. *Id.* Takeuchi describes that, as a result, the light guide plate 1 and the panels 16, 17 can be effectively cooled from the back sides during operation of the display system. *Id.*

2. Claim 1

Petitioner contends that Takeuchi teaches or suggests all elements of claim 1. Pet. 23–31.

Figure 5 of Takeuchi as annotated by Petitioner is reproduced below.



Pet. 26. Annotated Figure 5 of Takeuchi reproduced above illustrates Petitioner's alleged identification in Takeuchi of certain elements of claim 1. *Id.* at 24–27.

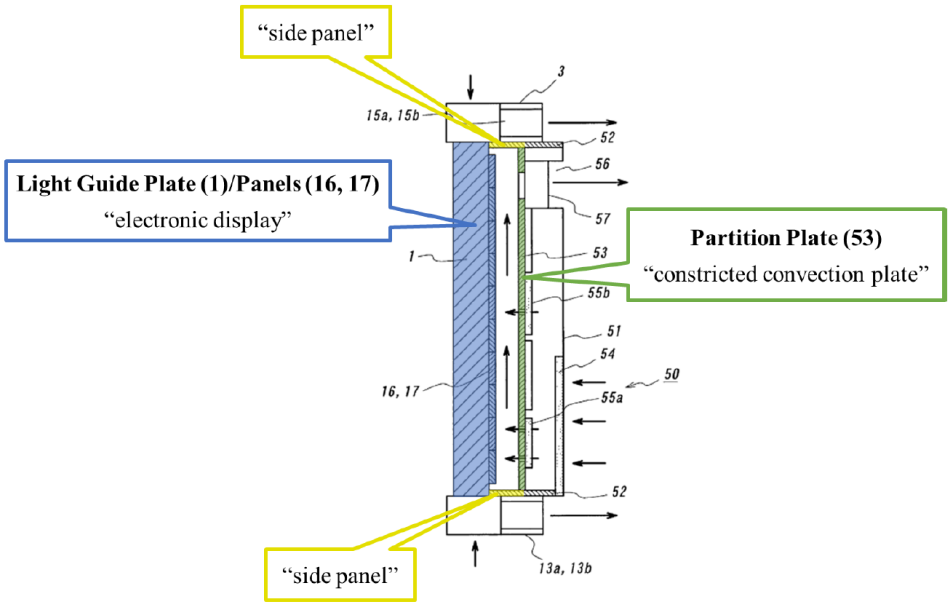
Referencing annotated Figure 5 of Takeuchi reproduced above, Petitioner asserts that light guide plate 1 and panels 16, 17 (annotated in blue) teach the "electronic display" recited in claim 1. Pet. 24 (citing Ex. 1004 ¶¶ 37, 47, Fig. 5). Petitioner further contends that the panel portion "causes a video image to be displayed on the light guide plate." *Id.* (citing Ex. 1004, Abstr.). Petitioner asserts that the rear-facing surface of the backsides of the light guide plate 1 and panels 16, 17 (annotated in red) teaches the recited "posterior display surface." *Id.* at 25–26 (citing Ex. 1004, Fig. 5; Ex. 1002 ¶ 106). Petitioner also argues that the backside of rear cover 51 and portions 52 form a three-sided cover that teaches a housing which contains the electronic display. *Id.* at 25 (citing Ex. 1004 ¶¶ 36, 40,

Fig. 5). Additionally, Petitioner asserts that Takeuchi's cooling device 50, depicted in Figure 5, teaches a system for cooling an electronic display. *Id.* at 24.

Addressing the limitation of claim 1 reciting "a constricted convection plate placed posterior to the posterior display surface," Petitioner contends that partition plate 53 (annotated in green) shown in annotated Takeuchi Figure 5 reproduced above teaches this limitation because Takeuchi's partition plate 53 is placed "posterior to" the rear-facing surface of the backsides of the light guide plate 1 and panels 16, 17 (the recited "posterior display surface").

Turning next to the limitation reciting "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," Petitioner relies on Takeuchi's cooling chamber as teaching this limitation. Pet. 27–30.

Figure 5 of Takeuchi with second annotations by Petitioner is reproduced below.



Pet. 28. Second annotated Figure 5 of Takeuchi reproduced above illustrates Petitioner's alleged identification in Takeuchi of certain elements of claim 1, including "two side panels." *Id.* at 27–28.

Referencing second annotated Figure 5 of Takeuchi reproduced above, Petitioner asserts that Takeuchi teaches or suggests "two side panels placed adjacent to the constricted convection plate and the posterior display surface, defining a constricted convection channel," as recited in claim 1, because Takeuchi's "cooling chamber" (the recited "constricted convection channel") is constrained by (a) the rear-facing surface of the backsides of the light guide plate 1 and panels 16, 17 (the recited "posterior display surface"), (b) the partition plate 53 (the recited "constricted convection plate," annotated in green), and (c) side panels (annotated in yellow) on the right

and left side of the partition plate 53 (the recited "two side panels placed adjacent to the constricted convection plate"). Pet. 27–28.

Regarding the limitation "two side panels placed adjacent to the constricted convection plate," Petitioner argues alternatively that to the extent Takeuchi does not disclose the recited "side panels," "it would have been obvious to add side panels adjacent to the partition plate and posterior display surface on the right and left sides of the chamber to prevent contamination and improve air flow." Pet. 29 (citing Ex. 1002 ¶ 119).

Petitioner further contends that Takeuchi teaches "a constricted convection channel having an entrance and an exit," as recited in claim 1, because Takeuchi's cooling chamber has two entrances (intake vents with filters 54, 55a, 55b) and one exit (an exhaust vent at recess portion 56). Pet. 29–30 (citing Ex. 1004 ¶¶ 40–41). According Petitioner, Takeuchi describes that "'[a]mbient air' is introduced 'into the cooling chamber defined by the partition plate **53**' through two fine filters **55***a*, **55***b*" and "[a]ir 'flows from the lower side toward the upper side of the chamber, cooling the light guide plate **1** and the panels **16, 17** from the backsides.'" *Id.* at 29 (citing Ex. 1004 ¶¶ 40–41, Fig. 5).

Lastly, addressing the limitation reciting "a fan placed to draw air from outside of the housing through the constricted convection channel," Petitioner asserts that Takeuchi discloses blower 57, which may be a "sirocco fan." Pet. 31 (citing Ex. 1004 ¶ 40). Petitioner further contends that Takeuchi discloses

> ambient air introduced into the cooling chamber flows from the lower side toward the upper side of the chamber, cooling the light guide plate **1** and the panels **16**, **17** from the back sides, and is sucked from the exhaust vent in the upper portion of the partition

> plate **53** into the blower **57** [i.e. a 'fan positioned to draw air'], and then exhausted from the recess portion 56 of the rear cover **51** [i.e. the '**housing**'] to the outside.

Id. (quoting Ex. 1004 ¶¶ 36, 41). Petitioner argues, therefore, Takeuchi's fan draws air from outside the housing and through and out of the cooling chamber (the recited "constricted convection channel").

Patent Owner contends that panels 16, 17 of Takeuchi do not meet the "side panels" limitation. Prelim. Resp. 28. Patent Owner's argument is unavailing because Petitioner relies on Takeuchi's side panels on the right and left side of the partition plate 53 (annotated in yellow in Petitioner's second annotated Figure 5 of Takeuchi (Pet. 28)), *not* panels 16, 17 of Takeuchi, as teaching the recited "two side panels." *See id.* at 27–28.

Patent Owner also asserts that "Takeuchi discloses using a porous plate through which air can flow in and out in various directions for its cooling mechanism" and, therefore, does not teach "a constricted convection channel having a specific entrance and specific exit for directed and consistent air flow." Prelim. Resp. 29.

At this stage, Patent Owner's argument does not undermine Petitioner's showing because, as discussed in the Petition, Takeuchi's cooling chamber has specific entrances (intake vents with filters 54, 55a, 55b) and a specific exit (an exhaust vent at recess portion 56). Pet. 29–30 (citing Ex. 1004 ¶¶ 40–41). As also discussed in the Petition, Takeuchi discloses directed air flow through the cooling chamber (the claimed "constricted convection channel") because Takeuchi describes that "'[a]mbient air' is introduced 'into the cooling chamber defined by the partition plate **53**' through two fine filters **55***a*, **55***b*" and "*[a]ir 'flows from the lower side toward the upper side of the chamber*, cooling the light guide

plate 1 and the panels 16, 17 from the backsides.'" *Id.* at 29 (emphasis added) (citing Ex. 1004 ¶¶ 40–41, Fig. 5).

Having reviewed Petitioner's and Patent Owner's arguments, and the evidence of record, we are persuaded that Petitioner sufficiently establishes, for purposes of institution, that the teachings of Takeuchi account for all of the recitations of claim 1.

F. Asserted Obviousness over Kim

Petitioner asserts that the subject matter of claim 1 would have been obvious over Kim. Pet. 32–42.

1. Overview of Kim (Ex. 1005)

Kim "provide[s] a cooling fan unit with improved cooling efficiency by efficiently cooling heat generated from a backlight 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

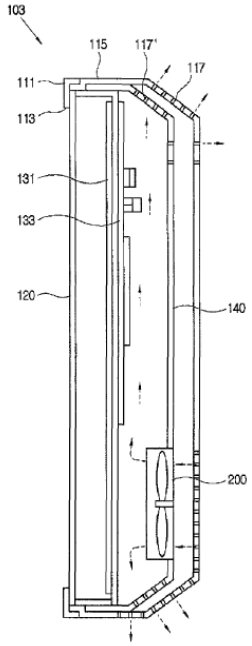


Figure 5 is schematic view of a cooling system described in Kim. Ex. 1005, 3:50.

Display body 103 includes liquid crystal display panel 120, backlight unit 130 (not labeled) comprising light source 131, circuit board 133, shield 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

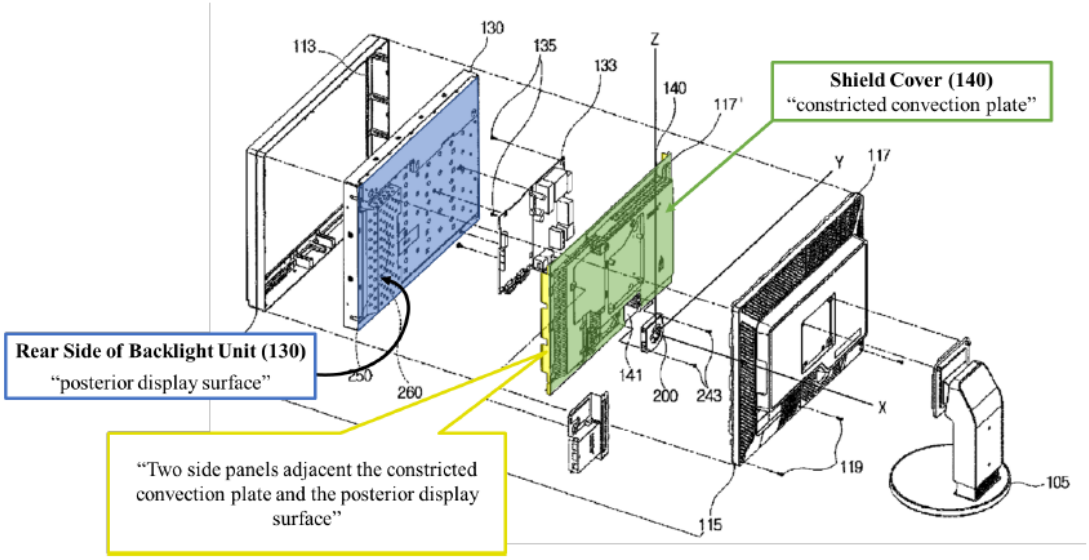
cover 140 has a plurality of air slits 117′ through which flowing air produced by cooling fan 210 comes in and out. *Id*. at 4:59–61. Cooling fan unit 200 is placed in a lower central portion of shield cover 140, and can alternatively be placed in a central or upper portion of shield cover 140 if necessary. *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.

2. Claim 1

Petitioner contends that Kim teaches or suggests all elements of claim 1. Pet. 32–42. In particular, Petitioner contends that Kim teaches an "electronic display" (backlight unit 130 and display panel 120) having a "posterior display surface" (rear facing surface of backlight unit 130), and "a housing" (casing 110). *Id.* at 32–35. Petitioner further asserts that Kim teaches a "constricted convection plate" (shield cover 140) which is "placed posterior to the posterior display surface" (*id.* at 35–37), and "two side panels" (side portions of shield cover 140) "placed adjacent to the constricted convection plate and the posterior display surface" (*id.* at 38).

Figure 2 of Kim as annotated by Petitioner is reproduced below.



Pet. 40. Annotated Figure 2 of Kim reproduced above illustrates Petitioner's identification in Kim of the "posterior display surface," "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" recited in claim 1. *Id.* at 39–40.

Petitioner asserts that Kim teaches "two side panels placed adjacent to the constricted convection plate and the posterior display surface, defining a constricted convection channel" because Kim discloses two sets of "side panels" (side portions of shield cover 140, annotated in yellow) adjacent to shield cover 140 (the recited "constricted convention plate"), which, along with the rest of the shield cover, define a channel that "supplies cooling air to the backlight unit." Pet. 38 (citing Ex. 1005, Abstr., 2:59–60, 4:52–55).

Regarding the limitation "two side panels placed adjacent to the constricted convection plate," Petitioner argues alternatively that "[t]o the extent that the portions of the shield cover **140** illustrated in Figures 2 and 5

may not be considered side panels," "it would have been obvious to include side panels by widening the constricted convection channel to facilitate greater clearance (and air movement) between the electrical components mounted to part of the rear of the display and the shield cover." Pet. 39 (citing Ex. 1002 ¶ 145).

According to Petitioner, Kim teaches a "constricted convection channel having an entrance and an exit" because in Kim, air is drawn "in and out" of the channel through air slits 117′, which appear only on the top and bottom of the shield cover 140. Pet. 40 (citing Ex. 1005, 4:59–61, Fig. 2; Ex. 1002 ¶ 147). Petitioner asserts that Kim discloses that the "cooling air generated by" cooling fan 210 "can efficiently cool the LEDs widely distributed on the plane of the backlight unit 130 and the circuit board 133 while the cooling air flows through a space between the shield cover 140 and the backlight unit 130." *Id.* at 40–41 (citing Ex. 1005, 5:34–38, Figs. 2, 5).

Petitioner further contends that Kim teaches "a fan placed to draw air from outside of the housing through the constricted convection channel," as recited in claim 1, because Kim discloses that "[t]he cooling 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." Pet. 42 (citing Ex. 1005, 5:42–45).

In response, Patent Owner argues that "Kim does not disclose the claimed 'constricted convection plate' or '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'" because Kim's shield cover 140 "is related to shielding electromagnetic wave radiation (Ex. 1005 at 4:55–58); it does not create a constricted convection

channel." Prelim. Resp. 29–30. Patent Owner argues that shield cover 140 with a plurality of air slits 117′ through which air produced by cooling fan 210 flows is "contrary to the claimed 'constricted convection plate' and 'side panels' that form a constricted convection channel having a specific entrance and specific exit for directed and consistent air flow." *Id*. at 30 (citing Ex. 1005, 4:59–61).

As discussed in the Petition, in Kim, air is drawn "in and out" of the channel through air slits 117′, which appear only on the top and bottom of the shield cover 140. Pet. 40 (citing Ex. 1005, 4:59–61, Fig. 2; Ex. 1002 ¶ 147). Petitioner asserts that Kim discloses that the "cooling air generated by" cooling fan 210 "can efficiently cool the LEDs widely distributed on the plane of the backlight unit **130** and the circuit board **133** while the cooling air flows through a space between the shield cover **140** and the backlight unit **130**." *Id.* at 40–41 (citing Ex. 1005, 5:34–38, Figs. 2, 5).

In addition, Kim discloses that shield cover 140 is "provided in the rear side of backlight unit 130, is supported by at least one of the backlight unit 130 and the casing 110, with a space formed between the shield cover 140 and the backlight unit 130." Ex. 1005, 4:52–55. Shield cover 140 also "comprises a fan support 141," "may have a plurality of air slits 117′ through which flowing air produced by the cooling fan 210 comes in and out," and "may be formed in diverse shapes such that the flowing air produced by the cooling fan 210 can be efficiently guided." *Id*. at 4:58–63.

Taken together, these disclosures in Kim are sufficient to support Petitioner's contentions that Kim teaches or suggests all elements of claim 1 at this stage of the proceeding. That Kim further states that shield cover 140 "may be made of a metal material to shield against an electromagnetic wave

generated from the backlight unit 130 and the circuit board 133" (Ex. 1005, 4:55–58) does not change that conclusion, on this record.

Having reviewed Petitioner's and Patent Owner's arguments, and the evidence of record, we are persuaded that Petitioner sufficiently establishes, for purposes of institution, that the teachings of Kim account for all of the recitations of claim 1.

G. Asserted Obviousness over Kim and Hong

Petitioner asserts that claims 4 and 7 are unpatentable under § 103(a) over the combination of Kim and Hong. Pet. 43–56.

1. Overview of Hong (Ex. 1006)

Hong "relates to a liquid crystal display device." Ex. 1006 ¶ 2. Hong's LCD device includes a backlight assembly and a liquid crystal panel disposed over an inner surface of a bottom case. *Id.* ¶ 25. The backlight assembly includes a plurality of LEDs, which may be arranged on a plurality of base printed circuit boards ("PCBs"). *Id.* ¶ 29. The base PCBs "are arranged in parallel on the bottom case" and "may contact or couple with the bottom case." *Id.* The base PCB may include a MCPCB (metal core printed circuit board) which may effectively absorb and transfer heat produced at the LED. *Id.*

2. Claim 4

Petitioner contends that the combination of Kim and Hong teaches or suggests all of the elements of independent claim 4. Pet. 43–55. In the proposed combination of Kim and Hong, Petitioner relies on Kim as teaching all of the elements of claim 4, except for the limitation reciting "a

metal core printed circuit board (PCB) having front and back sides," for which Petitioner further relies on Hong. *Id.*

For example, Petitioner contends that Kim teaches "a liquid crystal stack" (contained within LCD display panel 120) (*id*. at 43–44) and "a constricted convection plate placed behind the posterior surface" (shield cover 140 provided on the rear side of backlight unit 130) (*id*. at 50–52).

For claim 4's limitation reciting "a constricted convection plate placed behind the posterior surface of the PCB, defining a constricted convection channel having an entrance and an exit," Petitioner cites to and relies on its analysis of claim 1 discussed above, applying Kim to claim 1's limitation similarly reciting "the constricted convection plate and the posterior display surface, defining a constricted convection channel having an entrance and an exit." Pet. 50–51 (citing Pet. §§ IX.A.3 & 4). Similarly, for claim 4's limitation reciting "a fan positioned to draw air through the constricted convection channel," Petitioner cites to and relies on its analysis of claim 1 discussed above, applying Kim to claim 1's limitation similarly reciting "a fan placed to draw air from outside of the housing through the constricted convection channel." *Id.* at 52–53 (citing Pet. §§ IX.A.4).

Claim 4 also recites "a backlight assembly behind the liquid crystal stack" that comprises "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, 10:15–21. Petitioner contends that Kim teaches that backlight unit 130 (the recited "backlight assembly") is provided behind the LCD display panel, and comprises a plurality of LEDs as light source 131 that are widely distributed on the plane of backlight unit 130. Pet. 45 (citing Ex. 1005, 1:61–63, 2:51–

53, 4:33–35, 5:35–36; Ex. 1002 ¶ 165). Petitioner contends that "[a] POSITA would recognize, therefore, that the LEDs must be mounted on a first side of a PCB included as part of the backlight unit 130." *Id*. (citing Ex. 1002 ¶ 165). Petitioner points to the rear side of Kim's backlight unit 130 to satisfy the "a posterior surface on the rear side of the PCB" limitation of claim 4. *Id*. at 46–47 (citing Ex. 1005, Fig. 2; Ex. 1002 ¶ 166).

Petitioner also asserts that Hong discloses backlight assembly 120 located behind liquid crystal panel 110 that includes a plurality of LEDs 124 arranged on a plurality of base PCBs 122 placed on an inner surface of the bottom case 150. Pet. 47–49 (citing Ex. 1006 ¶¶ 25, 29, 33, Fig. 3; Ex. 1002 ¶¶ 167–169). Petitioner further contends that Hong discloses that 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." *Id.* at 48 (citing Ex. 1006 ¶ 29). Thus, Petitioner asserts 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.* at 49 (citing Ex. 1002 ¶¶ 168–169). Petitioner contends, therefore, Hong teaches "a metal core printed circuit board (PCB) having front and back sides," as recited in claim 4. *Id.* (citing Ex. 1002 ¶ 169).

Petitioner further contends that a POSITA "would be motivated to modify Kim's backlight unit . . . with Hong's metal core PCB ('MCPCB') with multiple LEDs mounted to its front side." Pet. 53 (citing Ex. 1006 ¶¶ 29, 33; Ex. 1002 ¶ 181). Petitioner asserts that a POSITA "would be motivated to use Hong's thermally efficient design of mounting LEDs on a metal core PCB in place of the PCB in Kim to enable Kim's cooling chamber to transfer the heat of Kim's backlight more efficiently." *Id.* (citing

Ex. 1002 ¶ 181). Petitioner argues that the substitution of Kim's circuit board with Hong's metal core PCB with multiple LEDs mounted to its front side would involve the use of one known technique to improve similar devices in the same way, and further would produce predictable results. *Id.* at 54 (citing Ex. 1002 ¶ 184).

Patent Owner argues that a POSITA "would [not] have been motivated to modify Kim based on Hong . . . due to the fundamental differences among the references." Prelim. Resp. 30. In particular, Patent Owner argues that "a POSITA would not use Hong's thermal convection and heat sink in conjunction with Kim's porous shield, nor would a POSITA arrive at the claimed constricted convection plate based on these two references." *Id*. at 31. Petitioner, however, does not propose combining Hong's thermal convection and heat sink with Kim's display apparatus. Instead, we understand Petitioner to be arguing that a POSITA would have included Hong's MCPCB with a plurality of LEDs mounted on its front side in Kim's display apparatus. Pet. 47–50, 53–55. Patent Owner does not argue, on this record, that a POSITA would not have been motivated to modify Kim with Hong in this manner.

Having reviewed Petitioner's and Patent Owner's arguments, and the evidence of record, we are persuaded that Petitioner sufficiently establishes, for purposes of institution, that the combined teachings of Kim and Hong account for all of the recitations of claim 4, and that a POSITA would have been motivated to combine the teachings as proposed with a reasonable expectation of success.

3. Claim 7

Claim 7 depends from claim 4 and further recites "the fan is placed near the exit of the constricted convection channel." Petitioner contends that Kim teaches the additionally recited limitation of claim 7. Pet. 55–56 (citing Ex. 1005, 5:4–6, 5:38–42, 7:62–65; Ex. 1002 ¶ 180). Patent Owner does not respond specifically to Petitioner's challenge to claim 7 beyond Patent Owner's arguments advanced with respect to claim 4 discussed above. *See* Prelim. Resp. 29–33.

Based on the record before us, we are persuaded that Petitioner's discussion of the particular structures in Kim and Hong, and the explanations in the Petition and the Smith-Gillespie Declaration, sufficiently show that the combined teachings of Kim and Hong account for all of the elements of claim 7.

H. Asserted Obviousness over Kim, Hong, and Takahashi

In this asserted ground of obviousness, Petitioner adds the teachings of Takahashi to the combination of Kim and Hong and challenges dependent claim 8 as obvious over the combination of Kim, Hong, and Takahashi. Pet. 57–61.

Claim 8 depends from claim 4. As discussed above in Section III.G.2, Petitioner has shown sufficiently that the combined teachings of Kim and Hong account for all of the recitations of claim 4. Petitioner contends that Takahashi teaches or suggests the additional limitations recited in dependent claim 8. Pet. 57–59.

Takahashi describes improved airflow control in "the heat dissipation structure of electronic devices such as PDP (plasma display [panel]) devices." Ex. 1008 ¶ 2, Fig. 2.

Petitioner provides detailed analysis showing where it contends each additional limitation of dependent claim 8 is taught in Takahashi, which we find sufficiently persuasive on the current record and at this stage of the proceeding. Pet. 57–59.

Petitioner also explains that a person of ordinary skill in the art would have been motivated to combine Kim, Hong, and Takahashi because a person of ordinary skill in the art would have been motivated to combine the teachings of Kim and Hong with Takahashi's teachings of using access apertures (i.e., through-holes) to gain access to hardware components associated with the backlight unit and/or LCD display, and especially to prevent cooling air leakage from holes formed in the shield plate 140. Pet. 60 (citing Ex. 1008, Abstr., ¶¶ 3, 10, 12–13, Figs. 2–3; Ex. 1002 ¶ 194). Petitioner further argues that

> The combination would have constituted the simple use of one known technique, the cooling of a posterior display surface by convection of air within a constricted convection channel, (as reflected by Kim), along with the known method of using an MCPCB to improve conductive heat transfer from the BL LEDs (as disclosed by Hong), while further taking advantage of a third known method of forming deep drawn through-holes in a plate to allow servicing electronic devices associated with display (as disclosed by Takahashi).

Id. at 61 (citing Ex. 1002 ¶ 196).

Patent Owner does not respond specifically to Petitioner's challenge to claim 8 beyond Patent Owner's arguments advanced with respect to claim 4 discussed above. *See* Prelim. Resp. 29–33.

Based on the record before us, we are persuaded that Petitioner's discussion of the particular structures in Kim, Hong, and Takahashi and the explanations in the Petition and the Smith-Gillespie Declaration, sufficiently show that the combined teachings of Kim, Hong, and Takahashi account for all of the elements of claim 8.

I. Asserted Obviousness over Na and Kim

Petitioner asserts that claim 1 is unpatentable under § 103(a) over the combination of Na and Kim. Pet. 61–77.

1. Overview of Na (Ex. 1010)

Na relates "to a backlight unit capable of improving a cooling effect and a liquid crystal display device including the same." Ex. 1010, 2. "[T]he 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.

Na's Figure 1 is reproduced below.

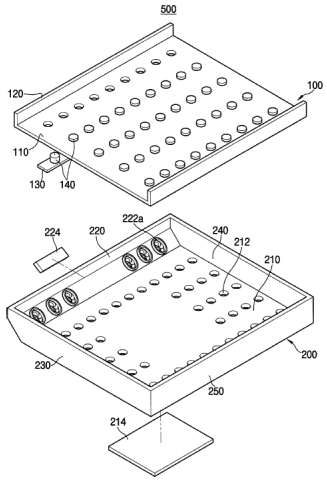


Figure 1 is an exploded perspective view of one embodiment of a backlight unit described in Na. Ex. 1010, 1. Backlight unit 500 includes areal light source device 100 and storage container 200. *Id*. at 4. Areal light source device 100 includes reflective plate 110, sidewall 120, driving substrate 130, and a plurality of LED light sources 140. *Id*. A plurality of coupling holes 112 are formed in reflective plate 110 so that the 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 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 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 "plurality of fans 222a function as an exhaust unit for discharging internal air. *Id*.

Na's Figure 3 is reproduced below.

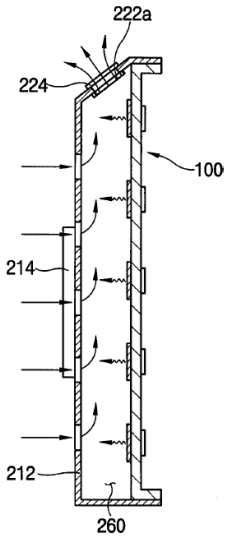


Figure 3 depicts "a side view for explaining a cooling process of the backlight unit of FIG. 1." Ex. 1010, 1. LED array substrate 110 of areal light source device 100 is driven to generate heat, increasing the temperature of the air in inner space 260 between areal light source device 100 and storage container 200. *Id*. at 5. The heated air is discharged to the outside of backlight unit 500 by a plurality 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*.

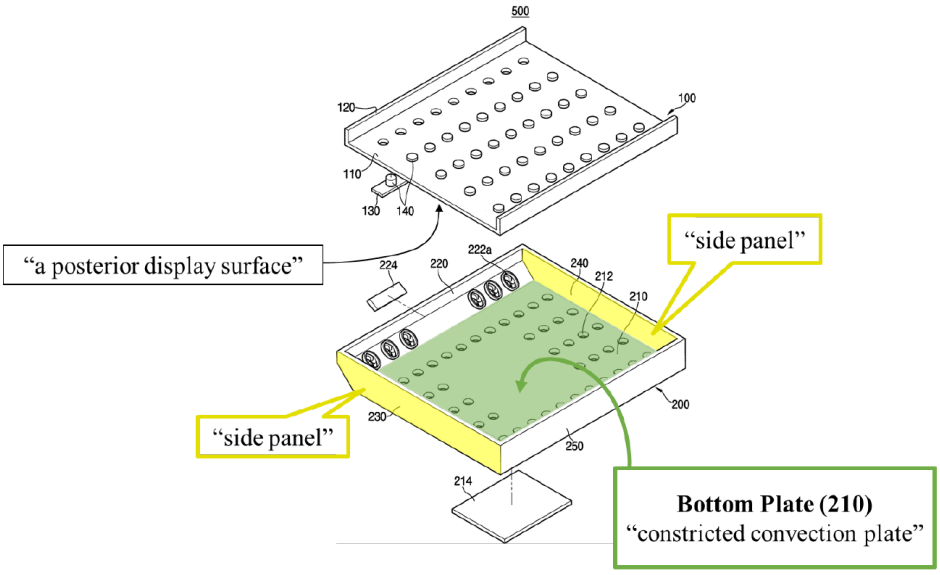
2. Claim 1

Petitioner contends that the combination of Na and Kim teaches or suggests all of the elements of independent claim 1. Pet. 61–77. In the

proposed combination of Na and Kim, Petitioner relies on Na as teaching all of the elements of claim 1, except for the recited "housing," for which Petitioner further relies on Kim. *Id.*

For example, Petitioner contends that Na teaches an "electronic display" (Na's liquid display panel 840, optical sheet 820 and areal light source device 100) (Pet. 63), a "posterior display surface" (the surface of Na's backlight unit 100) (*id.* at 66), a "constricted convection plate" (the rectangular bottom plate 210 of Na's storage container 200), and "two side panels placed adjacent to the constricted convection plate" (sidewalls 220, 230, 240, and 250 of Na's storage container 200 attached to the rectangular bottom plate 210) (*id.* at 71).

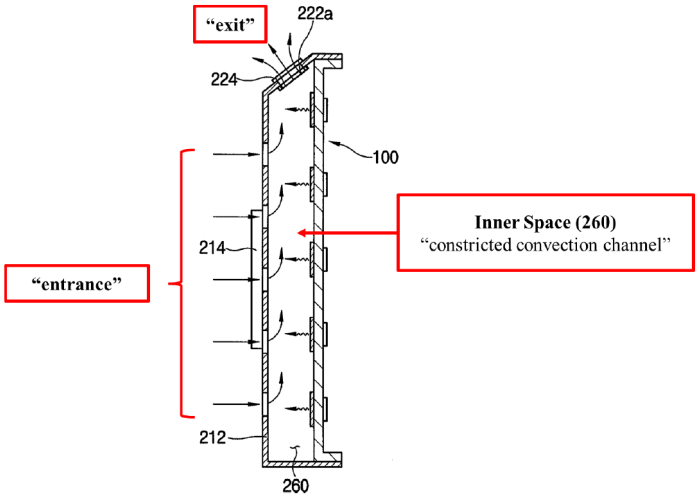
Figure 1 of Na as annotated by Petitioner is reproduced below.



Pet. 71. Annotated Figure 1 of Na reproduced above illustrates Petitioner's identification in Na of claim 1's elements "posterior display surface" (the surface of Na's backlight unit 100), "constricted convection plate" (the rectangular bottom plate 210 of Na's storage container 200), and "two side panels placed adjacent to the constricted convection plate" (sidewalls 220,

230, 240, and 250 of Na's storage container 200 attached to the rectangular bottom plate 210). *Id.*

Figure 3 of Na as annotated by Petitioner is reproduced below.



Pet. 72. Annotated Figure 3 of Na reproduced above illustrates Petitioner's identification in Na of claim 1's limitation "constricted convection channel having an entrance and an exit."

Petitioner asserts that, as illustrated in annotated Figures 1 and 3 of Na reproduced above, the surface of Na's backlight unit and Na's sidewalls adjacent to the rectangular bottom plate define a "constricted convection channel having an entrance and an exit" because Na discloses that

> "[L]ow-temperature air cooler than the high-temperature air in the inner space 260 [the 'constricted convection channel'] is introduced from the outside of the backlight unit 500 through the through-holes 212." The "through-holes 212 function as an intake unit [i.e., 'entrance'] through which external air is sucked."
>
> "[F]ans 222a are operated to flow air from the inner space to the outside" [i.e., produce an 'exit']. Thus, "the heat generated by the areal light source device 100 is transferred from the inner space to the outside," and "the fans 222a function as an exhaust unit ['exit'] for discharging internal air."

Pet. 72–73 (citing Ex. 1010, 4, 5).

Petitioner further contends that Kim's "casing 110" formed from "front casing 111 and a rear casing 115" teaches a "housing" recited in claim 1. Pet. 65 (citing Ex. 1005, 4:8–12; Ex. 1002 ¶ 204).

Lastly, Petitioner contends that the combined teachings of Na's inner space 260 (the recited "constricted convection channel having an entrance and an exit") and Kim's casing 110 (the recited "housing") teach "a fan placed to draw air from outside of the housing through the constricted convection channel," as recited in claim 1. Pet. 73–74.

Addressing the reasons to combine Na and Kim, Petitioner asserts that a POSITA would have been motivated to improve the "backlight unit and a liquid crystal display [LCD] device" of Na by adding an outer housing, as disclosed by Kim. Pet. 74. Petitioner argues that it would be 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 asserts that a POSITA would have understood that "an LCD device contained within a device like a LCD video display necessarily must be contained within some kind of housing, and thus would be motivated to employ Kim's solution for removing heated air to outside that housing, because it yields predictable results." Pet. 75 (citing Ex. 1002 ¶ 226).

Patent Owner argues that Na does not teach the claimed "housing," "constricted convection plate" or "constricted convection channel." Prelim. Resp. 33. According to Patent Owner, because Na "provides a cooling mechanism whereby air enters and exits through the same through-holes in a

bottom plate, not a channel having an entrance and an exit," Na "teaches away from the claimed constricted convection channel." *Id*. at 33–34 (citing Ex. 1010, Figs. 1–3).

As discussed above, Na's Figure 3 discloses that air is introduced into inner space 260 (the recited "constricted convection channel") from the outside through an intake unit of through-holes 212 (the recited "entrance") and discharged to the outside via fans 222a, which function as an exhaust unit (the recited "exit"). Ex. 1010, 4, 5, Fig. 3; Pet. 72–73 (citing Ex. 1010, 4, 5, Fig. 3). On this record, Patent Owner's argument is contrary to the express disclosure of Na and, therefore, does not undermine Petitioner's persuasive showing.

As to Patent Owner's argument that Na does not teach the claimed "housing," Patent Owner's argument is unavailing because, in the proposed combination of Na and Kim, Petitioner relies on Kim as teaching the recited "housing." A finding of obviousness cannot be overcome "by attacking references individually where the rejection is based upon the teachings of a combination of references." *Bradium Techs. LLC v. Iancu*, 923 F.3d 1032, 1050 (Fed. Cir. 2019) (quoting *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986)).

Patent Owner argues that "a POSITA would not have been motivated to combine Na and Kim" because

> A POSITA would not have expected Na's cooling system (which separates the driving circuits and rear surface of the backlight with a cooling chamber (Ex. 1010 at p. 4) to have been compatible with Kim's cooling system (which places the heat generating components of the backlight and driving circuit together, adjacent to a cooling chamber (Ex. 1005 at 4:52-63,

> 5:16-18, Fig. 5)) and thus would not have combined the references.

Prelim. Resp. 34.

Petitioner, however, does not propose combining Na's cooling system with Kim's cooling system. Instead, we understand Petitioner to be arguing that a POSITA would have included Kim's outer housing in the display assembly of Na with its cooling system to form a fully packaged LCD electronic display. Pet. 65, 74–75. Patent Owner does not argue, on this record, that a POSITA would not have been motivated to modify Na with Kim in this manner.

Having reviewed Petitioner's and Patent Owner's arguments, and the evidence of record, we are persuaded that Petitioner sufficiently establishes, for purposes of institution, that the combined teachings of Na and Kim account for all of the recitations of claim 1, and that a POSITA would have been motivated to combine the teachings as proposed with a reasonable expectation of success.

J. Asserted Obviousness over Na and Hong

Petitioner asserts that claims 4, 7, and 8 are unpatentable under § 103(a) over the combination of Na and Hong. Pet. 77–95.

1. Claim 4

Petitioner contends that the combination of Na and Hong teaches or suggests all of the elements of independent claim 4. Pet. 77–87. In the proposed combination of Na and Hong, Petitioner relies on Na as teaching all of the elements of claim 4, except for the limitation reciting "a metal core

printed circuit board (PCB) having front and back sides," for which Petitioner further relies on Hong. *Id.*

Petitioner provides detailed analysis showing where it contends each recitation of claim 4 is taught in Na and Hong, which we find sufficiently persuasive on the current record and at this stage of the proceeding. Pet. 77–87. Petitioner also explains persuasively that a POSITA would have been motivated to combine Na and Hong because a POSITA

> would be motivated to use Na's "backlight unit capable of improving a cooling effect and a liquid crystal display device including the same" . . . , and to modify its driving substrate 130 on which are mounted LEDs, to adapt the display for a higher power LED backlight by taking advantage of Hong's MCPCB which provides a more thermally efficient design for heat dissipating components.

Id. at 88 (citing Ex. 1010, 2, 4, 6–7; Ex. 1006 ¶¶ 29, 33; Ex. 1002 ¶ 267). Petitioner asserts that "[t]he substitution of Na's driving substrate 130 to which LEDs are mounted with Hong's MCPCB with multiple LEDs mounted to it involves the use of one known technique to improve similar devices in the same way, and further produces predictable results." *Id.* at 89.

Patent Owner argues that a POSITA "would [not] have been motivated to modify Na based on Hong . . . due to the fundamental differences among the references." Prelim. Resp. 34. Patent Owner asserts that "[i]n Hong, the heat produced at the LEDs 124 is transferred to heat sink 162 through the plurality of PCBs 122 and the bottom case 150 and thus irradiated outside, where each PCB 122 holds a single row of LEDs" and that "[t]his does not teach or suggest replacing Na's single driving substrate 130 for all LEDs, with a single, metal PCB." *Id.* at 34–35.

To the extent Patent Owner's argument is premised on physical incorporation of Hong's MCPCB into Na's backlight unit, we are not persuaded because "[t]he test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." *MCM Portfolio LLC v. Hewlett-Packard Co.*, 812 F.3d 1284, 1294 (Fed. Cir. 2015) (*quoting In re Keller*, 642 F.2d 413, 425 (CCPA 1981)).

In addition, "*KSR* does not require that a combination *only unite old elements* without changing their respective functions." *ClassCo, Inc. v. Apple, Inc.*, 838 F.3d 1214, 1219 (Fed. Cir. 2016) (emphasis added) (citing *KSR*, 550 U.S. at 416); *see also Google LLC v. Ji-Soo Lee*, 759 F. App'x 992, 997 (Fed. Cir. 2019) ("Our obviousness framework permits modifying one reference and combining it with a second reference." (citing *Smith & Nephew, Inc. v. Rea*, 721 F.3d 1371, 1380 (Fed. Cir. 2013)) (non-precedential).

Having reviewed Petitioner's and Patent Owner's arguments, and the evidence of record, we are persuaded that Petitioner sufficiently establishes, for purposes of institution, that the combined teachings of Na and Hong account for all of the recitations of claim 4, and that a POSITA would have been motivated to combine the teachings as proposed with a reasonable expectation of success.

2. Claims 7 and 8

Claims 7 and 8 depend from independent claim 4. Petitioner asserts that Na teaches or suggests the additionally recited limitations of claims 7 and 8. Pet. 91–95. Petitioner provides detailed analysis showing where it

contends each additional limitation of dependent claims 7 and 8 is taught in Na, which we find sufficiently persuasive on the current record and at this stage of the proceeding. *Id.*

Patent Owner does not respond specifically to Petitioner's challenge to these dependent claims beyond Patent Owner's arguments advanced with respect to independent claim 4 discussed above. *See* Prelim. Resp. 33–35.

Based on the record before us, we are persuaded that Petitioner's discussion of the particular structures in Na and Hong, and the explanations in the Petition and the Smith-Gillespie Declaration, sufficiently show that the combined teachings of Na and Hong account for all of the elements of claims 7 and 8.

K. Objective Indicia of Nonobviousness

As part of our obviousness analysis, we also consider whether objective indicia of nonobviousness (i.e., secondary considerations) may lead to a conclusion that the challenged claims would not have been obvious. *See, e.g.*, *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538–39 (Fed. Cir. 1983) (instructing that evidence of secondary considerations, when present, must always be considered in determining obviousness).

Objective evidence of nonobviousness "is only relevant to the obviousness inquiry 'if there is a nexus between the claimed invention and the [objective indicia of nonobviousness].'" *In re Affinity Labs of Tex., LLC*, 856 F.3d 883, 901 (Fed. Cir. 2017) (quoting *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1312 (2006)). A "nexus" is a legally and factually sufficient connection between the objective evidence and the claimed invention such that the objective evidence should be considered in the

determination of obviousness. *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332 (Fed. Cir. 2019); *see In re Paulsen*, 30 F.3d 1475, 1482 (Fed. Cir. 1994). A presumption of nexus arises where "the patentee shows that the asserted objective evidence is tied to a specific product and that product 'embodies the claimed features, and is coextensive with them.'" *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) (quoting *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))); *see also Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 723 F.3d 1363, 1372 (Fed. Cir. 2013) (explaining that a "presumption of a nexus" exists where a product is "coextensive" with a patent claim). If, however, the patented invention is only a component of the commercial embodiment, the patentee is not entitled to a presumption of nexus. *Fox Factory*, 944 F.3d at 1374. In addition, "[a] patent claim is not coextensive with a product that includes a 'critical' unclaimed feature that is claimed by a different patent and that materially impacts the product's functionality." *Id*. at 1374–75. But, "[a] finding that a presumption of nexus is inappropriate does not end the inquiry into secondary considerations;" rather, "the patent owner is still afforded an opportunity to prove nexus by showing that the evidence of secondary considerations is 'the direct result of the unique characteristics of the claimed invention.'" *Id*. at 1374 (quoting *In re Huang*, 100 F.3d 125, 140 (Fed. Cir. 1996)). Patent Owner bears the burden of establishing that a nexus exists between the evidence of secondary considerations and the patented invention. *Id*. at 1373.

Patent Owner argues that "[t]here are multiple indicia of non-obviousness of the '595 Patent with a nexus to [Patent Owner's] outdoor and

semi-outdoor electronic display products, which practice the '595 Patent, including . . . industry praise, commercial success, long-felt need, unsuccessful attempts by others, and copying." Prelim. Resp. 7. Specifically, Patent Owner points to an email in which a representative of "[r]eal-party-in-interest Samsung SDS America praised [Patent Owner's] technical achievements and commercially successful entry into the outdoor display market." *Id*. at 7–8 (citing Ex. 2001). Patent Owner also asserts that "Samsung SDS America even attempted to enter into a 'Mutual Non-Disclosure Agreement' with [Patent Owner]." *Id*. at 8 (citing Ex. 2002).

Patent Owner argues that such praise "directly discusses Samsung's belief that Patent Owner would be a 'key partner in outdoor enclosures,' and that Patent Owner's innovations are both 'impressive and unique' and 'rais[e] the bar for high quality standards.'" Prelim. Resp. 8 (citing Ex. 2001). Patent Owner also asserts that "Samsung saw 'loads of opportunities for collaboration in the outdoor space (smart city, transit, rail, etc.) where we can embrace [Patent Owner's] technology and blended in with Samsung displays.'" *Id*. (citing Ex. 2001). Patent Owner argues that "[t]his praise is all tied directly to the claimed invention, i.e., systems and products for effectively cooling outdoor and semi-outdoor electronic displays using an open loop airflow pathway and closed loop airflow pathway in combination with heat exchangers, polarizers, and anti-reflective films." *Id*.

To the extent that there is any praise in the cited evidence, Patent Owner does not tie it to any specific product that embodies, and is coextensive with, the features claimed in the '595 patent. *See Fox Factory*, 944 F.3d at 1373. Nor does Patent Owner show that the cited evidence is the

direct result of the unique characteristics of the invention claimed in the '595 patent. *See id.* at 1374. On the contrary, the "claimed invention" that Patent Owner contends this "praise is directly tied to" includes elements (e.g., an open loop airflow pathway and closed loop airflow pathway) that are not claimed, or even discussed, in the '595 patent. Thus, even if the cited evidence were tied to cooling outdoor and semi-outdoor electronic displays using an open loop airflow pathway and closed loop airflow pathway in combination with heat exchangers, polarizers, and anti-reflective films as Patent Owner contends, Patent Owner still fails to tie the cited evidence to any specific product that embodies, or is coextensive with, features claimed in the '595 patent. Accordingly, we are not persuaded, on this record, that Patent Owner has shown sufficient nexus between the asserted evidence and any challenged claim.

Patent Owner also asserts that, Petitioner "at least knew of the evidence of industry praise directly tied to the claimed invention and had [] evidence in their possession before filing" the Petition. Prelim. Resp. 13 (citing *id*. at 7–9). For the same reasons discussed above with respect to nexus, the cited evidence (Exs. 2001–2003) is not sufficiently detailed to impose on Petitioner an obligation to address them in the Petition as objective evidence of nonobviousness. Thus, on this record, we decline to impose such an obligation on Petitioner.

L. Conclusion

Based on our consideration of the record before us, and for the reasons shown above, we determine that Petitioner establishes sufficiently that (1) Takeuchi teaches or suggests all recitations of claim 1; (2) Kim teaches or suggests all recitations of claim 1; (3) the combination of Kim and

Hong teaches or suggests all recitations of claims 4 and 7; (4) the combination of Kim, Hong, and Takahashi teaches or suggests all recitations of claim 8; (5) the combination of Na and Kim teaches or suggests all recitations of claim 1; and (6) the combination of Na and Hong teaches or suggests all recitations of claims 4, 7, and 8.

We also determine that Patent Owner has not shown sufficient nexus between the asserted evidence and any challenged claim, and, thus, has not established that objective indicia of nonobviousness outweigh Petitioner's evidence of unpatentability. Accordingly, we determine that Petitioner establishes a reasonable likelihood of prevailing in showing that (1) claim 1 would have been obvious over Takeuchi; (2) claim 1 would have been obvious over Kim; (3) claims 4 and 7 would have been obvious over the combination of Kim and Hong; (4) claim 8 would have been obvious over the combination of Kim, Hong, and Takahashi; (5) claim 1 would have been obvious over the combination of Na and Kim; and (6) claims 4, 7, and 8 would have been obvious over the combination of Na and Hong.

With respect to Petitioner's contentions of obviousness of claim 1 over Takeuchi and obviousness of claim 1 over Kim, Patent Owner argues that Petitioner's obviousness analysis is deficient because it is "uncertain whether Petitioners assert Takeuchi [or Kim] anticipates any claim element or claim, Takeuchi renders obvious any claim element or claim, or both" and that "Petitioner[] provide[s] no analysis of how a POSITA would modify Takeuchi [or Kim] to reach the claimed invention." Prelim. Resp. 18–19, 20–21.

As discussed above, we determine that Petitioner establishes sufficiently that Takeuchi teaches or suggests all recitations of claim 1 and

that Kim teaches or suggests all recitations of claim 1. We also determine that Patent Owner has not established that objective indicia of nonobviousness outweigh Petitioner's evidence of unpatentability. Thus, under the facts and circumstances of this case, for purposes of this Decision, we determine that Petitioner's persuasive showing that Takeuchi or Kim teaches or suggests all elements of claim 1 is sufficient to establish a reasonable likelihood of showing obviousness of claim 1 over Takeuchi or Kim. *See Realtime Data*, 912 F.3d at 1373 (affirming the Board's determination of obviousness because a single reference disclosed every element of the challenged claims); *see also Broadcom Corp. v. Int'l Trade Comm'n*, 28 F.4th 240, 253 (Fed. Cir. 2022) (In analyzing anticipation and obviousness of patent claims, "[s]atisfying a more stringent standard does not undermine satisfaction of a lesser standard.").

IV. CONCLUSION

For the foregoing reasons, taking into account the arguments and evidence presented in the Preliminary Response, we conclude that the information presented in the Petition establishes a reasonable likelihood that Petitioner would prevail in proving that at least one challenged claim of the '595 patent is unpatentable. Accordingly, we institute an *inter partes* review of all challenged claims based on the grounds asserted in the Petition.

At this stage of the proceeding, we have not made a final determination as to the patentability of any of the challenged claims. Our final determination will be based on the record as fully developed during trial.

V. ORDER

In consideration of the foregoing, it is

ORDERED that, pursuant to 35 U.S.C. § 314(a), *inter partes* review is hereby instituted as to 1, 4, 7, and 8 of the '595 patent on all grounds presented in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, commencing on the entry date of this Decision.

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