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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG DISPLAY CO., LTD.,
Petitioner,

v.

SOLAS OLED, LTD.,
Patent Owner.

IPR2019-01668
Patent 9,256,311 B2

Before SALLY C. MEDLEY, JESSICA C. KAISER, and JULIA HEANEY, *Administrative Patent Judges.*

KAISER, *Administrative Patent Judge*.

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

I. INTRODUCTION

On September 30, 2019, Samsung Display Co., Ltd. ("Petitioner") filed a Petition requesting an *inter partes* review of claims 1–20 of U.S. Patent No. 9,256,311 B2, issued on February 9, 2016 (Ex. 1001, "the '311 patent"). Paper 1 ("Pet."). Solas OLED Ltd. ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp."). Taking into account the arguments presented in Patent Owner's Preliminary Response, we determined the information presented in the Petition established that there was a reasonable likelihood that Petitioner would prevail in challenging at least one of claims 1–20 of the '311 patent, and we instituted this *inter partes* review, as to all challenged claims, on April 1, 2020. Paper 7 ("Dec. on Inst.").

During the course of trial, Patent Owner filed a Patent Owner Response (Paper 44, "PO Resp."[1]); Petitioner filed a Reply to the Patent Owner Response (Paper 27, "Pet. Reply"[2]); Patent Owner filed a Sur-reply (Paper 33, "PO Sur-reply"); and Petitioner filed a Sur-sur-reply (Paper 35, "Pet. Sur-sur-reply"). An oral hearing was held on February 4, 2021, and a transcript of the hearing is included in the record. Paper 43 ("Tr.").

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

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[1] Patent Owner initially filed the Response under seal, subject to the Board's ruling on Patent Owner's Motion to Seal (Paper 18). Patent Owner, however, later withdrew its redactions (s*ee* Ex. 3002), and filed its Response publicly (Paper 44). In this decision, we cite only the public version of the Patent Owner Response.

[2] The parties initially filed confidential versions of the Petitioner Reply and Patent Owner Sur-reply, but they later withdrew their redactions. The Board thus changed the confidentiality designation of these filings to Public. *See* Ex. 3003.

claims 1–20 of the ’311 patent. For the reasons discussed below, we hold that Petitioner has demonstrated by a preponderance of the evidence that claims 1–20 are unpatentable under § 103.

II. BACKGROUND

A. The ’311 Patent (Ex. 1001)

The ’311 patent describes “an apparatus [that includes] a substantially flexible substrate and a touch sensor disposed on the substantially flexible substrate. The touch sensor compris[es] drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate.” Ex. 1001, code (57). Figure 7 of the ’311 patent is reproduced below.

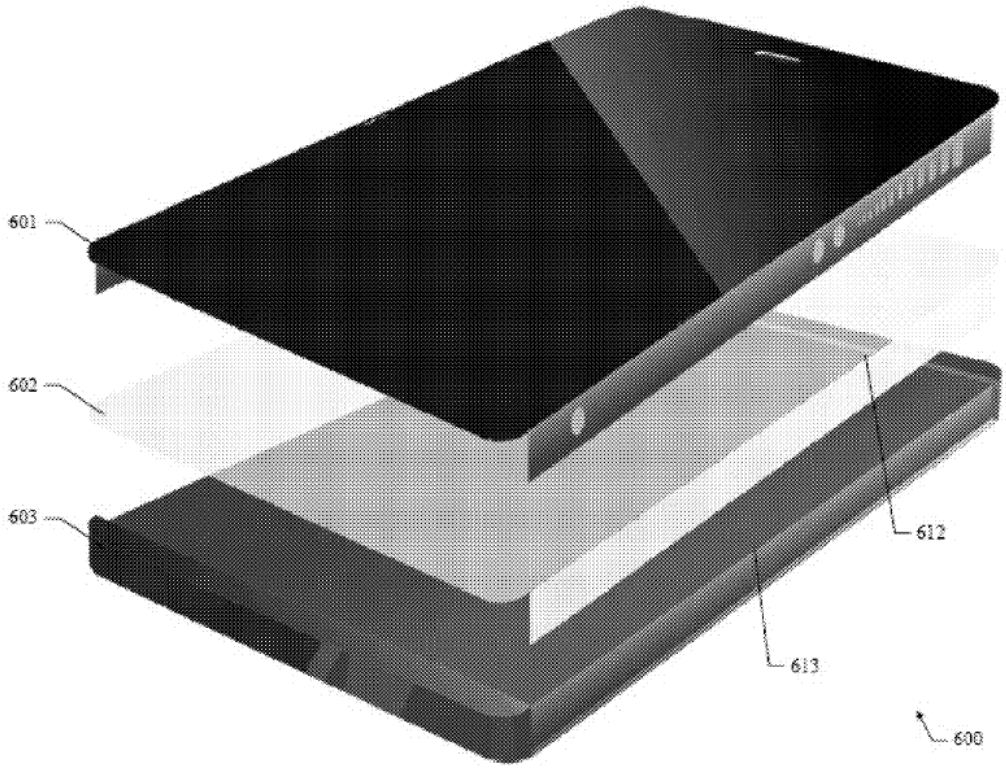


Figure 7

Figure 7 "illustrates an example mobile telephone that incorporates a flexible touch-sensitive apparatus." *Id.* at 7:37–38. In Figure 7, phone 600 includes touch-sensitive apparatus 612 wrapped around display 613. *Id.* at 7:39–41. Substrate 602 may include tracking areas with tracks providing drive and sense connections to and from the drive and sense electrodes of touch-sensitive apparatus 612. *Id.* at 7:41–44. The electrode pattern of touch-sensitive apparatus 612 can be metal-mesh technology (e.g., "a copper, silver, or other suitable metal mesh"). *Id.* at 7:44–47. "Substrate 602 and the conductive material of the electrode pattern may be flexible, enabling the conductive material to wrap around the left and right edges of the surface," and "[f]or sharper edges (e.g., with radii of less than 1 mm), the flexible conductive material of the electrode pattern may be thicker or wider at the sharper edges than at the flat portions of [the] surfaces." *Id.* at 7:48–55.

B. Illustrative Claim

Of the challenged claims, claims 1 and 7 are independent. Claim 1 is illustrative and is reproduced below.

> 1. An apparatus comprising:
>
> a substantially flexible substrate; and
>
> a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate, wherein:
>
> the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid; and

> the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display.

Ex. 1001, 8:61–9:7.

C. Related Proceedings

Petitioner and Patent Owner identify a related litigation in the U.S. District Court for the Eastern District of Texas asserting the '311 patent, titled *Solas OLED Ltd. v. Samsung Display Co., Ltd., et al.*, Case No. 2:19-cv-00152-JRG (E.D. Tex.). Pet. 3; Paper 4, 1. The parties have informed us that there has been a jury verdict in the related district court proceeding. Ex. 1034, 5:11–6:16. In that verdict, the jury was not presented with the unpatentability ground that we reach in this Decision. *Id.* Thus, we are presented with different issues to resolve in this Decision than was the jury in the related district court proceeding.

D. References

Petitioner relies on the following references:

1. "Kuriki" (US 8,722,314 B2; issued May 13, 2014) (Ex. 1003);
2. "Mikladal" (US 9,395,851 B2; issued July 19, 2016) (Ex. 1004);
3. "Philipp" (US 2011/0102361 A1; published May 5, 2011) (Ex. 1005);
4. "Rappoport" (US 2012/0218219 A1; published Aug. 30, 2012) (Ex. 1006);
5. "Moran" (WO 2010/099132; published Sept. 2, 2010) (Ex. 1007); and
6. "Joo" (US 2008/0223708 A1; published Sept. 18, 2008) (Ex. 1008).

E. Grounds Asserted

Petitioner challenges the patentability of the '311 patent claims on the following grounds:

Claims Challenged	35 U.S.C. §[3]	References/Basis
1–13, 15, 16, 18	103(a)	Kuriki, Mikladal
14, 17	103(a)	Kuriki, Mikladal, Philipp
19, 20	103(a)	Kuriki, Mikladal, Rappoport
1–13, 15, 16, 18	103(a)	Moran, Joo
14, 17	103(a)	Moran, Joo, Philipp
19, 20	103(a)	Moran, Joo, Rappoport

Petitioner also relies on testimony from Andrew Wolfe, Ph.D. (Ex. 1023). Patent Owner relies on testimony from Thomas L. Credelle (Ex. 2002).

III. ANALYSIS

A. Legal Principles

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the subject matter sought to be patented 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 differences between the claimed subject matter and the prior art;

[3] The Leahy-Smith America Invents Act ("AIA") included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. Because the '311 patent issued from an application filed before March 16, 2013, we apply the pre-AIA version of § 103.

(3) the level of ordinary skill in the art; and (4) when in the record, objective evidence of nonobviousness. *See Graham v. John Deere Co*., 383 U.S. 1, 17–18 (1966). In that regard, an obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418.

B. Level of Ordinary Skill in the Art

In the Institution Decision, we adopted Petitioner's formulation of the level of ordinary skill in the art and determined that a person of ordinary skill in the art "would have had a relevant technical degree in Electrical Engineering, Computer Engineering, Computer Science, Materials Science, or the like, and 2–3 years of experience in touch sensor design." Dec. on Inst. 6 (quoting Pet. 10–11) (adopting Petitioner's formulation, which is supported by Dr. Wolfe's testimony, because it is consistent with the '311 patent and the asserted prior art). In its Patent Owner Response, Patent Owner adopts Petitioner's definition of the level of ordinary skill in the art. PO Resp. 8 (citing Ex. 1023 ¶ 78; Ex. 2002 ¶ 39). We maintain our determination from the Institution Decision because that level of skill is consistent with the '311 patent and the asserted prior art.

C. Claim Construction

In an *inter partes* review, we construe claim terms according to the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b) (2019). Under that standard, we construe claims "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." *Id.* Furthermore, we expressly construe the claims only to the extent necessary to resolve the parties'

dispute. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe 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))).

In our Institution Decision, we determined we did not need to explicitly construe any claim terms at that stage of the proceeding. Dec. on Inst. 7. During the trial, Patent Owner discusses claim construction for the following claimed limitations: (1) "configured to wrap around one or more edges of a display"; (2) "touch sensor . . . to wrap around [the] one or more edges"; (3) "edges of a display"; and (4) "to form a mesh grid." PO Resp. 3–8. Regarding these terms, Patent Owner points out the district court's construction of "configured to wrap around one or more edges of a display" in a parallel proceeding[4] (*id.* at 3–4 (citing Ex. 1025, 24–28)) and Patent Owner's disagreement with Petitioner's characterization of a "touch sensor" as encompassing tracks or tracking (*id.* at 4–6). Patent Owner ultimately contends that none of these phrases need to be construed for purposes of this proceeding. *See id.* at 3–8.

Petitioner discusses constructions for "configured to wrap around one or more edges of a display" and "touch sensor . . . to wrap around [the] one or more edges." Pet. Reply. 1–2. Regarding the first phrase, Petitioner contends its arguments are consistent with the district court construction. *Id.* at 1 (citing Ex. 1025, 27–28). Petitioner offers no construction of the second phrase. *Id.* at 2.

[4] *Solas OLED Ltd. v. Samsung Display Co., Ltd. et al.*, No. 2:19-cv-00152-JRG (E.D. Tex.).

We determine we need not explicitly construe any claim terms to resolve the unpatentability issues before us. *See Nidec*, 868 F.3d at 1017.

D. Asserted Obviousness over Moran and Joo

1. Overview of Moran

Moran discloses "touch screen sensors and micropatterned substrates that comprise a visible light transparent substrate and at least two electrically conductive micropatterns disposed on or in the visible light transparent substrate." Ex. 1007, 4:18–20. Figure 2 of Moran is reproduced below.

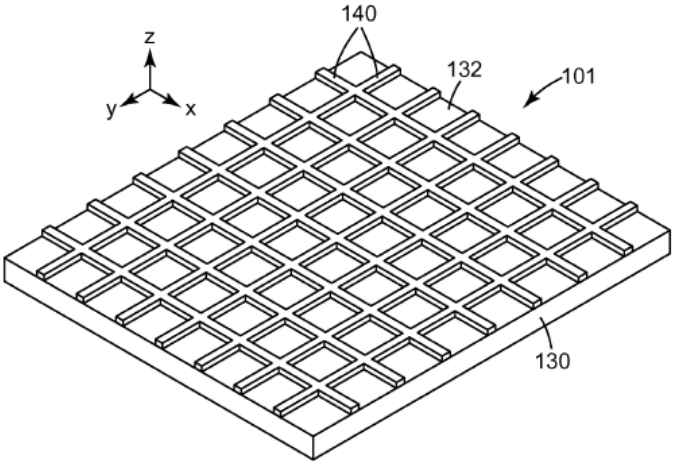


Fig. 2

Figure 2 illustrates "conductive visible light transparent region 101 that would lie within a touch sensing area of a touch screen panel." *Id.* at 7:16–18. In Figure 2, electrically conductive micropattern 140 is disposed on visible light transparent substrate 130. *Id.* at 7:18–20. Moran states that its substrate and sensor "may be substantially planar and flexible." *Id.* at 8:15–16.

2. Overview of Joo

Joo discloses a "cover for a mobile device." Ex. 1008, code (57). The cover has a touch sensitive portion, which can be at least partially located on

a side surface. *Id.* ¶¶ 16, 17. Joo discloses its "touch input portion . . . is extendingly formed at the side surface portion of the cover as well as the upper surface portion thereof," and therefore "a separate side key is not required to be mounted at the side surface of the terminal for generating input, thereby simplifying the manufacturing process thus to reduce the manufacturing cost and make the enhanced appearance of the terminal." *Id.* ¶ 67.

3. Analysis

Petitioner contends claims 1–13, 15, 16, and 18 are unpatentable as obvious over Moran and Joo. Pet. 61–75; Pet. Reply 21–26. We have reviewed the evidence and arguments provided by the parties and are persuaded that Petitioner has demonstrated by a preponderance of the evidence that claims 1–13, 15, 16, and 18 are unpatentable as obvious over Moran and Joo.

Claim 1 recites "a substantially flexible substrate." Ex. 1001, 8:62. Petitioner contends Moran teaches such a substrate because its "light transparent substrate 130" is made of polyethylene terephthalate ("PET") and is "substantially planar and flexible." Pet. 62 (quoting Ex. 1007, 7:16–26, 8:13–16; Ex. 1023 ¶ 167).

We determine Petitioner has shown Moran teaches "a substantially flexible substrate," as recited in claim 1. Moran refers to its substrate as being "visible light transparent" and provides PET as an example of a useful polymer for that substrate. Ex. 1007, 7:16–26. Further, Moran states that its substrate "may be substantially planar and flexible." *Id.* at 8:15–16. Based on these disclosures, we credit Dr. Wolfe's testimony that a person of ordinary skill in the art "would have recognized that Moran disclosed this claim limitation." Ex. 1023 ¶ 167. We thus find Petitioner has met its

burden as to this limitation, and we note that Patent Owner does not separately address this limitation (*see generally* PO Resp.; PO Sur-reply).

Claim 1 further recites "a touch sensor disposed on the substantially flexible substrate, the touch sensor comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate." Ex. 1001, 8:63–67. Petitioner contends Moran discloses this limitation because it discloses "'at least two electrically conductive micropatterns disposed on or in the visible light transparent substrate,' which are connected to circuitry that 'driv[es] the conductive micropatterns with electrical signals for the purpose of capacitively detecting the presence or location of a touch event to an information display.'" Pet. 62 (citing Ex. 1007, 4:18–26, 6:7–26; Ex. 1023 ¶ 168). Petitioner also contends that a person of ordinary skill in the art would have understood that each pair of Moran's electrically conductive micropatterns comprise drive and sense electrodes. *Id.* at 63 (citing Ex. 1007, 4:18–24, 6:15–26, 7:4–9, 9:6–7, 32:21–29; Ex. 1023 ¶ 170). Petitioner further contends that Moran's conductive micropattern is made from metal such as copper or silver and that its sensor is "substantially planar and flexible"; thus Petitioner contends a person of ordinary skill in the art would have understood Moran's electrodes are formed of flexible material configured to bend with the substrate. *Id.* at 64 (citing Ex. 1007, 8:13–16, 22:13–15; Ex. 1023 ¶¶ 171–72).

We determine Petitioner has shown Moran teaches this limitation of claim 1. Moran discloses "at least two electrically conductive micropatterns disposed on or in the visible light transparent substrate." Ex. 1007, 4:18–20. Moran also states:

> The sensor element has a sheet like form and includes at least one electrically insulating visible light transparent substrate layer that supports a conductive material (e.g., metal) that is patterned onto the surface of the substrate in a mesh geometry so as to generate a transparent conductive region that lies within the touch sensing area of the sensor.

Id. at 6:11–15. Dr. Wolfe testifies that a person of ordinary skill in the art "would have readily understood that each pair of conductive micropatterns in Moran (Ex. 1007 at 6:27–26) consists of a drive electrode and sense electrode that together form a capacitive node," as recited in claim 1. Ex. 1023 ¶ 170. Dr. Wolfe also testifies that Moran's conductive micropatterns are configured to bend along with its PET substrate because the materials Moran uses for its conductive micropatterns (copper or silver) are flexible, and Dr. Wolfe cites evidence in support of his testimony as to material flexibility when used as electrodes. *Id.* ¶¶ 171–72 (citing Ex. 1007, 22:13–15; Ex. 1012 ¶¶ 8–9; Ex. 1018, 2955, 2962; Ex. 1019 ¶¶ 25, 33, 81; Ex. 1003, 21:8–12, 27:48–28:38, 29:55–30:33). Thus, we find Petitioner's contentions as to this limitation of claim 1 persuasive because those contentions are supported by Moran's disclosures as well as Dr. Wolfe's testimony about how a person of ordinary skill in the art would understand those disclosures, given background knowledge of the art. We note that Patent Owner does not separately address this limitation (*see generally* PO Resp.; PO Sur-reply).

Claim 1 also recites "the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid." Ex. 1001, 9:1–4. For this limitation, Petitioner points to Moran's Figure 2 reproduced above. Pet. 64–65 (citing Ex. 1007, Fig. 2, 9:17–22; Ex. 1023 ¶ 173).

We determine Petitioner has shown Moran teaches this limitation of claim 1. As shown above, Figure 2 of Moran depicts intersecting conductive lines. Ex. 1007, Fig. 2. Moran further states: "Preferred conductive micropatterns include regions with two dimensional meshes (or simply, meshes), where a plurality of linear micropattern features (often referred to as conductor traces or metal traces) such as micropatterned lines define enclosed open areas within the mesh." *Id.* at 9:17–20. We find these disclosures, cited by Petitioner, show that Moran discloses "the flexible conductive material of the drive or sense electrodes comprises first and second conductive lines that electrically contact one another at an intersection to form a mesh grid," as recited in claim 1. We note that Patent Owner does not separately address this limitation (*see generally* PO Resp.; PO Sur-reply).

Claim 1 further recites "the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display." Ex. 1001, 9:5–7. For this limitation, Petitioner relies on Moran in combination with Joo. Pet. 65; Pet. Reply 21–22. Petitioner contends that Moran discloses its substrate and sensor as "substantially planar and flexible," and acknowledges that Moran does not expressly disclose wrapping the substrate and sensor around a display edge. Pet. 65–66 (citing Ex. 1007, 8:13–16; Ex. 1023 ¶ 174). For that requirement, Petitioner points to Joo's teaching that when

> the touch input portion for generating input when being touched is extendingly formed at the side surface portion of the cover as well as the upper surface portion thereof . . . a separate side key is not required to be mounted at the side surface of the terminal for generating input, thereby simplifying the manufacturing process thus to reduce the manufacturing cost and make the enhanced appearance of the terminal.

Id. at 66 (quoting Ex. 1008 ¶ 67; citing Ex. 1023 ¶ 176).[5] Petitioner contends Joo "provides an express teaching, suggestion, or motivation for a [person of ordinary skill in the art] to wrap Moran's flexible touch sensor around the sides of the device to create additional touch-sensitive regions." *Id.* at 66–67 (citing Ex. 1023 ¶¶ 177–83). Petitioner further contends that "[m]odifying Moran's flexible touch sensor using these teachings from Joo would have been well within the skill of a" person of ordinary skill in the art. *Id.* at 67–68 (citing Ex. 1023 ¶¶ 180–83).

Petitioner further contends that this use of Joo's teachings is "nothing more than an 'application of a known technique [Joo's teaching of wrapping a touch sensor around the edges of a touchscreen display] to a piece of prior art ready for the improvement [Moran's flexible capacitive touch sensor for a touchscreen device].'" *Id.* at 67 (citing *KSR*, 550 U.S. at 417). Petitioner explains that a person of ordinary skill would have had a reasonable expectation of success in implementing the modification whereby the touch-sensitive portions of Moran's touch sensor are expanded and then wrapped around the edges of Moran's display. *Id.* Petitioner contends, and Dr. Wolfe explains, that such modification would not have required changes to the underlying structure of Moran's flexible touch sensor, nor to the materials used to construct its elements. *Id.* at 67–68 (citing Ex. 1007, 5:28–6:6, 6:30–7:3; Ex. 1008 ¶¶ 60–62, Fig. 7; Ex. 1023 ¶¶ 181–82); *see also* Ex. 1023 ¶ 183 (discussing several prior art references that outline the flexible

[5] Petitioner further contends that a number of prior art references expressly teach "the advantages of wrapping a touch sensitive element around the side of a display." Pet. 66 (citing Ex. 1004, 7:31–44; Ex. 1015, 13:42–14:8; Ex. 1016, 22:16–23:12; Ex. 1023 ¶¶ 178–79).

and malleable nature of the conductive line electrodes used in touch screens).

In its Patent Owner Response, Patent Owner argues "Moran does not teach a mesh grid configured to wrap around an edge." PO Resp. 73–74. Patent Owner further argues that "Petitioner has not sufficiently shown that a [person having ordinary skill in the art] would be motivated to modify Moran in view of Joo as suggested by Dr. Wolfe." *Id.* at 73, 75 (citing Ex. 1023 ¶¶ 174–83). In particular, Patent Owner argues that Dr. Wolfe's analysis "glosses over the specific teachings of Joo in favor of a more generalized 'teaching' of a touch sensor that follows a radius of curvature." *Id.* at 76.

Regarding Patent Owner's argument that "Moran does not teach a mesh grid configured to wrap around an edge," Patent Owner notes that while Moran discloses that the sensor "may be . . . flexible," that sensor is also "substantially planar." *Id.* (citing Ex. 1007, 8:15–16). Patent Owner argues that a substantially planar sensor is not wrapped around an edge, and that just because that sensor can be flexible does not mean it can also be wrapped around an edge. *Id.* Patent Owner then relies on the specification of Moran to assert that Moran uses the term "flexible" to mean "'sufficiently flexible' to wind onto a roll of unspecified diameter . . . during processing." *Id.* at 73–74 (citing Ex. 1007, 5:17–21, 25–27; Ex. 2002 ¶ 152). Specifically, Patent Owner argues that the flexibility of the touch sensor of Moran does not mean that such a sensor can be bent around the small radius of curvature at the edge of a display without being damaged. *Id.* at 74.

In its Reply, Petitioner contends that "[i]t is undisputed that Moran's sensor is flexible." Pet. Reply 24. Petitioner notes that Moran's disclosure

teaches the sensor may be "substantially planar and flexible," and may be "processed in a roll-to-roll fashion." *Id.* (citing Ex. 1007, 5:17–21, 8:13–16). Petitioner further asserts that Patent Owner's arguments about Moran's flexible touch sensor not being flexible *enough* to wrap around the small radius of curvature of a display edge amount to unfounded speculation. *Id.* (citing PO Resp. 74). In support, Petitioner asserts that neither Patent Owner nor Patent Owner's declarant Mr. Credelle "actually contend [] or identify evidence" supporting a proposition that one of ordinary skill in the art would expect bending damage or flexibility limitations if Moran's touch sensor were wrapped around a display edge. *Id.* Petitioner then identifies similarities between the electrodes' dimensions and materials of the '311 patent and those disclosed in Moran. *Id.* at 24 n.4; *compare* Ex. 1001, 2:47–54 ("fine lines of metal," such as "copper" or "silver," with a "width of approximately 10 μm or less"), *with* Ex. 1007, 22:13–14 ("useful metals" for the "micropatterns include gold, silver, . . . copper"), 12:9–12 ("the width of a line" may be "less than or equal to approximately 10 micrometers").

Relying on Dr. Wolfe's declaration discussing the various materials and thicknesses disclosed in Moran, Petitioner further asserts that a person of ordinary skill in the art would "readily understand that Moran's sensor is highly flexible." Pet. Reply 25 (citing Ex. 1031, 118:3–25); *see also* Ex. 1007, 5:17–27, 7:21–25 (disclosing common visible light transparent substrates as including polymeric films having thicknesses ranging in general from about 5–1000 microns, and in many embodiments, from 25–500 microns and such polymers including PET).

We find Petitioner's argument and evidence, including Dr. Wolfe's testimony, discussed above on this point persuasive. *See* Pet. Reply 24–25; Ex. 1023 ¶¶ 182–83; Ex. 1007, 8:13–16; Ex. 1031, 118:3–25. As discussed

above, we determine Petitioner has shown Moran teaches "a substantially flexible substrate" and a touch sensor "comprising drive or sense electrodes made of flexible conductive material configured to bend with the substantially flexible substrate," as recited in claim 1. In the context of this limitation, where the substrate and touch sensor "are configured to wrap around one or more edges of a display," we remain persuaded by Petitioner's showing. Dr. Wolfe testified at his deposition that when the materials and the thickness of the substrate disclosed in Moran (5 microns) are considered in context, "you understand that you're talking about a highly flexible film that -- that ranges in its flexibility to some -- from something like Saran Wrap to something that's – that's heavier, that's more of a -- of a -- of a bendable plastic sheet." Ex. 1031, 118:3–25. Moran discloses using a visible light transparent substrate (Ex. 1007, 4:18–20), and that such substrates include polymeric films as thin as 5 microns (*id.* at 5:17–25). As discussed above, Dr. Wolfe also points to evidence showing the materials used in Moran's mesh electrodes (copper or silver) are sufficiently flexible to wrap around the edge of a display. Ex. 1023 ¶¶ 182–183 (citing Ex. 1012 ¶¶ 8–9; Ex. 1018, 2955, 2962; Ex. 1019 ¶¶ 25, 33, 81; Ex. 1003, 21:8–12, 27:48–28:38, 29:55–30:33). We determine this evidence persuasively shows a person of ordinary skill in the art would have understood Moran's substrate and touch sensor to be flexible enough to wrap around an edge of a display.

Patent Owner's arguments focus on Moran's disclosure that its sensor is "substantially planar" and that Moran's polymeric film substrate can be processed in a roll-to-roll fashion. *See* PO Resp. 73–74. We find these arguments do not undermine Petitioner's persuasive showing because Petitioner relies on other teachings in Moran (i.e., the thicknesses and

specific materials disclosed in Moran as well as the background knowledge of the skilled artisan about such materials, as discussed above) to show that a person of ordinary skill in the art would have understood Moran's substrate and touch sensor to be flexible enough to wrap around an edge of a display.

Patent Owner further argues that Petitioner has failed to establish a sufficient motivation to combine Moran and Joo to teach a "substantially flexible substrate and touch sensor . . . configured to wrap around one or more edges of a display." PO Resp. 74–83. Patent Owner contends that Petitioner has not shown why a person of ordinary skill in the art, starting with Moran, would have looked to Joo's teaching of an integrally molded curved touch sensor, and modified Moran to extend Moran's PET metal mesh film and bend the film around an edge. *Id.* at 77. Specifically, Patent Owner contends that Dr. Wolfe's analysis of the combination of Moran and Joo "glosses over the specific teachings of Joo in favor of a more generalized 'teaching' of a touch sensor that follows a radius of curvature." *Id.* at 76 (citing Ex. 2002 ¶ 156).

In support, Patent Owner asserts that "Joo does not teach a mesh grid configured to wrap around an edge" and Joo has no discussion of "materials, structure, or operation of the touch input device." *Id.* Patent Owner asserts that Dr. Wolfe overlooks ***how*** the touch sensor of Joo is curved by injection molding and not by wrapping around the edges of a display. *Id.* at 76–77 (citing Ex. 1008 ¶ 44; Ex. 2002 ¶ 157). Because the touch sensor of Joo is integrally molded to achieve a curved configuration, Patent Owner contends there is "no teaching or suggestion in Joo that ***Moran's*** PET metal mesh sensor could have been wrapped around the edge of a display." *Id.* at 77 (citing Ex. 2002 ¶ 158). Patent Owner also argues that a person of ordinary skill in the art would have understood that the sensor layer of Joo would be

annealed during an in-mold injection process and would result in a rigid cover layer that is not "configured to wrap" around a display edge "so much as it is specifically manufactured . . . to fit over a curved surface." *Id.* at 77–78.

In addition, Patent Owner contends there is no specific teaching about "how to modify Moran's PET-based touch sensor film to be 'configured' to wrap around the edge of a display." *Id.* at 78. Specifically, Patent Owner contends that Joo does not teach how a person having ordinary skill in the art would modify the "conductive lines on the PET film in Moran" to wrap around the edges of a display – whether the lines should be widened or thickened in spots to prevent damage or fracture. *Id.* Thus, Patent Owner contends that a person of ordinary skill in the art would not, starting with the touch sensor of Moran, have been motivated to extend and wrap such a touch sensor around the edges of a display, as taught by Joo. *Id.* at 79.

Furthermore, Patent Owner contends that "the method of manufacturing the curved sensor expressly taught in Joo would, at minimum, be ill-suited for use with the PET-based touch sensor of Moran and thus would be unlikely to be modify Moran's PET films using the techniques taught in Joo." *Id.* (citing Ex. 2002 ¶ 162). Patent Owner asserts that the manufacturing techniques used for Joo's touch sensor molding, e.g., high pressures and temperatures, would have negative effects, such as warping, on the "fragile electric components" present in Moran's PET touch sensor and would reduce the reliability of those components. *Id.* at 79–80 (citing Ex. 2002 ¶ 163; Ex. 2019, 1).

In its Reply, Petitioner reiterates why it would have been obvious "based upon the teaching of Joo, to modify Moran's flexible capacitive touch screen sensor to wrap it around the edges of an underlying

display." Pet. Reply. 22 (citing Pet. 65–68). Petitioner explains that Joo teaches the advantages of a touch sensor "extendingly formed at the side surface . . . as well as the upper surface," because "it eliminates the need for a 'separate side key . . . for generating input,' 'enhance[s] the appearance,' and 'reduce[s] the manufacturing cost.'" *Id.* (citing Ex. 1008 ¶ 67; Ex. 1031, 106:7–10, 106:19–22). Petitioner further explains that such a modification would have been implemented "by expanding the touch-sensitive portions of Moran's touch sensor . . . and wrapping those expanded touch sensitive portions around the edges of Moran's display." *Id.* (citing Pet. 67). Petitioner also again explains that a person having ordinary skill in the art would have reasonably expected success in wrapping Moran's flexible sensor around the edges of a display, and Dr. Wolfe testifies that based upon the "structural properties of the materials used to [create] Moran's touchscreen sensor," such a modification would have been straightforward. *Id.* at 23–24 (citing Ex. 1023 ¶¶ 182–83; Ex. 1012; Ex. 1018; Ex. 1019).

In its Sur-reply, Patent Owner contends this combination is "driven by improper hindsight," that Patent Owner's arguments do not rely on Joo's manufacturing techniques, and that Petitioner overlooks differences between Moran and Joo. PO Sur-reply 25. Patent Owner, however, continues to rely on testimony[6] about combining Joo's manufacturing technique with Moran to argue that a person of ordinary skill in the art would not have looked to Joo when modifying Moran. *Id.* at 26. Thus, Patent Owner contends:

[6] Petitioner's Sur-sur-reply addresses only this testimony. *See generally* Pet. Sur-sur-reply.

> the basic technologies discussed in Joo and Moran are too different to conclude that Joo teaches or suggests to a POSITA the precise modification to Moran that that arrives at the challenged claims, especially where, as here, the record is devoid of even a single reference that teaches the critical elements of Limitation 1[e]/7[e] together: (1) a metal mesh sensor that is (2) configured to wrap around one or more edges of a display--which is a hallmark of nonobviousness.

Id. (citing PO Resp. 81).

We have considered the parties' arguments and evidence on this issue as detailed above, and we find Petitioner's contentions persuasive. As Patent Owner acknowledges (PO Sur-reply 26), Petitioner's combination does not rely on any manufacturing techniques in Joo. Rather, Petitioner argues that a person of ordinary skill in the art would have found it obvious to wrap Moran's flexible substrate including its touch screen around the sides of the device to create additional touch sensitive regions on the sides of the device as taught in Joo. *See* Pet. 66–67. We agree with Petitioner that the "benefits of extending a touch-sensitive region over the side of a display," such as eliminating a separate side key and thus reducing manufacturing costs, are not wholly dependent upon the injection molding technique of Joo. *Id.* In other words, Petitioner's combination is based on its contention that a person of ordinary skill in the art would have recognized that Moran's substrate and touch sensor could be extended and wrapped around the edge of a display and would have been motivated to make that modification because of the known benefits, as described in Joo, of having a touch sensitive portion extend to the side of a display (e.g., replacing mechanical elements on the side, such as a side key, with a touch sensitive element). *See id.* We are persuaded that these benefits inure from having the touch sensitive portion on the side of the display rather than the

manufacturing technique that results in that touch sensitive portion (i.e., injection molding versus bending the touch sensitive portion to wrap it around the edge of the display).

We also find that Petitioner has provided a persuasive rationale for making this modification to Moran in light of Joo's teachings, namely, to replace separate side keys, to enhance the appearance of the touchscreen device, and to reduce manufacturing cost. *See* Pet. 66 (quoting Ex. 1008 ¶ 67; citing Ex. 1023 ¶ 176); Pet. Reply 22. We find this rationale persuasive because it is reflected in the prior art itself (i.e., in Joo) and is based on a rational underpinning of known benefits to extending the touch portion to the side of the display.

Patent Owner's arguments do not undermine Petitioner's persuasive showing on motivation to combine. To the extent Patent Owner argues Joo itself lacks a teaching to modify Moran's touch screen to wrap around the edge of its display (PO Resp. 76–77), obviousness law does not require a specific teaching, suggestion, or motivation in the prior art itself. *See KSR*, 550 U.S. at 418. Thus, we find it of no moment that Joo does not explicitly speak to wrapping Moran's PET metal mesh sensor around the edge of a display. Instead, Petitioner points to a specific teaching in Joo of advantages of having a touchscreen wrapped around the edge of a display. Pet. 66 (citing Ex. 1008 ¶ 67; Ex. 1023 ¶ 176). Dr. Wolfe testifies that a person of ordinary skill in the art would have been motivated to modify Moran to achieve the benefits taught in Joo. *See* Ex. 1023 ¶¶ 178–79. We credit this testimony because it is supported by Joo's teachings (i.e., Ex. 1008 ¶ 67 (By "extendingly form[ing the touch input portion] at the side surface portion of the cover," "a separate side key is not required to be mounted at the side surface of the terminal for generating input, thereby simplifying the

manufacturing process thus to reduce the manufacturing cost and make the enhanced appearance of the terminal."), as well as other contemporaneous references showing the background knowledge of a skilled artisan (Ex. 1004, 7:31–44 ("In a touch sensitive film covering different surfaces of a three-dimensional device, there can be several touch sensing regions for different purposes. . . . Other sensing regions e.g. at the sides of the device can be configured to serve as touch sensitive element replacing the conventional mechanical buttons, e.g. the power button."); Ex. 1016, 23:3–8 ("Further, as can be seen from step c) of Fig. 6 the multilayered element formed onto the structure, in this case on at least a part of a mobile phone, also replaces the function of any mechanical buttons or switches used in prior art mobile phones."). *See id.* In other words, persuasive evidence of record, as cited by Dr. Wolfe, supports that a person of ordinary skill in the art would have been aware of and motivated by the known advantages of extending the touch sensor to cover the side of a device.

Although Patent Owner identifies implementation details that would need to be resolved in Petitioner's proposed combination (PO Resp. 78), we find Dr. Wolfe's testimony (Ex. 1023 ¶¶ 178–83) credible and persuasive that resolving these details would have been well within the skill of a person of ordinary skill in the art. *See KSR*, 550 U.S. at 417. As discussed above, we find persuasive Dr. Wolfe's testimony about the properties of the substrate and touch sensor materials disclosed in Moran, namely, the flexibility of those materials. Given those properties and the persuasive rationale for the modification discussed above, we are persuaded that Petitioner's proposed modification (i.e., extending Moran's touch sensor and wrapping it around the edge of the display) would have amounted to the "application of a known technique [wrapping a touch sensor around the edge

of a touchscreen device's display] to a piece of prior art ready for the improvement [Moran]." Pet. 68 (citing *KSR*, 500 U.S. at 417).

Further, Patent Owner acknowledges and does not appear to dispute to our preliminary determination on institution that Petitioner's combination does not rely on Joo's manufacturing techniques (Dec. 21; Pet. Reply 22). PO Sur-reply 25. Patent Owner, however, continues to argue that Joo's manufacturing technique undermines Petitioner's obviousness rationale. *Id.* at 25–26. At oral hearing, Patent Owner's counsel framed the issue as whether a person of ordinary skill in the art "would have plucked one reference out of the sea of prior art and combined it with the other reference." Tr. 33:13–14. In other words, according to Patent Owner, Moran and Joo are simply too different to support Petitioner's combination because of Joo's manufacturing process. *See* PO Sur-reply 25–26.

We do not agree. "A person of ordinary skill is also a person of ordinary creativity, not an automaton." *KSR*, 550 U.S. at 421. Here, the person of ordinary skill "would have had a relevant technical degree in Electrical Engineering, Computer Engineering, Computer Science, Materials Science, or the like, and 2–3 years of experience in touch sensor design." Pet. 10–11 (citing Ex. 1023 ¶¶ 77–78); PO Resp. 8. In light of that skill level and as discussed in further detail above, we find credible Dr. Wolfe's testimony that Joo's teachings as to the benefits of wrapping a touchscreen around an edge would have motivated a person of ordinary skill in the art to modify Moran. Ex. 1023 ¶ 178. In particular, as we discuss above, we are persuaded that a person of ordinary skill in the art would have understood that these benefits do not depend on the method of manufacturing the touch screen to extend around the edge of the display (i.e., the benefits, such as elimination of mechanical buttons, derive from the existence of the touch

sensitive portion on the side, rather than how the touch sensitive portion was manufactured).

We also do not find that Petitioner's rationale relies on hindsight as Patent Owner contends (PO Sur-reply 25). In particular, Patent Owner faults Petitioner's articulation of the motivation as "wrap[ping] the flexible touch sensor of Moran around the edges of a display," as a near copy of the claim language. *Id.* (citing Pet. Reply 23). We do not view Petitioner's proposed modification as evidencing hindsight. Petitioner states that the "modification could be implemented, for example, by expanding the touch-sensitive portions of Moran's touch sensor (i.e., the portions containing the mesh electrodes) and wrapping those expanded touch-sensitive portions around the edges of Moran's display." Pet. 67. It is true that the claim limitation at issue recites "the substantially flexible substrate and the touch sensor are configured to wrap around one or more edges of a display," similar to the modification of Moran's touch sensor that Petitioner proposes. Nevertheless, given that the modification is relatively straightforward, we see no reason that Petitioner must provide a complicated explanation.

Indeed, Dr. Wolfe explains why a person of ordinary skill would have had a reasonable expectation of success in making this modification based on the properties of the materials used in Moran. Ex. 1023 ¶¶ 182–83. Specifically, as discussed above, Dr. Wolfe explains that a person of ordinary skill in the art would have recognized that the substrate material (PET) in the thicknesses disclosed in Moran (as thin as 5 microns) would have been highly flexible. *See* Ex. 1031, 118:3–25 (testifying that such thin films are like "cellophane" or "Saran Wrap"); *see also* Ex. 1007, 8:13–16 (describing the substrate as "flexible"). Dr. Wolfe also explains that a person of ordinary skill in the art would have understood that the sensor

materials disclosed in Moran would be flexible enough to bend around the edge of a display along with the substrate material. Ex. 1023 ¶¶ 172, 182–83. As discussed above, Dr. Wolfe supports his testimony with references showing the background knowledge of an ordinary artisan that silver and copper mesh electrodes are flexible. *Id.* ¶ 183; *see also* Pet. Reply 24 n.4 (noting that for its electrodes, Moran discloses the same materials (silver and copper) in the same thicknesses (approximately 10 microns) as the '311 patent) (citing Ex. 1001, 2:47–54; Ex. 1007, 22:13–14, 12:9–12).

For the reasons discussed above, we determine Petitioner has shown a person of ordinary skill in the art would have been motivated to modify Moran to extend its touchscreen and wrap it around the edge of a display in light of Joo's teachings. In sum, for the reasons discussed above, we determine Petitioner has shown by a preponderance of the evidence that claim 1 is unpatentable as obvious over Moran and Joo.

Petitioner relies on the same analysis as claim 1 for the similar limitations of independent claim 7 and provides further analysis detailing where it contends an additional limitation of claim 7 as well as each additional limitation of claims 2–6, 8–13, 15, 16, and 18 are taught in Moran. Pet. 69–75. Claim 7 includes substantially similar limitations to the limitations of claim 1 discussed above. *See* Ex. 1001, 8:61–9:7, 9:33–46. We find Petitioner has shown Moran or the combination of Moran and Joo teach these limitations for the same reasons discussed above for the similar limitations of claim 1. Claim 7 further recites "one or more computer-readable non-transitory storage media embodying logic that is configured when executed to control the touch sensor." Ex. 1001, 9:47–49. Petitioner argues that this limitation of claim 7 would have been obvious in view of Moran's disclosure. Pet. 69 (citing Ex. 1007, 6:7–26; Ex. 1023 ¶¶ 138, 184).

We determine Petitioner has shown this limitation of claim 7 would have been obvious in light of Moran's teachings. Moran states:

> It is within the scope of two conductive micropatterns that are electrically isolated for the micropatterns both to be connected to the same signal processing, logic, memory, or other circuitry for the purpose of using the micropatterns as part of a system (e.g., driving the conductive micropatterns with electrical signals for the purpose of capacitively detecting the presence or location of a touch event to an information display).

Ex. 1007, 6:19–24. Dr. Wolfe testifies that a person of ordinary skill in the art would have understood "that at least the recited logic and memory are non-transitory storage media embodying logic that is configured when executed to control the touch sensor." Ex. 1023 ¶ 184. We credit this testimony because it is consistent with Moran's disclosure above. We note that Patent Owner does not separately address this limitation (*see generally* PO Resp.; PO Sur-reply).

Petitioner also has shown the additional limitations of dependent claims 2–6, 8–13, 15, 16, and 18 are taught in Moran or would have been obvious in light of Moran's teachings. Pet. 69–75. Claims 2 and 8 depend from independent claims 1 and 7, respectively, and additionally recite "wherein the touch sensor further comprises tracking disposed on the substantially flexible substrate configured to provide drive or sense connections to or from the drive or sense electrodes and configured to bend with the substantially flexible substrate." Ex. 1001, 9:8–12, 10:1–5. Petitioner contends Moran teaches this limitation. Pet. 70–71 (citing Ex. 1007, Figs. 11–13, 6:19–24, 30:24–29, 31:9–12, 32:10–12; Ex. 1023 ¶ 185). We determine Petitioner has shown Moran teaches this limitation. For example, Figure 13 of Moran shows first and second conductive trace regions 706 and 726, which allow electrical connection to the patterned

substrates. Ex. 1007, Fig. 13, 32:10–12. Dr. Wolfe testifies that because these traces are made from the same materials as the micropatterns (copper and silver), formed on Moran's substrate, they would bend with the underlying substrate. Ex. 1023 ¶¶ 185–87. Based on this evidence, we find Petitioner's showing persuasive. We note that Patent Owner does not separately address this limitation (*see generally* PO Resp.; PO Sur-reply).

Claims 3 and 9 depend from independent claims 1 and 7, respectively, and additionally recite "wherein the first and second conductive lines are made from one of carbon nanotubes, copper, silver, a copper-based material, or a silver-based material." Ex. 1001, 9:13–16, 10:6–9. Petitioner contends Moran teaches the conductive lines of its mesh electrodes may be made from silver or copper. Pet. 71. We are persuaded because Moran states: "Examples of useful metals for forming the electrically conductive micropattern include . . . silver . . . [and] copper." Ex. 1007, 22:13–15. We note that Patent Owner does not separately address this limitation (*see generally* PO Resp.; PO Sur-reply).

Claims 4 and 10 depend from independent claims 1 and 7, respectively, and additionally recite "wherein the touch sensor comprises: a single-layer configuration with drive and sense electrodes disposed only on a first surface of the substantially flexible substrate; or a two-layer configuration with drive electrodes disposed on the first surface of the substantially flexible substrate and sense electrodes disposed on a second surface of the substrate opposite the first surface." Ex. 1001, 9:17–25, 10:10–18. Petitioner contends Moran teaches the "single-layer configuration" recited in these claims. Pet. 72. For example, Moran states: "The second conductive micropattern may be disposed on the same substrate as the first conductive micropattern." Ex. 1007, 9:1–3; *see also* Ex. 1023

¶ 189 (testifying that a person of ordinary skill in the art would have understood from Moran's disclosures that it discloses the recited single-layer configuration) (citing Ex. 1007, 6:7–26, 8:29–9:5). We note that Patent Owner does not separately address this limitation (*see generally* PO Resp.; PO Sur-reply).

Claims 5 and 11 depend from independent claims 1 and 7, respectively, and additionally recite "wherein the touch sensor is a mutual-capacitance touch sensor or a self-capacitance touch sensor." Ex. 1001, 9:26–28, 10:19–21. Petitioner contends Moran teaches a mutual-capacitance sensor, as recited in these claims. Pet. 72. We agree because Moran teaches "integrated circuits used to make mutual capacitance measurements of the transparent sensor element." Ex. 1007, 32:21–22. We note that Patent Owner does not separately address this limitation (*see generally* PO Resp.; PO Sur-reply).

Claims 6 and 12 depend from independent claims 1 and 7, respectively, and additionally recite "wherein the touch sensor further comprises electrically-isolated structures made of conductive material comprising a conductive mesh." Ex. 1001, 9:29–31, 10:22–24. Petitioner contends Moran teaches this limitation. Pet. 72–73. We agree because, for example, Figure 10 in Moran depicts "mesh bars 441 that are electrically isolated from the electronic device" that "serve to maintain optical uniformity across the sensor." Ex. 1007, Fig. 10, 28:3–10. We note that Patent Owner does not separately address this limitation (*see generally* PO Resp.; PO Sur-reply).

Claims 13 and 16 depend from independent claims 1 and 7, respectively, and additionally recite "wherein the first and second conductive lines are substantially orthogonal to one another." Ex. 1001,

10:25–26, 33–34. Petitioner contends Moran teaches this limitation. Pet. 73–74. We agree because Figure 2 of Moran depicts substantially orthogonal conductive trace lines. Ex. 1007, Fig. 2. We note that Patent Owner does not separately address this limitation (*see generally* PO Resp.; PO Sur-reply).

Claims 15 and 18 depend from independent claims 1 and 7, respectively, and additionally recite "wherein the first and second conductive lines are made of fine lines of metal having a thickness of approximately 5 micrometers or less and a width of approximately 10 micrometers or less." Ex. 1001, 10:29–32, 37–40. Petitioner contends Moran teaches this limitation. Pet. 74–75. We are persuaded. As discussed above, Moran teaches its conductive lines can be made from silver or copper (i.e., metals). Ex. 1007, 22:13–15. Moran also teaches the recited dimensions. *Id.* at 12:7–30 (teaching widths of between 0.5 and 5 micrometers), 22:27–28 (teaching micropatterns with thicknesses from 5 nanometers to 50 nanometers). We note that Patent Owner does not separately address this limitation (*see generally* PO Resp.; PO Sur-reply).

For the reasons discussed above, we determine Petitioner has demonstrated by a preponderance of the evidence that claims 1–13, 15, 16, and 18 would have been obvious over Moran and Joo.

E. Asserted Obviousness over Moran, Joo, and Philipp

Petitioner contends claims 14 and 17 are unpatentable as obvious over Moran, Joo, and Philipp. Pet. 75–76. Claims 14 and 17 depend from independent claims 1 and 7, respectively, and additionally recite "the first and second conductive lines are non-linear." Ex. 1001, 10:26–27, 34–35. Petitioner contends the combination of Moran and Philipp teaches this limitation. Specifically, Petitioner relies on Moran as disclosing the "first

and second conductive lines." Pet. 64–65. Petitioner then relies on Philipp to teach non-linear conductive lines and proposes incorporating that teaching into Moran's mesh electrodes. *Id.* at 75–76 (citing Ex. 1005 ¶¶ 6, 30–31, Abstract). Further, Petitioner relies on Philipp as providing an express motivation for the combination, namely, "to avoid creating moiré patterns between the display and the touchscreen." *Id.* at 75 (citing Ex. 1005, Abstract, ¶¶ 6, 30–31, 42; Ex. 1023 ¶ 198); *see also id.* (noting that Moran also notes a concern about "minimizing interference such as moire effects") (citing Ex. 1007, 12:15–18; Ex. 1023 ¶ 198).

We find Petitioner's analysis about the references' teachings and the motivation to combine persuasive. As discussed above, Moran teaches first and second conductive lines. *See* Ex. 1007, Fig. 2. In addition, Philipp teaches using non-linear conductive lines to reduce interference, including moiré patterns. Ex. 1005, code (57) ("The touchscreen electrode elements are configured to avoid creating moiré patterns between the display and the touchscreen, such as angled, wavy, zig-zag, or randomized lines."), ¶¶ 6 (same), 30 ("At 202, wavy lines are used to avoid long linear stretches of fine metal line, reducing the probability of causing interference patterns. Similarly, the fine metal lines at 203 zig-zag, breaking up long linear stretches of parallel lines."), 31 ("[A]ngled and wavy lines are used here to avoid creating moiré patterns . . . ."), 42 ("[T]he electrodes follow irregular paths configured to avoid creating moiré patterns when overlaying a display."). Moran also indicates a desire to minimize interference including moiré patterns. Ex. 1007, 12:15–18 ("In the design of one or more overlaid conductive micropatterns, one may include concepts known in the art for minimizing interference such as moire effects between the one or more overlaid conductive micropatterns and the display pixels."). We are

persuaded that Petitioner has provided persuasive reasoning that a person of ordinary skill in the art would have modified Moran's mesh electrodes with Philipp's non-linear conductive lines because Moran itself suggests implementing known concepts for minimizing interference (Ex. 1007, 12:15–18), and Philipp provides its non-linear conductive lines (e.g., wavy and zig-zag) as a known way to reduce interference patterns including moiré patterns.

For the reasons discussed above, we determine Petitioner has demonstrated by a preponderance of the evidence that claims 14 and 17 would have been obvious over Moran, Joo, and Philip. We note that Patent Owner does not separately address these dependent claims (*see generally* PO Resp.; PO Sur-reply).

F. Asserted Obviousness over Moran, Joo, and Rappoport

Petitioner contends claims 19 and 20 are unpatentable as obvious over Moran, Joo, and Rappoport. Pet. 76–77. Claims 14 and 17 depend from independent claims 1 and 7, respectively, and additionally recite "the first and second conductive lines of the flexible conductive material of the drive or sense electrodes is wider at the one or more edges of the display." Ex. 1001, 10:40–47. Petitioner relies on Moran, as modified by Joo, as teaching the "first and second conductive lines of the flexible conductive materials of the drive or sense electrodes . . . at the one or more edges of the display." Pet. 76. Petitioner relies on Rappoport to teach the technique of making conductive metal lines wider at the edge of a display and incorporates that teaching into the combination of Moran and Joo's mesh electrodes at the edge of a display. *Id.* (citing Ex. 1006). Petitioner also provides a rationale for combining the teachings of Moran and Joo with Rappoport. Specifically, Petitioner contends that using Rappoport's teaching of making conductive

metal lines wider at the edge of a display in the combination of Moran and Joo would help ensure conductive lines are not cracked or otherwise damaged when bent around the edge. Pet. 76–77.

We find Petitioner's analysis about the references' teachings and the motivation to combine persuasive. We find Petitioner's contentions about the Moran-Joo combination persuasive for the reasons discussed above as to claim 1. In addition, Rappoport's Figures 7–9 show traces 62 with enlarged width WD' in the vicinity of bend axis 56 (i.e., in the vicinity of the edge of a display). Ex. 1006, Figs. 7–9, ¶¶ 42–43. Rappoport states: "The enlarged dimensions of traces 62 in the segment of traces 62 that overlaps bend axis 56 may help ensure that traces 62 are not cracked or otherwise damaged when inactive edge 58 of substrate 60 is bent downward away from active region 54." *Id.* ¶ 43. We find this teaching provides a persuasive motivation for modifying Moran's mesh electrodes to be wider at one or more edges of the display to avoid cracking or other damage to the metal traces.

For the reasons discussed above, we determine Petitioner has demonstrated by a preponderance of the evidence that claims 19 and 20 would have been obvious over Moran, Joo, and Rappoport. We note that Patent Owner does not separately address these dependent claims (*see generally* PO Resp.; PO Sur-reply).

G. Remaining Grounds Challenging Claims 1–20 of the '311 Patent

For the reasons discussed above, Petitioner has shown, by a preponderance of the evidence, that claims 1–20 of the '311 patent are unpatentable as obvious over Moran and Joo or over Moran and Joo in combination with additional references. In addressing these grounds, we have addressed all of the challenged claims. *See* 35 U.S.C. § 318(a) (requiring the Board to "issue a final written decision with respect to the

patentability of any patent claim challenged by the petitioner and any new claim added under section 316(d)"); *see also SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding that a petitioner "is entitled to a final written decision addressing all of the claims it has challenged"). Accordingly, we need not and do not decide whether Petitioner has shown by a preponderance of the evidence that claims 1–20 are unpatentable as obvious over Kuriki and Mikladal or Kuriki and Mikladal in combination with additional references. *Cf. In re Gleave*, 560 F.3d 1331, 1338 (Fed. Cir. 2009) (not reaching other grounds of unpatentability after affirming the anticipation ground); *see also Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (holding that once a dispositive issue is decided, there is no need to decide other issues).

IV. CONCLUSION[7]

For the foregoing reasons, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–20 of the '311 patent are unpatentable, as summarized in the following table:

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

Claims	35 U.S.C. §	Reference(s) /Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–13, 15, 16, 18	103(a)[8]	Kuriki, Mikladal		
14, 17	103(a)	Kuriki, Mikladal, Philipp		
19, 20	103(a)	Kuriki, Mikladal, Rappoport		
1–13, 15, 16, 18	103(a)	Moran, Joo	1–13, 15, 16, 18	
14, 17	103(a)	Moran, Joo, Philipp	14, 17	
19, 20	103(a)	Moran, Joo, Rappoport	19, 20	
Overall Outcome			1–20	

V. ORDER

Accordingly, it is:

ORDERED that claims 1–20 of the ’311 patent are held to be unpatentable; 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.

[8] As explained immediately above, we need not and do not decide whether Petitioner has shown by a preponderance of the evidence that claims 1–20 also would have been obvious based on the remaining grounds not addressed in this Decision.

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