

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MIANYANG BOE OPTOELECTRONICS TECHNOLOGY CO., LTD.,
WUHAN CHINA STAR OPTOELECTRONICS SEMICONDUCTOR
DISPLAY TECHNOLOGY CO., LTD., TIANMA MICROELECTRONICS
CO. LTD., and VISIONOX TECHNOLOGY, INC.,
Petitioner,

v.

SAMSUNG DISPLAY CO., LTD.,
Patent Owner.

IPR2023-01075
Patent 11,594,578 B2

Before JAMESON LEE, TERRENCE W. McMILLIN, and
JOHN A. HUDALLA, *Administrative Patent Judges*.

McMILLIN, *Administrative Patent Judge*.

JUDGMENT
Determining No Challenged Claim Unpatentable
35 U.S.C. § 318(a)

Mianyang BOE Optoelectronics Technology Co., Ltd.; Wuhan China Star Optoelectronics Semiconductor Display Technology Co., Ltd.; Tianma Microelectronics Co. Ltd.; and Visionox Technology, Inc. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1–6, 10, 12, 17–19, 21–23, 40–47, 51, and 52 (“the challenged claims”) of U.S. Patent No. 11,594,578 B2 (Ex. 1001, “the ’578 patent”). Samsung Display Co., Ltd. (“Patent Owner”) filed a Preliminary Response (Paper 9). We instituted the petitioned review (Paper 11, “Inst. Dec.”).

Patent Owner filed a Patent Owner Response (Paper 19, “PO Resp.”) to oppose the Petition. Petitioner filed a Reply (Paper 29, “Pet. Reply”) to the Patent Owner Response. Patent Owner filed a Sur-reply (Paper 31, “PO Sur-reply”) to the Reply. We conducted an oral hearing on October 9, 2024. A transcript has been entered into the record (Paper 44).

We have jurisdiction under 35 U.S.C. § 6(b)(4) and § 318(a). This Decision is a final written decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of claims 1–6, 10, 12, 17–19, 21–23, 40–47, 51, and 52 of the ’578 patent. We determine Petitioner has not shown by a preponderance of the evidence that any of the challenged claims are unpatentable.

I. BACKGROUND

A. *Real Parties-in-Interest*

Petitioner identifies Mianyang BOE Optoelectronics Technology Co., Ltd.; Wuhan China Star Optoelectronics Semiconductor Display Technology Co., Ltd.; Tianma Microelectronics Co. Ltd.; and Visionox Technology, Inc. and their subsidiaries as the real parties-in-interest. Pet. 3–4. Patent Owner

identifies Samsung Display Co., Ltd., as the real party-in-interest.
Paper 6, 2.

B. Related Matters

The parties identify the following proceedings related to the '578 patent (Pet. 4; Paper 6, 2):¹

Certain Active Matrix Organic Light-Emitting Diode Display Panels And Modules For Mobile Devices, And Components Thereof, Inv. No. 337-TA-1351 (USITC);² and

Samsung Display Co., Ltd. v. BOE Technology Co., Ltd., Case No. 2-23-cv-00309 (E.D. Tex.).

C. The '578 Patent

The '578 patent is directed to “a pixel arrangement structure of an organic light emitting diode (OLED) display.” Ex. 1001, 1:22–23. The '578 patent indicates that “[a]n organic emission layer included in the pixel of an OLED display may be deposited and formed by using a mask such as a fine metal mask (FMM).” *Id.* at 1:46–48. The '578 patent notes, however, that “[w]hen reducing a gap between the neighboring pixels to obtain a high aperture ratio of the pixel, deposition reliability may be deteriorated,” but “[o]n the other hand, when increasing the gap between the pixels to improve

¹ The '578 patent is based on a continuation of an application that issued as U.S. Patent No. 10,854,683 (challenged in IPR2023-00988) and which in turn is based on a continuation of an application that issued as U.S. Patent No. 9,818,803 (challenged in IPR2023-00987). Ex. 1001, code (63).

² The Initial Determination (Ex. 2088) of the U.S. International Trade Commission was entered in this investigation on November 15, 2024. With regard to validity of the '578 patent, the Administrative Law Judge determined that claims 5, 10, 17, 40, 41, 45, and 47 of the '578 patent were not shown to be obvious. *Id.* at 101–03.

the deposition reliability, the aperture ratio of the pixel may be deteriorated.”
Id. at 1:48–53. The ’578 patent also indicates that pixels of certain colors may have different lifespans from other pixels, and that the described pixel arrangement structure of the OLED display may provide improved life span.
Id. at 7:35–42. The ’578 patent indicates that an exemplary embodiment “provides a pixel arrangement structure for an OLED display having an improved aperture ratio of a pixel while efficiently setting up a gap between the pixels.” Ex. 1001, 1:66–2:3.

Figure 1 of the ’578 patent is reproduced below.

FIG.1

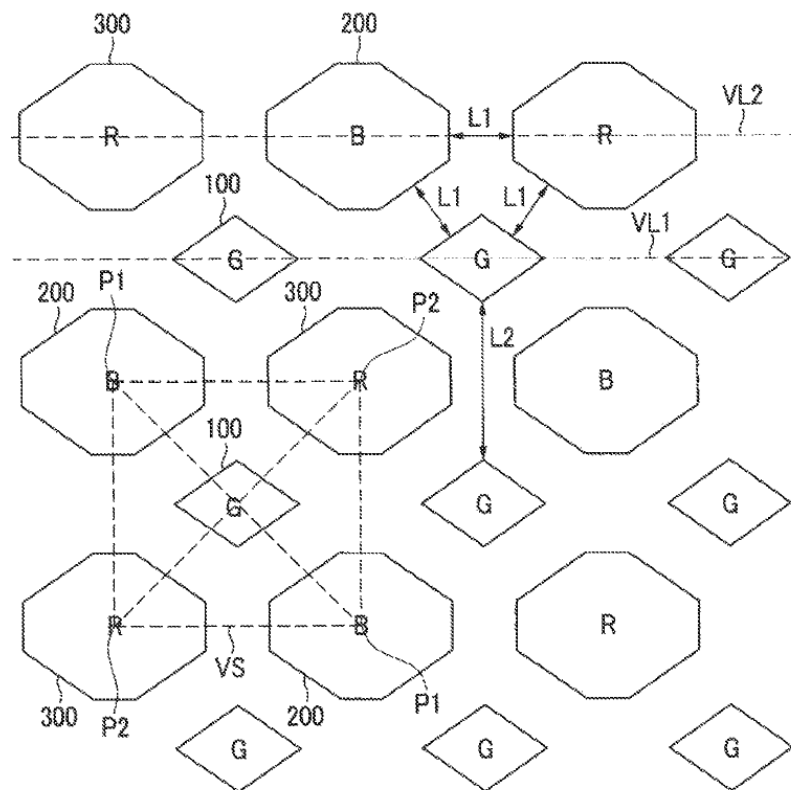


Figure 1 depicts “a view of a pixel arrangement structure of an OLED display.” Ex. 1001, 3:8–9. “[T]he pixel arrangement structure of the OLED display includes a plurality of first pixels 100, a plurality of second pixels 200, and a plurality of third pixels 300,” which respectively emit green, blue, and red light. *Id.* at 3:62–65, 4:23–24, 4:40–41, 4:53–54.

According to the ’578 patent, “each of the first pixels 100 has a smaller area than neighboring second pixels 200 and third pixels 300, and has a quadrilateral (i.e., four-sided) shape.” Ex. 1001, 4:14–17. “The second pixels 200 are arranged diagonally with respect to the first pixels 100, such as at first vertices P1 along one diagonal of a virtual square VS having one of the first pixels 100 as a center point (or center) of the virtual square VS.” *Id.* at 4:24–28. “In a similar fashion, the third pixels 300 are arranged diagonally with respect to the first pixels 100, such as at second vertices P2 along the other diagonal of the virtual square VS.” *Id.* at 4:28–31.

The ’578 patent states that, “[e]ach of the third pixels 300 has a larger area than the neighboring first pixel 100 and the same area as each of the second pixels 200.” Ex. 1001, 4:46–48. The ’578 patent also indicates that “by enclosing each of the first pixels 100 by a pair of the second pixels 200 and a pair of the third pixels 300, the aperture ratio of the first pixels 100, the second pixels 200, and the third pixels 300 may be improved.” *Id.* at 5:30–33.

The ’578 patent further states that

the gap of the first length L1 is formed between adjacent pairs of the first pixels 100 and the second pixels 200, between adjacent pairs of the first pixels 100 and the third pixels 300, and between adjacent pairs of the second pixels 200 and the third pixels 300. In addition, the gap of the second length L2

that is longer than the first length L1 is formed between the neighboring ones of the first pixels 100. This results in improved deposition reliability when using a fine metal mask to form the green, blue, and red organic emission layers respectively included in the first pixels 100, the second pixels 200, and the third pixels 300.

Ex. 1001, 5:19–29.

Figure 2 of the '578 patent is reproduced below.

FIG.2

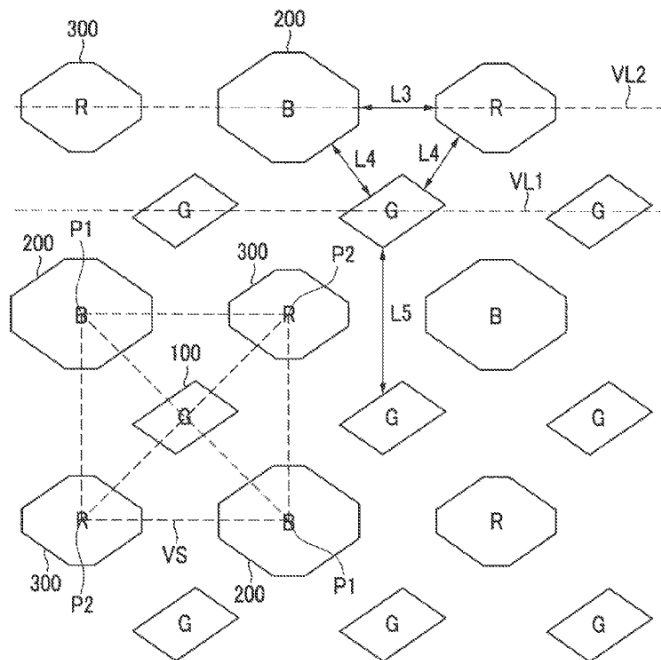


Figure 2 depicts “a view of a pixel arrangement structure of an OLED display.” Ex. 1001, 3:10–11. In Figure 2, “[t]he plurality of first pixels 100 have the same quadrilateral shape (e.g., a parallelogram)” and “the second pixels 200 have a larger area than the third pixels 300.” *Id.* at 6:11–13.

According to the '578 patent, because “the second pixels 200 that emit blue have the shortest life span,” “the second pixels 200 have a larger area than the third pixels 300, thereby suppressing the deterioration of the life span of the OLED display.” *Id.* at 6:54–59.

Figure 5 of the '578 patent is reproduced below.

FIG.5

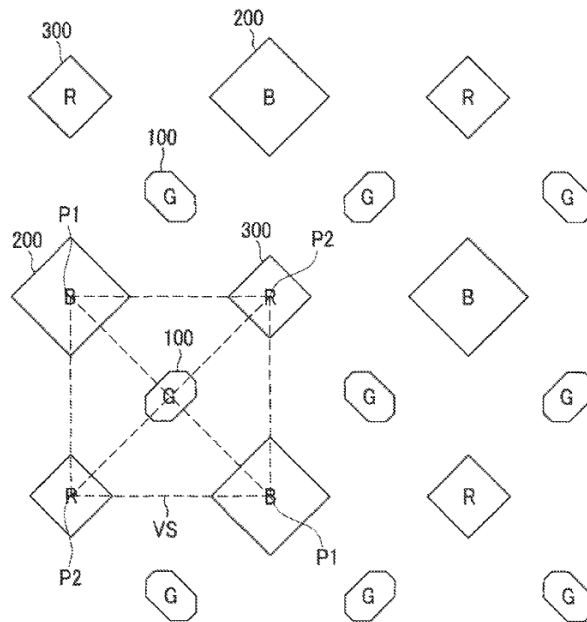


Figure 5 depicts “a view of a pixel arrangement structure of an OLED display.” Ex. 1001, 3:19–20. According to the '578 patent, “the neighboring first pixels 100 have a octagonal shape and are symmetrical to each other, while the second pixels 200 have a larger area than the third pixels 300.” *Id.* at 8:44–47. The '578 patent states that “[t]his results in improved deposition reliability in the deposition process using the fine metal mask to form the green, blue, and red organic emission layers respectively included in the first pixels 100, the second pixels 200, and the third pixels 300.” *Id.* at 8:47–51.

The application that led to the '578 patent was filed on July 8, 2019, and claims priority to, *inter alia*, a Korean application that was filed on March 6, 2012 (i.e., the earliest possible effective filing date). Ex. 1001,

codes (22), (30). We apply the March 6, 2012, date for qualifying the asserted references as prior art.

D. Illustrative Claim

Of the challenged claims, claims 1, 42, and 45 are independent. Claims 2–6, 10, 12, 17–19, 21–23, 40, 41, 43, 44, 46, 47, 51, and 52, directly or indirectly, depend from one of claims 1, 42, and 45. Claim 1 recites:

1. A pixel arrangement structure of an organic light emitting diode (OLED) display, the pixel arrangement structure comprising a plurality of pixels comprising:

a plurality of first pixels;
a plurality of second pixels; and
a plurality of third pixels,

wherein the OLED display comprises a pixel defining layer defining areas of the first pixels, the second pixels, and the third pixels,

wherein the first pixels, the second pixels, and the third pixels are configured to emit different color lights,

wherein the first pixels are arranged in first sets extending along a first direction to form respective first lines,

wherein the second pixels and the third pixels are alternately arranged in second sets extending along the first direction to form respective second lines parallel to the first lines,

wherein one of the second lines passes through centers of the second pixels and the third pixels in a corresponding one of the second sets and passes between the first pixels in corresponding adjacent ones of the first sets,

wherein the first lines and the second lines are alternately arranged,

wherein the first pixels are also arranged in third sets extending along a second direction that is perpendicular to the first direction to form respective third lines,

wherein the second pixels and the third pixels are also alternately arranged in fourth sets extending along the second direction to form respective fourth lines that are parallel to the third lines,

wherein the third lines and the fourth lines are alternately arranged,

wherein the first pixels and either the second pixels or the third pixels are alternately arranged along a third direction, which crosses the first direction and the second direction,

wherein a region having a width in the second direction that is equal to a width of the first pixels in the second direction, extending parallel to the first direction, and completely overlapping a row of the first pixels extending in the first direction, is entirely offset in the second direction from at least one of the second pixels or the third pixels in at least one of rows of the second pixels and the third pixels adjacent to the row of the first pixels, and

wherein a shortest distance between two nearest ones of the first pixels in one of the first sets is greater than a shortest distance between one of the second pixels and one of the third pixels that are nearest each other in one of the second sets.

Ex. 1001, 8:63–9:26 (emphasis added to determinative limitation).

E. Cited Art

Petitioner relies on the following references:

U.S. Patent No. 6,897,855 B1, filed Feb. 16, 1999, issued May 24, 2005 (Ex. 1004, “Matthies”);

U.S. Patent No. 6,366,025 B1, filed Feb. 24, 2000, issued Apr. 2, 2002 (Ex. 1005, “Yamada”); and

U.S. Patent Application Publication No. 2011/0234550 A1, filed Aug. 13, 2010, published Sept. 29, 2011 (Ex. 1011, “Hong”).

1. Matthies

Matthies is a U.S. patent directed to “large-area display devices which are formed as an array of tiled display devices.” Ex. 1004, 1:8–10. Matthies

states that “[b]uilding a large-area display out of smaller tiles has been recognized as a desirable solution,” because “the basic unit of manufacture is relatively small,” which “reduces manufacturing costs.” *Id.* at 1:56–65. Matthies explains that “[n]o practical tiled display system has yet been developed” because “[w]hat has been missing is a fabrication technology that allows a display to be constructed so that pixels can be brought up to the very edge . . . while at the same time allowing for electronics to address each tile, even those tiles completely surrounded by other tiles.” *Id.* at 1:66–2:7.

Figure 1 of Matthies is reproduced below.

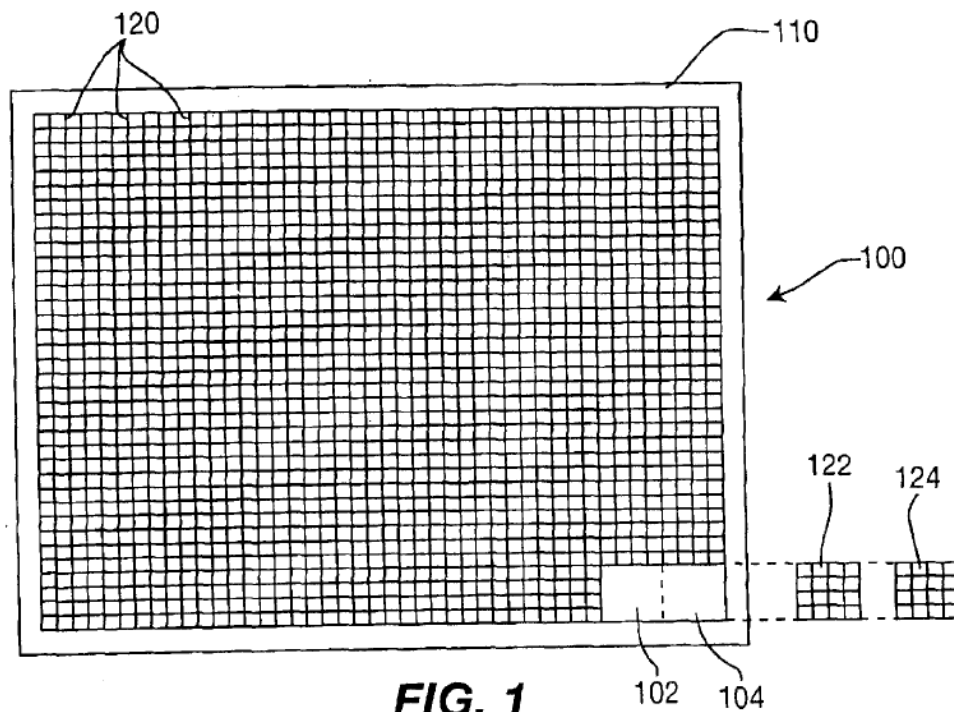


Figure 1 depicts “a front plan drawing of a large area display device from which two tiles have been removed.” Ex. 1004, 3:49–50. According to Matthies, “display 100 is a tiled display in which emissive or reflective elements, on which the image pixels are formed, are built as relatively small arrays on tiles 120 and assembled into a frame to produce the large-area

display having a large number of pixel forming elements.” *Id.* at 5:38–42. Matthies indicates that “[a]lthough the display 100 is shown as being formed from tiles having 16 pixel forming elements in a four by four array, it is contemplated that each tile may include many more pixels.” *Id.* at 5:56–59.

Matthies states that in an exemplary embodiment, “the pixel forming elements are made from an organic light emitting diode (OLED) material.” Ex. 1004, 6:17–19. According to Matthies, “[t]he active portion . . . of the pixels occupies only about 1/4 of the total pixel area.” *Id.* at 15:67–16:1. Matthies indicates that “this spacing of the pixels leaves room along the edges of the display for the vias . . . to connect to the row and column electrodes of the pixel without interfering with the regular spacing of the pixels across tile boundaries.” *Id.* at 16:5–9.

Figure 7 of Matthies is reproduced below.

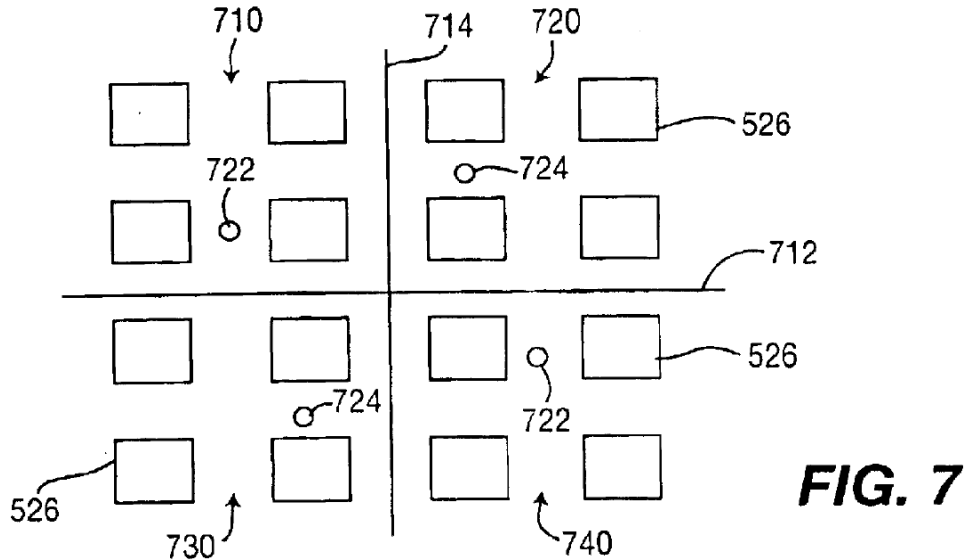


Figure 7 depicts “a pixel diagram which shows an exemplary pixel layout for portions of four tiles.” Ex. 1004, 4:6–7. “In the layout shown in FIG. 7, the active portions 526 of the pixels are centered in their respective pixel regions and the vias which connect the row and column electrodes of the

display to the electronics are formed between respective pixel elements.” *Id.* at 16:22–26. “The distance between the edge of an active region 526 and the edge 712 of the display is equal on all sides of the tile.” *Id.* at 16:26–28.

Figure 8B of Matthies is reproduced below.

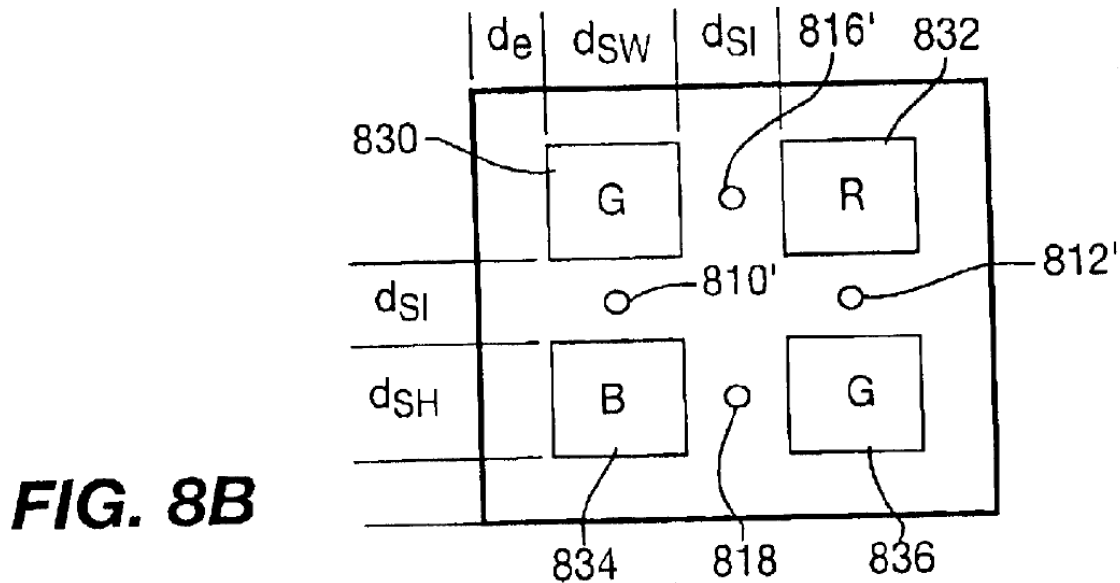


Figure 8B depicts “a front-plan view of an alternative single color pixel structure which includes separate sub-pixels.” Ex. 1004, 4:12–13. According to Matthies, Figure 8B illustrates a “color pixel structure” that “includes four sub-pixel elements, 830, 832, 834 and 836.” *Id.* at 16:62–64. “Two of these sub-pixel elements, 830 and 836 emit green light when stimulated while the other two pixel elements, 832 and 834 emit red and blue light, respectively.” *Id.* at 16:64–66. Matthies indicates that “[t]his structure is known as a quad sub-pixel structure.” *Id.* at 16:67. According to Matthies, “[t]he geometry of the quad sub-pixel structure is defined by the dimensions d_{SH} , the height of the sub-pixel, d_{SW} , the width of the sub-pixel, d_e , the distance from the active sub-pixel areas to the edge of the pixel area, and d_{SI} , the distance between adjacent sub-pixels.” *Id.* at 17:16–20.

Matthies teaches that a “tile may also include circuitry which automatically adjusts the pixel brightness to compensate for aging of the display material,” such as a “small light sensor over one or more pixel positions which continually monitors the brightness of that pixel and adjusts the current level applied to that pixel—and the current levels applied to all of the other pixels on the display—to compensate for variations in pixel brightness due to aging of the display.” Ex. 1004, 11:47–58. Matthies also teaches “that the decay in the brightness of an OLED pixel that occurs with aging can be predicted” by, for example, “measuring the current and time for a particular pixel, and integrating the product of current and time” or by “monitor[ing] the voltage that is applied to the pixel.” *Id.* at 11:61–12:16. Matthies indicates that the “methods for adjusting the current applied to a pixel in order to maintain a predetermined brightness level may be combined with any other method either as a check or to augment the performance of the other method.” *Id.* at 12:41–46.

Matthies issued May 24, 2005,³ (Ex. 1004, code (45)) and Petitioner contends that Matthies qualifies as prior art under 35 U.S.C. § 102(b). Pet. 14. Patent Owner does not contest the prior art status of Matthies. *See generally* PO Resp. We determine that Matthies qualifies as prior art under 35 U.S.C. § 102(b), because Matthies’ issue date of May 24, 2005, is more than one year before the earliest claimed priority date for the ’578 patent, which is March 6, 2012. Ex. 1001, code (30); Ex. 1004, code (45).

³ The Petition incorrectly states that Matthies issued on May 23, 2005, when it actually issued one day later on May 24, 2005. Pet. 11; Ex. 1004, code (45). This does not affect whether Matthies qualifies as prior art.

2. *Yamada*

Yamada is a U.S. patent related to an “electroluminescence (EL) display apparatus.” Ex. 1005, 1:6–7. Yamada discusses an “EL display apparatus” including “emissive regions 1B, 1R, and 1G for the display pixel of the respective color . . . arranged in a matrix configuration.” *Id.*

at 2:55–60. Yamada indicates that “the emission efficiency of the emissive layer for emitting light of various colors differs with each color.” *Id.*

at 2:53–54. According to Yamada, when the pixels “all have identical emissive areas in size,” “in order to obtain the same luminance at the display pixels having a low emission efficiency, a current larger than that supplied to the other display pixels having a high emission efficiency must be supplied.”

Id. at 2:55–64. Yamada teaches that “[t]his causes the life of those display pixels having a low emission efficiency, in particular, to shorten, and also possibly causes the life of the EL display apparatus to shorten.” *Id.*

at 2:64–67.

Yamada purports to improve upon these aspects of EL displays by way of “a color display device, in which a display pixel having an emissive element is provided for every color, wherein the emissive area of the display pixel of any one color, among the display pixels of various colors, is different in size from the emissive area of the display pixel of another color.” Ex. 1005, 3:17–22. According to Yamada,

By setting the emissive area of the display pixel, namely, the emissive area of the emissive element, in accordance with the emission efficiency of the emissive element as in the foregoing, and by supplying, for example, the same power to the emissive elements of colors having different emission efficiencies, it becomes possible to have the same emission luminance at the various display pixels.

Id. at 3:65–4:5. Therefore, Yamada states “it is possible to prevent the deterioration from accelerating when a load is selectively placed on the emissive element having low emission efficiency and extend the life of the display device.” *Id.* at 4:11–14.

Figure 4 of Yamada is reproduced below.

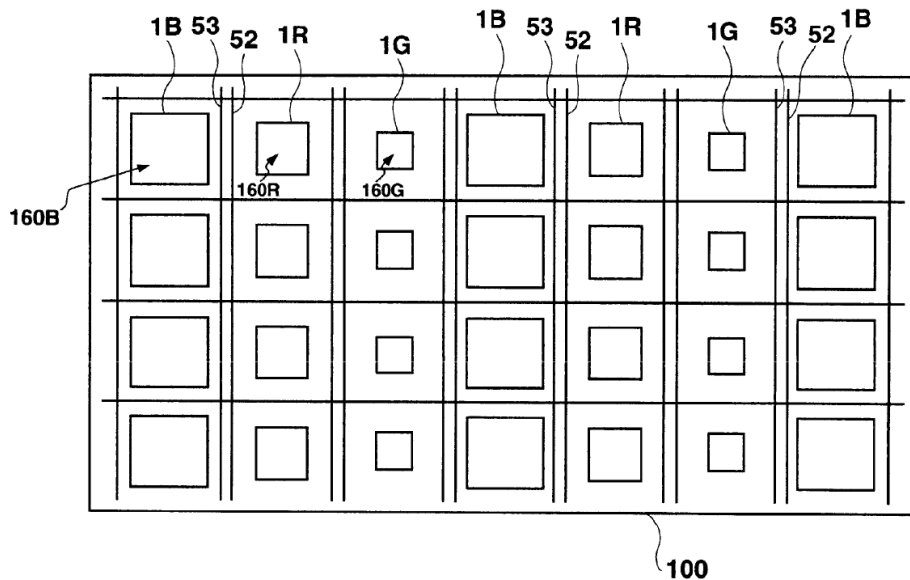


Fig. 4

Figure 4 depicts a “conceptual diagram showing emissive region areas of the EL display apparatus.” Ex. 1005, 6:24–25. According to Yamada, Figure 4 “is a top plan view of an EL display apparatus 100” representing “a case where the respective display pixels emit red (R), green (G), and blue (B) light.” *Id.* at 6:49–52. “[I]n the case of FIG. 4, the emissive area of the green display pixel 1G is provided as the smallest,” while “[e]missive regions 1R and 1B of the other colors are formed with a larger area than that of emissive region 1G.” *Id.* at 7:6–10. Yamada indicates that while in Figure 4 the “[a]rea of green emissive region 1G < area of red emissive region 1R < area of blue emissive region 1B,” “the order in size of the emission region areas is not fixed at the above-mentioned green < red < blue, but is

determined by the emission efficiency of the emissive materials that are used.” *Id.* at 7:10–19.

Yamada issued April 2, 2002, (Ex. 1005, code (45)) and Petitioner contends that Yamada qualifies as prior art under 35 U.S.C. § 102(b). Pet. 17. Patent Owner does not contest the prior art status of Yamada. *See generally* PO Resp. We determine that Yamada qualifies as prior art under 35 U.S.C. § 102(b), because Yamada’s issue date of April 2, 2002, is more than one year before the earliest claimed priority date of the ’578 patent, which is March 6, 2012. Ex. 1001, code (30); Ex. 1005, code (45).

3. *Hong*

Hong is a U.S. patent application publication directed to an “organic electroluminescent display (ELD) device” in which “aperture ratio and resolution are improved due to an arrangement of organic patterns in sub-pixel regions.” Ex. 1011 ¶ 3. Hong discloses each of first, second, and third organic patterns having a rectangular shape with two truncated corners. *Id.* ¶ 61. According to Hong, this allows the organic patterns to be made larger and “[a]s a result, an aperture ratio is . . . improved.” *Id.*

Petitioner notes that Hong published September 29, 2011 and was filed in the U.S. on August 13, 2010, and contends that Hong qualifies as prior art under 35 U.S.C. §§ 102(a) and (e). Pet. 18. Patent Owner does not contest the prior art status of Hong. *See generally* PO Resp. We determine that Hong qualifies as prior art under 35 U.S.C. §§ 102(a) and (e), because both Hong’s filing date and publication date were before the earliest claimed priority date of the ’578 patent, which is March 6, 2012. Ex. 1001, code (30); Ex. 1011, codes (22), (43).

F. Asserted Grounds

Petitioner challenges claims 1–6, 10, 12, 17–19, 21–23, 40–47, 51, and 52 of the ’578 patent based on the following grounds (Pet. 6):

Claims Challenged	35 U.S.C. §	References
1–6, 10, 12, 17–19, 21–23, 41, 42, 44, 47, 52	103(a) ⁴	Matthies, Yamada
40, 43, 45–47, 51, 52	103(a)	Matthies, Yamada, Hong

II. ANALYSIS

A. Legal Standards

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007).

The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We also recognize that prior art references must be “considered together with the knowledge of one of ordinary skill in the pertinent art.” *In re*

⁴ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102 and 103. Because the ’578 patent claims priority to an application filed before March 16, 2013 (the effective date of the relevant amendments), the pre-AIA versions of §§ 102 and 103 apply.

Paulsen, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)).

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 Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (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 *In re Warsaw Orthopedic, Inc.*, 832 F.3d 1327, 1333 (Fed. Cir. 2016) (citing *DyStar Textilfarben GmbH & Co. Deutschland KG v. C. H. Patrick Co.*, 464 F.3d 1356, 1360 (Fed. Cir. 2006)).

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; accord *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1259 (Fed. Cir. 2007). However, 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). Instead, Petitioner must articulate a reason why a person of ordinary skill in the art would have combined the prior art references. *In re NuVasive*, 842 F.3d 1376, 1382 (Fed. Cir. 2016).

B. Level of Ordinary Skill in the Art

Citing testimony from Dr. Pattison, Petitioner contends a person of ordinary skill in the art “would have had a degree in electrical engineering, materials science, physics, or a similar discipline, along with 2 years of professional experience working with display design, including OLED

displays, or an equivalent level of skill, knowledge, and experience.” Pet. 13 (citing Ex. 1003 ¶¶ 37–40). Petitioner further notes that such a person of ordinary skill in the art “would have been aware of and generally knowledgeable about OLED materials, and display pixel design, layout, and operation.” *Id.* at 13–14 (citing Ex. 1003 ¶ 40). We adopted Petitioner’s definition in the decision on institution. Inst. Dec. 12.

Patent Owner proposes that

consistent with the finding in the related ITC Investigation, that a person of ordinary skill in the art (“POSITA”) would have had a relevant technical degree in Electrical Engineering, Computer Engineering, Material Science, Physics, or the like, and experience in electroluminescence and the design of active-matrix displays or pixel arrangements for such displays.

PO Resp. 5 (citing Ex. 2009 ¶ 64; Ex. 2001, 15). Patent Owner describes its proposal as containing “slightly different language” than Petitioner’s definition and does not explain why we should adopt its proposal over Petitioner’s articulation. *Id.* Notwithstanding, Patent Owner contends that “Petitioner fails to establish unpatentability under either [party’s] definition.” *Id.*

For purposes of this Decision, we again adopt Petitioner’s definition of the level of ordinary skill in the art. It is supported by the testimony of Dr. Pattison, and appears consistent with what is reflected by the content of the applied prior art references. *Cf. Okajima v. Bourdeau*, 261 F.3d 1350, 1354–55 (Fed. Cir. 2001) (the applied prior art may reflect an appropriate level of skill).

We find Patent Owner’s articulation of the level of ordinary skill to be imprecise, because Patent Owner does not specify the amount of experience possessed by an ordinarily skilled artisan. The unbounded reference to

“experience” is vague and overly broad, as it could mean 1 year of experience or over 30 years of experience, for example. In addition, the ’578 patent is directed to “a pixel arrangement structure of an (OLED) [organic light emitting diode] display” (Ex. 1001, 1:22–23), whereas Patent Owner’s proposed experience is tied to “active-matrix displays.” PO Resp. 5. Given that the field of OLED displays includes both passive and active matrix designs (*see generally* Ex. 2009 ¶¶ 40–56), we see no reason to restrict the relevant experience to active matrix displays. For these reasons, we do not adopt Patent Owner’s definition of the level of ordinary skill in the art.

C. Claim Construction

In an *inter partes* review, we construe claims “using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim.” 37 C.F.R. § 42.100(b). Accordingly, our claim construction standard is the same as that of a district court. *See id.* Under the standard applied by district courts, claim terms are generally given their plain and ordinary meaning, as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). “There are only two exceptions to this general rule: 1) when a patentee sets out a definition and acts as his own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012).

With regard to claim construction, the Petition⁵ states:

In the related ITC action involving the '578 patent, Patent Owner and the Staff proposed constructions for certain claim terms that did not meaningfully depart from the claim language. (*See generally* Ex. 1010.) For purposes of this petition, Petitioner adopts these constructions. (Ex. 1003, ¶¶ 83-88.)
The patent's other terms are afforded their plain and ordinary meaning. (*Id.*)

Pet. 13 (emphasis added). Patent Owner's Response states:

The Administrative Law Judge ("ALJ") in related ITC Investigation No. 337-TA-1351 issued a claim construction order construing two terms of the '578 Patent. Ex. 2001. The parties in that Investigation also submitted a list of agreed-upon constructions including certain terms of the '578 Patent. Ex. 2002. No specialized constructions are necessary in this proceeding, as Petitioner fails to prove unpatentability of any claims under any interpretation.

PO Resp. 4–5.

As discussed *infra*, this Decision is based upon our determination that Petitioner has failed to show that the cited art teaches or suggests a "pixel defining layer" as recited. Neither party in this proceeding or in the ITC Investigation argued that "pixel defining layer" as recited in the challenged claims required construction, and neither party presented any arguments regarding the construction or meaning of this term.⁶ Pet. 13; PO Resp. 4–5.

⁵ 37 C.F.R. § 42.104(b)(3) requires that a petition contain a statement identifying how a challenged claim is to be construed.

⁶ In our Decision instituting trial, we stated that "[i]f either party contends that explicit claim construction is necessary in order to make a final determination whether or not any challenged claim is unpatentable based on the arguments and evidence presented, it should clearly explain why during

We give the term “pixel defining layer” as recited its plain and ordinary meaning.

For purposes of this decision, we determine that no aspects of the challenged claims require explicit construction. *See, e.g., 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))).

D. Petitioner Has Not Shown That the Cited Art Teaches or Suggests All the Elements of Any Challenged Independent Claim

“In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.” *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). A petitioner has “the burden of proving a proposition of unpatentability by a preponderance of the evidence.” 35 U.S.C. § 316(e). This burden of persuasion never shifts to the patent owner except in limited circumstances not present here. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in *inter partes* review). After weighing the evidence with regard to the “pixel defining layer” limitation in

trial and provide a clear and unambiguous construction with supporting evidence including specifically identifying the challenges, claims, and limitations to which the construction is necessary.” Inst. Dec. 13 n.5.

the challenged claims, we determine that Petitioner has failed to carry its burden as to any challenged claim.

Petitioner challenges independent claims 1, 42, and 45 of the '578 patent. Pet. 6; Ex. 1001, 9:5–15:34. The remaining challenged claims (claims 2–6, 10, 12, 17–19, 21–23, 40, 41, 43, 44, 46, 47, 51, 52) are dependent claims that depend directly or indirectly from the challenged independent claims. *Id.* Each of challenged independent claims 1, 42, and 45 includes as an element a “pixel defining layer.” Ex. 1001, 9:11–12, 13:48–49, 14:45–46. The challenged dependent claims contain this limitation by virtue of their dependency on a claim that includes this limitation. *See* 35 U.S.C. § 112 ¶ 4 (2006) (“A claim in dependent form shall be construed to incorporate by reference all the limitations of the claim to which it refers.”).

Petitioner fails to establish that the cited art teaches or suggests a “pixel defining layer” as recited. In the Petition, Matthies is relied on for this limitation. Pet. 23–26 (claim 1), 61–62 (claim 42), 64 (claim 45). Petitioner summarizes the section of the Petition discussing this limitation in challenged, independent claim 1 (*id.*) with this sentence: “In sum, a POSITA would have considered the layer including and around Matthies’ shaped active areas 324/326 to be the claimed ‘pixel defining layer’ (annotated and labeled with blue . . .).”⁷ *Id.* at 26. For this limitation in challenged independent claims 42 and 45, the Petition explicitly states that Matthies is solely relied on. *See id.* at 62, 64 (“Matthies teaches what these limitations

⁷ The parenthetical in this quote refers to the annotated version of Figure 10B of Matthies that is included in the Petition on page 25 and is discussed and reproduced *supra*.

require for the same reasons set forth above.”). And, in discussing motivation to combine the teachings of Matthies and Yamada, Petitioner articulates no reasoning to support modifying Matthies’ structure based on Yamada to yield a “pixel defining layer.” *See* Pet. 69–75.

Patent Owner argues that “[t]he Petition failed to identify any teaching or suggestion in Matthies of a pixel defining layer, because there is none.” PO Resp. 31 (citing Ex. 2009 ¶ 187); *see also* PO Sur-reply 15–17. Petitioner contends that “[a] POSITA would have understood that Matthies employs (or at least could obviously employ) the claimed ‘*pixel defining layer*.’” Pet. 23. An allegation that a skilled artisan would have understood that the prior art “could obviously” be modified to include an element of the claimed invention does not establish that the prior art teaches or suggests such recited element. *See Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) (“[O]bviousness concerns whether a skilled artisan not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention.”).

The alleged teaching of a “pixel defining layer” relied on in the Petition is depicted in an annotated version of Figure 10B of Matthies, reproduced below. *See* Pet. 25.

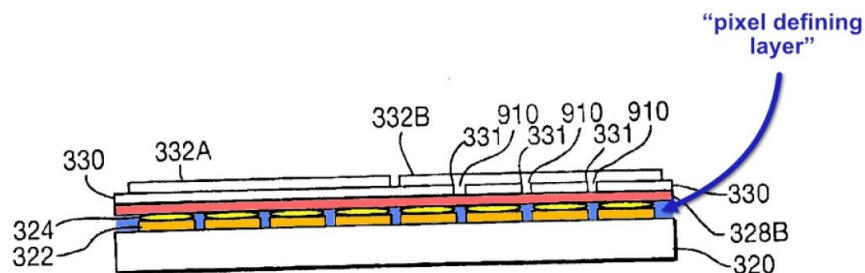


FIG. 10B

Figure 10B depicts a cut-away view of a tile “which illustrates an exemplary contact structure for a row electrode.” Ex. 1004, 4:21–23. According to Petitioner, the annotated version of Figure 10B from Matthies has a “pixel defining layer” that is shown in blue between each of the active areas 324 (yellow) and electrodes 322 (orange).⁸ However, this “pixel defining layer” was added by Petitioner to Figure 10B and is not shown or described in Matthies. Petitioner acknowledges that the “pixel defining layer” is “not labeled or shown in this Figure” and attempts to justify annotating Figure 10B in this manner by arguing that “[a] POSITA would have understood that this *obviously could include*, for instance, an intervening layer of insulation (blue [in annotated Figure 10B]) that surrounds the active areas.”⁹ Pet. 25 (emphasis added).

In support of this contention regarding what a skilled artisan would have understood from Matthies, the Petition states that “Matthies also explains that various other ‘layers’ may be present to improve the function or life of the display layers.” *Id.* (citing Ex. 1004, 6:37–38). Yet even if this is true, Petitioner fails to articulate how or why adding a “pixel defining layer” to the structure disclosed in Matthies would improve the function or life of the display layers. Petitioner provides no reasoning or explanation as to how or why Matthies’ disclosed structure would benefit from the addition

⁸ Petitioner never explains why the blue-colored annotations added by it to Figure 10B constitute a “layer.”

⁹ Petitioner acknowledges that the structure depicted in Matthies already contains insulating layer 330 but does not argue that this insulating layer 330 is the claimed “pixel defining layer.” Pet. 24 (“The electrodes and active materials are then covered by ‘an insulating layer 330’ that ‘protect the display materials.’”).

of a “pixel defining layer” or how or why any potential problem or deficiency in Matthies’ disclosed structure is addressed by the addition of a “pixel defining layer.”

Figure 10B of Matthies (unaltered) is reproduced below.

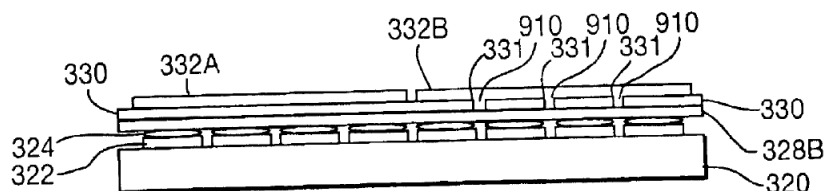


FIG. 10B

Figure 10B neither depicts insulation between the active areas nor calls out the same with a reference number. Thus, without Petitioner’s annotations, the “pixel defining layer” does not exist. Further, the detailed description of Figure 10B does not describe any component in the spaces where Petitioner has placed the “pixel defining layer” in the annotated version of Figure 10B in the Petition. Ex. 1004, 17:56–18:24. Nor does Petitioner identify anything depicted or described in Matthies that it argues should be considered to be the claimed “pixel defining layer.” Pet. 24.

Petitioner argues that the alleged “pixel defining layer” (colored blue in the version of Figure 10B annotated by the Petitioner) “is responsible for defining the shape of, and thus also the ‘area’ occupied by, the various sub-pixels making up Matthies’ display.” Pet. 26. Notwithstanding, Petitioner states in a somewhat contradictory fashion that it is “the ‘OLED materials 324 and 326’ that ‘define the active area of the pixel’” and “the pixels shapes are defined by the intermediate layer of shaped OLED active materials 324 and 326.” Pet. 24 (citing Ex. 1004, 12:62–65, 13:1–5, 13:10–14, 13:16–21, 15:67–16:2, Figs. 3, 9); *see also* Pet. Reply 12 (“Matthies teaches pixels that are located in their own layer and have a specific, defined

shape.”). Petitioner does not attempt to reconcile these ideas. Further, the Petition in describing Figure 10B of Matthies also states that “Matthies’ various OLED active areas 324 (yellow [in annotated Figure 10B]) are depicted as existing in their own layer, are physically separated from each other, and have a defined shape.” *Id.* at 25 (citing Fig. 10B). As such, Petitioner fails to provide a coherent explanation to support that adding the alleged “pixel defining layer” to Figure 10B would define the shape and area of the pixels.

Although Petitioner cites additional passages in Matthies in the section of the Petition relating to this limitation, Petitioner does not allege that any of these passages teach or suggests a “pixel defining layer.” *See* Pet. 23–26 (citing Ex. 1004, 5:47–48, 5:56–61, 6:6–7, 6:18–22, 6:37–38, 12:62–65, 13:1–5, 13:10–14, 13:16–21, 15:67–16:2, Figs. 3, 9).

Petitioner asserts that “Matthies employs the same ‘known’ prior art ‘configuration[]’ referenced in the ‘578 patent: in Matthies, ‘[the] basic light emitting structure consists of a thin organic polymer layer’—its ‘pixel forming elements’—sandwiched between a pair of appropriately selected and patterned electrodes.’” Pet. 23 (quoting Ex. 1004, 6:20–22) (bracketed material in original). This is an argument based on inappropriate application of hindsight in light of the disclosure of the ’578 patent, i.e., that a modification should be made to Matthies to include a “pixel defining layer” or that Matthies should be understood as disclosing a “pixel defining layer” because the ’578 patent discloses a “pixel defining layer.” Petitioner does not identify any acknowledgement or admission in the ’578 patent that the inclusion of a “pixel defining layer” was previously known in the art.

In the Petition, Yamada is relied upon only as providing “an example” showing that “[a] POSITA would have understood that [Matthies] obviously could include, for instance, an intervening layer of insulation (blue [in annotated Figure 10B]) that surrounds the active areas.” Pet. 25 (citing Ex. 1005, 9:13–35) (“Yamada provides an example of this, explaining that the ‘emissive area’ of a particular pixel (which includes ‘emissive element layer 165’) is bounded by a ‘planarization insulating film 167.’”). Petitioner also provides an annotated version of Figure 6B of Yamada, reproduced below, that Petitioner alleges discloses a “pixel defining layer.” Pet. 26.

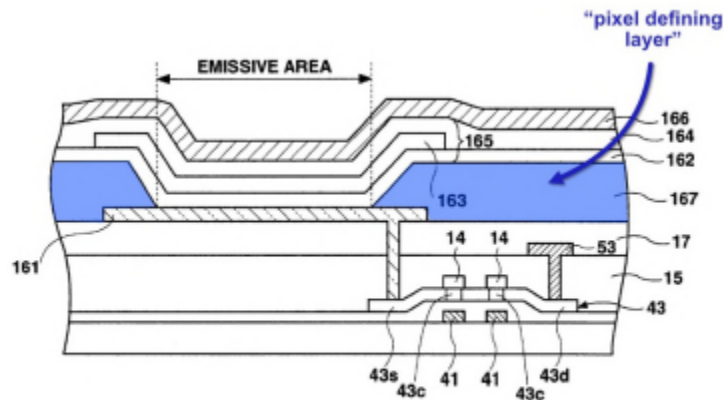


Fig. 6B

Figure 6B depicts a “cross-sectional configuration[] of one display pixel.” Ex. 1005, 6:31–32. Petitioner does not explain, and we do not discern, how or why the planarization insulating film 167 depicted in Figure 6B of Yamada bounds the emissive element layer 165. The emissive element layer 165 comprises three layers (hole transport layer 162, emissive layer 163, and electron transport layer 164) that extend above and beyond the internal boundaries of planarization insulating film 167. Ex. 1005, 10:18–22, Fig. 6B. The labelled “emissive area” in Figure 6B includes only portions of emissive element layer 165 and emissive layer 163. The alleged “pixel

defining layer” in annotated Figure 6B does not bound or define the shape or area of either emissive element layer 165 or emissive layer 163 in Yamada.

And, as mentioned above, Petitioner does not explain how or why the planarization film 167 that is identified by it as the “pixel defining layer” in Yamada is an example that supports adding the alleged “pixel defining layer” in annotated Figure 10B of Matthies. The alleged “pixel defining layer” in annotated Figure 10B of Matthies was placed by Petitioner in contact with, and between, OLED active material 324 (yellow in annotated Figure 10B). The alleged “pixel defining layer” in annotated Figure 6B of Yamada is depicted as below and separated by intervening hole transport layer 162 from emissive layer 163. Petitioner makes no attempt to reconcile these different dispositions. Nor does Petitioner explain how Yamada’s single-pixel configuration in Figure 6B (*see* Ex. 1005, 7:19–30) would be applicable to an entire “pixel defining layer” in a manner consistent with Petitioner’s conception of Matthies’ Figure 10B.

We also find no support for the contention that Yamada teaches a “pixel defining layer” in Petitioner’s cited passage in Yamada, which provides:

After the anodes 161 of the organic EL elements are formed at the respective display pixel regions, the above-mentioned organic compound materials, which differ for R, G, and B, are used next to form the emissive element layer 165 for R, G, and B. For the organic EL elements, the materials used in the emissive element layer have a relatively high resistance and the emissive region is limited to the region that is sandwiched between the anode and cathode layers in the emissive element layer. Therefore, the emissive element layer may be the same as the anode formation region or larger than the anode formation region. However, to prevent a short circuit at the anode end between the anode and cathode formed on the

emissive element layer, the emissive element layer for R, G, and B in the present embodiment shown in FIG. 6A are set to be larger than the respective anode area so as to cover the anode. Of course, if another countermeasure is adopted so that a short circuit does not occur between the anode and cathode (for example, forming the **planarization insulating film 167** as shown in FIG. 6B to be described later), it is not absolutely necessary for the emissive element layer 165 to be larger than the anode.

Ex. 1005, 9:13–35 (emphasis added). Petitioner does not explain how or why this passage supports its contention that planarization insulating film 167 of Yamada provides an example of a “pixel defining layer” that could be included in Figure 10B of Matthies. According to the cited passage of Yamada, the function of planarization insulating film 167 is to prevent a short circuit between the anode and cathode not to bound or define the area or shape of the pixel. We determine that Petitioner has failed to establish that Yamada teaches or suggests a “pixel defining layer.”

Moreover, even assuming that Petitioner intends to rely on a combination of the teachings of Matthies and Yamada for the “pixel defining layer” limitation, Petitioner fails to articulate any reasoning why a skilled artisan would have been motivated to combine the teachings of Matthies and Yamada related to the “pixel defining layer” limitation.

Patent Owner argues that Matthies does not teach or suggest a “pixel defining layer” and that the annotated Figure 10B in the Petition is misleading. PO Resp. 31. The Patent Owner’s Response states, “Matthies’ tiled displays do not include a pixel defining layer, and there is no reason Petitioner’s proposed combination of Matthies and Yamada would” and “[t]he Petition failed to identify any teaching or suggestion in Matthies of a pixel defining layer, because there is none.” *Id.* (citing Ex. 2009 ¶¶ 187–

189); *see also* PO Sur-reply 16 (“Petitioner has not identified *any* disclosure of a [pixel defining layer] in Matthies—because no such disclosure exists [sic].”). For the reasons discussed above, we agree with Patent Owner.

With regard to motivation to modify Matthies as depicted in the annotated version of Figure 10B in the Petition, Patent Owner’s Response states:

A POSITA would have had no motivation to modify Matthies’ display tile to attempt to add a pixel defining layer. Ex. 2009, ¶188. The Petition failed to identify any reason why a POSITA would add a pixel defining layer to Matthies. It did not even attempt to show that a POSITA would have a reasonable expectation of success. Petitioner merely speculated that a POSITA “could” have added a pixel defining layer. Pet. at 25. Such speculation is insufficient to prove the claims obvious due to the lack of motivation to make such changes. *See Adidas [AG v. Nike, Inc.]*, 963 F.3d [1355,] 1359 [(Fed. Cir. 2020)].

PO Resp. 32; *see also* PO Sur-reply 16 (“The Petition did not argue a POSITA would *add* a [pixel defining layer] to Matthies display, nor offer any motivation for a POSITA to have done so.”). We agree with Patent Owner that Petitioner provides an inadequate evidentiary basis for modifying Matthies’ tile as depicted in annotated Figure 10B in the Petition or otherwise for modifying or interpreting the disclosure of Matthies to include a teaching or suggestion of a “pixel defining layer.” And, as noted previously, in discussing motivation to combine the teachings of Matthies and Yamada, Petitioner articulates no reasoning to support combining the teachings of these references related to a “pixel defining layer.” *See* Pet. 69–75.

There is an insufficient evidentiary basis provided by Petitioner to support a finding that the cited art teaches or suggests a “pixel defining layer” as recited in the challenged claims of the ’587 patent. The Petition has the following critical deficiencies: (1) Petitioner fails to establish that Matthies teaches or suggests a “pixel defining layer;” (2) Petitioner fails to establish that Yamada teaches or suggests a “pixel defining layer;” and (3) Petitioner fails to articulate any rationale for combining the alleged teachings of a “pixel defining layer” in Matthies and Yamada.

Accordingly, the prior art has not been shown to teach or suggest every limitation of any challenged claim. We determine that Petitioner’s unpatentability challenges to the claims of the ’587 patent are fatally deficient.¹⁰

¹⁰ Petitioner filed three pending motions: Petitioner’s Motion to Strike (Paper 24); Petitioner’s Second Motion to Strike (Paper 33); and Petitioner’s Motion to Exclude (Paper 39). These Motions do not relate at all to our consideration of whether Petitioner has established that the prior art teaches or suggests a “pixel defining layer” or otherwise relate to our analysis and this Decision. These Motions are moot and we determine that we need not consider or decide these Motions.

III. CONCLUSION

After considering the evidence and arguments presented, we determine that Petitioner has not shown by a preponderance of the evidence that claims 1–6, 10, 12, 17–19, 21–23, 40–47, 51, and 52 are unpatentable. A summary of our conclusions is set forth in the table below.

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–6, 10, 12, 17– 19, 21– 23, 41, 42, 44, 47, 52	103	Matthies, Yamada		1–6, 10, 12, 17–19, 21–23, 41, 42, 44, 47, 52
40, 43, 45–47, 51, 52	103	Matthies, Yamada, Hong		40, 43, 45–47, 51, 52
Overall Outcome				1–6, 10, 12, 17–19, 21–23, 40–47, 51, 52

IV. ORDER

Accordingly, it is

ORDERED that claims 1–6, 10, 12, 17–19, 21–23, 40–47, 51, and 52 of the U.S. Patent No. 11,594,578 B2 are not determined to be unpatentable; and

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

IPR2023-01075
Patent 11,594,578 B2

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