

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

MIANYANG BOE OPTOELECTRONICS TECHNOLOGY CO., LTD.; TCL
CHINA STAR OPTOELECTRONICS TECHNOLOGY CO., LTD.; TIANMA
MICROELECTRONICS CO. LTD.; AND VISIONOX TECHNOLOGY, INC.,

Petitioner,

v.

SAMSUNG DISPLAY CO., LTD.,

Patent Owner.

Case No. IPR2023-00987
U.S. Patent No. 9,818,803

PETITIONER'S REPLY

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LISTING OF EXHIBITS

Exhibit	Description
1001	U.S. Patent No. 9,818,803 to Lee
1002	File History of U.S. Patent No. 9,818,803 to Lee
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1004	U.S. Patent No. 6,897,855 B1 to Matthies et al.
1005	U.S. Patent No. 7,091,986 B2 to Phan
1006	JP 4496852 B2 to Murai et al.
1007	Certified translation of JP 4496852 B2 to Murai et al. and associated translator's declaration
1008	U.S. Patent No. 6,366,025 B1 to Yamada
1009	U.S. Pub. 2009/0121983 A1 to Sung et al.
1010	U.S. Patent No. 3, 971,065 to Bayer
1011	U.S. Pub. 2009/0302331 A1 to Smith et al.
1012	U.S. Patent No. 7,274,383 B1 to Brown Elliot
1013	U.S. Pub. 2010/0171440 A1 to Satou
1014	U.S. Pub. 2003/0128179 A1 to Credelle
1015	U.S. Patent No. 6,867,549 to Cok et al.
1016	U.S. Patent No. 5,644,327 to Onyskevych et al.
1017	Reply Declaration of P. Morgan Pattison, Ph.D.
1018	Transcript from the June 12, 2024 of the Deposition of Ioannis Kymissis, Ph.D.

1019	Stewart et al, "Polysilicon TFT Technology for Active Matrix OLED Displays," IEEE Transactions on Electronic Devices, Vo. 48, No. 5 (May 2001)
1020	Aerts et al., "Design of an Organic Pixel Addressing Circuit for an Active-Matrix OLED Display," IEEE Transactions on Electronic Devices, Vo. 49, No. 12 (Dec. 2002)

I. INTRODUCTION

Patent Owner's Response (Paper 19) repeatedly ignores the prior art's teachings. In one glaring example, Patent Owner spends pages arguing that a POSITA have considered Matthies and Yamada un-combinable because Matthies purportedly limits itself to just passive-matrix displays. Matthies says the opposite: it is intended for use with **both** passive- and active-matrix displays. Patent Owner also posits that Yamada only provides a benefit if the size of a display's blue pixel is increased. But Yamada explains that **relatively** resizing an OLED display's pixels is also beneficial because it makes color balance easier to achieve and maintain. Patent Owner similarly argues that neither Phan nor Murai teach "OLED display[s]." But again they say the opposite: both **do apply** to OLEDs.

In addition to ignoring the art, Patent Owner repeatedly theorizes that merely because there are different, known ways to design an OLED the claims are somehow non-obvious. The art does include examples of variable pixel spacing, pixels arranged in stripes, and increased numbers of blue pixels. But this does not negate the fact that the art **also** teaches exactly what the '803 patent requires: regularly spaced pixels in "virtual squares," quad-pixels, and the use of an increased number of green pixels.

The totality of the art's teachings must be considered in an obviousness analysis. Whether or not the art includes a single, self-contained example that by

itself teaches all the claim limits—what Patent Owner appears to effectively require here—is of no moment. A POSITA “is also a person of ordinary creativity.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007). They would plainly consider the combination of Matthies (or Phan and Murai) and Yamada to be nothing more than a straight-forward exercise of display design and optimization that the prior art itself invites.

Patent Owner’s secondary considerations arguments are no better. According to Patent Owner, the ’803 patent allowed for “active-matrix” OLED displays providing “full-HD” and increased “pixel densities” on mobile devices. But the ’803 patent neither discloses nor claims any of this. Thus, Patent Owner’s secondary considerations lack the required nexus. Or, at the very least, the considerations have such a tenuous connection with the claimed subject matter that they have no meaningful bearing on obviousness.

II. ARGUMENT

A. Ground 1: Obviousness Over Matthies and Yamada

1. Matthies is Not Limited to Passive-Matrix Displays

Patent Owner’s arguments are all built on faulty premise: that Matthies limits itself to just passive-matrix OLEDs. *E.g.*, Response, 10. Patent Owner employs this to argue that Matthies and Yamada are incompatible and un-combinable. *Id.*, 12-14.

Matthies does explain that “exemplary embodiment[s]” “employ[] a passive addressing technique.” (Matthies, 10:31-33.) But it **also** teaches “active matrix”

displays. Petition, 13 (quoting Matthies, 8:21-26). In fact, Matthies **repeatedly** states that it is equally applicable to both actively and passively driven OLEDs. (*Id.*, 7:15-19 (“display” can be “active and passive”); 7:42-45 (“active” or “passive ... circuits” can be employed); 8:21-23 (“electronics,” such as “pixel driving circuitry[,]” can be “both active and passive”); 8:20-26 (referencing “active matrix circuits” particularly with “high temperature” substrates); 8:30-33 (use of either “active or passive devices” is contemplated).)

Patent Owner is aware of these teachings. It mentioned Matthies’ disclosure of “active matrix” displays in its pre-institution filings. Paper 9, 14 n.2. Yet, it failed to acknowledge—let alone address—this in its Response. Patent Owner’s expert also did not cite, consider, or assess any of the many portions of Matthies discussing active-matrix displays.

All that the “reference fairly suggest[s]” must be considered. *Janssen Pharms. Inc. v. Teva Pharms. USA, Inc.*, 97 F.4th 915, 930-31 (Fed. Cir. 2024). Moreover, it is improper to merely address “the express statements of each reference one-by-one” without “fully assessing the teachings” of the art “in toto.” *Id.* at 928. Here, a POSITA plainly would have understood—just as Matthies itself states—that Matthies’ OLED pixel arrangements can be used in both passive- and active-matrix displays. (See Ex. 1017, ¶¶ 6-16; see also Ex. 1018, 17:18-18:9, 19:13-20:22, 22:7-

23:1 (confirming that there were known benefits for active-matrix displays); Ex. 2009, ¶¶ 47, 119 (similar).)

Matthies is also not alone in its teaching that the same pixel layout can be employed with both passive- and active-matrix OLEDs. Numerous prior art references—cited by both Petitioner and Patent Owner—say the very same thing. (*E.g.*, Ex. 1011, [0008], [0022], [0025], [0076] (pixels for “active” or “passive matrix” OLEDs, or even a “LCD”); Ex. 1014, Abstract, [0043] (pixels for LCD, AMOLED, and plasma); Ex. 1015, 1:7-10, 5:53-56 (“patterns” usable with “active” and “passive matrix” “OLED[s]”); Ex. 2011, 1:8-10, 4:10-17 (pixels for “passive” and “active-matrix” OLED “displays”); Ex. 2021, [0001], [0009] (pixel “arrangements” for both “passive” and “active matrix OLED[s]”).) In sum, rather than teaching that there is some meaningful difference between the pixel layouts employed by passive- and active-matrix displays, the art establishes that these displays routinely employ the same layouts.

Patent Owner’s argument that passive- and active-material OLED display pixel arrangements are somehow fundamentally different is also odds with ’803 patent. The patent’s claims require only an “OLED ... display.” (Ex. 1001, claim 1.) ***Both*** passive- and active-matrix OLEDs are embraced. (*Id.*, see also Ex. 1018, 24:2-25:3, 25:20-26:14, 27:5-28:9.) Likewise, the specification does not even use the terms “active” or “passive,” let alone explain that the patent applies to one but

not the other. (*See generally id.*) So, just like both Matthies and the prior art in general, the '803 patent tacitly affirms that the same pixel arrangement is usable with all types of OLEDs. Similarly, nothing about the claims excludes a tile display. (Ex. 1018, 28:10-30:10.) Patent Owner's arguments to the contrary essentially require more specificity and detail from the prior art than the '803 itself provided. *KSR Int'l*, 550 U.S. at 419 ("What matters is the objective reach of the claim."); *see also Janssen Pharms.*, 97 F.4th at 927 (obviousness "cued to the ... claims at issue").

2. Yamada Would Improve Matthies

Next, Patent Owner is also wrong when it argues that use of Yamada's teachings would not be beneficial. Response, 14-17.

To begin, Patent Owner address only a ***fraction*** of the reasons for combination. In addition to display life improvement and display simplification, the Petition ***also*** pointed out that applying Yamada's teachings and re-sizing Matthies pixels would make it easier for Matthies' display to achieve "color balance." Petition, 39-40. Per Yamada, with resized pixels "display of a target white is simplified" and "extremely easy to control[.]" (Yamada, 4:65-5:3.) Neither Patent Owner nor its expert explain why Matthies would not benefit from easier color balance control.

Patent Owner is also wrong when it argues that Matthies' display lifetime will purportedly not be "extend[ed]" unless Matthies' blue pixels are made "larger."

Response, 15. While it is of course true that supplying a lower current density to blue pixels will increase those pixels' lifetime, this is only half the story. The art teaches that it is also important for pixels to age at approximately the same rate relative to each other. (Ex. 1017, ¶¶ 34-48.)

Here, Yamada explains that if increased "load is selectively placed" on a subset of pixels, their "deterioration" is "accelerated" relative to the other pixels. (Yamada, 3:62-4:14; *see also* 5:4-8.) This not only increases the risk of individual pixel failure, but it also decreases the display's overall "service life" by making it more difficult to maintain color or "white balance." (*Id.*, 11:48-55; *see also* 2:64-67 (application of larger currents to certain pixels impacts overall "life of the EL display apparatus").) So, resizing OLED pixels in accordance with emission efficiency both prevents less efficient blue pixels from failing earlier and prevents different pixel aging rates from impacting display usability over time. (Ex. 1017, ¶¶ 45-48.)

This same concept is also discussed elsewhere. For instance, another reference cited in the Petition explains that by resizing an OLED display's pixels, the "light emitting elements will age at approximately the same rate..." (Ex. 1015, 4:32-37.) This in turn avoids the "color shift experienced" when pixels age differently. (*Id.*, 4:43-45.) Another reference similarly explains that "[t]o maintain a well-balanced, full color display, it is important that the relative luminance of the three-colored materials be maintained throughout the lifetime of the display." (Ex.

2011, 1:50-56.) Once again, this improves the display’s “useful lifetime” by “maximiz[ing] the time that the relative luminance of the three-color elements can be maintained....” (*Id.*, 2:1-4.)

Patent Owner does not address this. Instead, it merely argues that that if Matthies’ blue pixels are not increased from their original size, those pixel will not themselves have a longer life. But the useful life of an OLED display is dictated not only by the lifetimes of the individual pixels, but also by how long proper color and white balance can be maintained. (Ex. 1017, ¶¶ 34-48.) By applying Yamada’s teachings, a POSITA would have understood that Matthies’ pixels would all age at or near the same rate. (*Id.*, ¶ 46.) This would in turn prevent the color/white balance from drifting apart over time. (*Id.*, ¶ 47.) It follows that applying Matthies’ teachings to Yamada would improve the lifetime of Matthies’ display. (*Id.*, ¶¶ 17-33, 34-48.)

Patent Owner also takes issue with the Petition’s explanation of how Matthies’ display would be simplified—and thus further improved—by Yamada. Here, Patent Owner argues that the Petition proposes the removal of circuitry “necessary for Matthies’ display to function.” Response, 16. But Matthies includes a variety of extra circuitry that compensates for the fact that similarly sized pixels age differently. Petition, 41. This includes “light sensor[s]” to detect individual pixel deterioration and an “electronic compensation system,” “memory” and “programmable current sources” to adjust pixel behavior over time. *Id.* (quoting

Matthies, 10:58-11:5, 11:47-63). The Petition simply pointed out that by applying Yamada, this extra deterioration compensation structure would be less necessary. Petition, 42. Because Matthies' pixels would be resized, they would age at approximately the same rate and could be controlled collectively instead of individually. In any event, Matthies also explains that "other methods" to address aging can also be included to "augment" those it already employs. *Id.* (citing Matthies, 12:41-47.) This is exactly what Yamada provides.

3. Patent Owner's Other Points of Distinction Are Illusory

Patent Owner also offers a grab bag of other arguments. None have merit.

For example, Patent Owner argues that "Yamada is directed" only to "triple-pixel RGB stripe) structure" and a POSITA would have used only this when applying Yamada to Matthies. Response, 17. This amounts to an improper attack on the prior art in isolation. Matthies teaches a "quad sub-pixel structure" as an example pixel type usable with an OLED display. (*E.g.*, Matthies, 16:62-67.) Yamada also explains that its pixel resizing teachings are "not limited" to any one pixel shape or layout. (Yamada, 12:26-49.) If this were not enough, the prior art repeatedly recognized that quad sub-pixel structures were considered superior to and are preferred over stripe arrangements. (*E.g.*, Ex. 1011, [0006] ("checkerboard[s]" "provide better visual performance"); Ex. 1012, 2:18-21 ("conventional stripes" are

“non-optimal”); Ex. 1015, 3-11 (more green pixels increases “apparent resolution”); Ex. 2012, 2:5-6 (“quadruple type pixel[s] ... improve” OLED “efficiency”).)

Patent Owner’s argument that a POSITA would only have used “two blue pixels” when implementing Matthies is no better. Response, 19. Matthies teaches that a quad sub-pixel structures with two green pixels is beneficial because “more ... luminance information ... is in the green pixels” allowing “for a brighter display.” (Matthies, 16:67-17:4.) Other art expresses further benefits, explaining that a “greater number of green light emitting elements” allows the “apparent resolution of the display” to be “improved.” (Ex. 1015, 3:5-11.) Matthies does reference use of two blue (or red) pixels. But it explains that this is only one of many possible design “[a]lternative[s]” that can be employed. (Matthies, 17:5-10.) And “whether or not there are other ways” to combine the prior art—all Patent Owner points to here—is “not decisive” of obviousness. *Volvo Penta of the Am. v. Bruswick Corp*, 81 F.4th 1202, 1209 (Fed. Cir. 2023).

Patent Owner next argues that a POSITA would not apply Yamada to Matthies because this would “reduc[e] the display’s aperture ratio.” Response, 20. But aperture ratio is not the be-all and end-all of display design. It is simply one factor a POSITA would have considered. (*E.g.*, Ex. 1001, 1:40-45 (recognizing tradeoff between aperture ratio/manufacturability); Ex. 1012, 3:41-50 (display aperture can vary from “substantially non-existent” to “very pronounced”); Ex. 1011, [0062]

(recognizing tradeoffs between aperture ratio and manufacturability); Ex. 2015, 1:66-2:3 (increasing aperture ratio impacts “resolution,” “lifetime, brightness, and the like”).) Moreover, at its heart, Patent Owner’s argument appears to simply take issue with the commercial viability of the combined display of Matthies and Yamada. But the claims here embrace any OLED display with the claimed pixel arrangement regardless of whether commercializable. *See Janssen Pharms.*, 97 F.4th at 927.

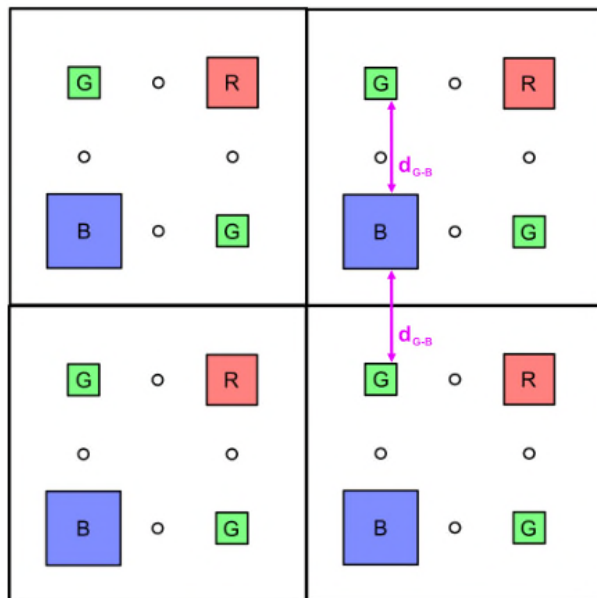
Patent Owner also argues the Petition “ignore[ed] the role of chromaticity” when combining Matthies and Yamada. Response, 23. According to Patent Owner, when considering “chromaticity”—and when using materials different from Yamada’s—other different pixel sizes could be preferred. *Id.*, 24. But Yamada does include examples—considering chromaticity—with larger blue and smaller green pixels. (Yamada, 11:25-62.) Regardless, the fact that (1) Yamada teaches that POSITAs can balance pixel life and chromaticity and (2) there are other OLED materials available beyond those discussed in Yamada that could require different relative pixel sizes does not negate Yamada’s teaching that it is often obviously best to make the blue pixels largest and the green pixels smallest. (*Id.*, 5:66-6:12, 11:40-62.)

The prior art also does not “teach away” from Yamada. Response, 21. Patent Owner points to various “criticisms of Yamada.” (*Id.*) While certain of the exhibits Patent Owner cites do reference Yamada, none dispute its central premise: that blue,

red, and green pixels should have different sizes in accordance with their emission efficiency. (Ex. 2011, 2:50-57 (teaching an “OLED color display” with “subpixels ... different in size based on ... emission efficiency”); Ex. 1015, 2:15-28 (teaching an “OLED display device” using a pixel “relative size” that is a “function of” “lifetime,” “efficiency,” and “number”). Further, they recognize—just as Yamada itself teaches—that it is often best to make blue pixels largest and green pixels smallest. (*E.g.*, *id.*, 4:16-21 (“green ... elements may be smaller than both the red and blue”).) Thus, rather than showing that there would have been some teaching away, Patent Owner has merely pointed to further evidence of obviousness.

Finally, nothing about the combination of Matthies and Yamada “conflicts” with Matthies’ “goals.” Response, 24-31. According to Patent Owner, Matthies requires “uniform” pixel sizes and equal spacing “to the edge of the tile” to avoid making the “seams between tiles visible.” *E.g.*, *id.*, 30. It does not. Matthies repeatedly explains that the pixels making up its display can have different sizes and shapes. (*E.g.*, Matthies, 17:36-37 (referencing “larger and smaller pixel apertures”); 18:63-64 (“[o]ther tile configurations are contemplated”); 19:8-12 (“different pixel pitches” can be employed).) Likewise, Matthies does not require that space between a sub-pixel and tile edge always be exactly the same. Instead, merely requires that “distance between ... pixels of two adjacent tiles” be “the same as the ... distance of

adjacent pixels in the interior of a tile.” (*Id.*, 5:49-53; *see also* 8:39-41.) This is how the pixels of Matthies and Yamada are spaced:



(Ex. 1017, ¶¶ 49-54, 55-59.)

B. *Ground 2: Obviousness Over Phan*

1. *Phan Teaches OLED Displays*

Patent Owner argues that Phan does not teach a pixel arrangement for an OLED display. Phan, however, clearly states that its pixel arrangement applies to multiple display types, including OLEDs. (Phan, 1:18-28; Ex. 1018, 110:18-112:7 (POSITA would understand reference to “OLED” display), 18:16-19:2 (term “OLED” embraces both active and passive-matrix displays).) There is also nothing unusual about Phan’s teaching that the same pixel arrangement can be used by different displays. Numerous prior art references—including references Patent Owner itself cites—say the very same thing. (*E.g.*, Matthies, 5:28-35 (same pixel

arrangement usable with LCD, OLED, plasma); Ex. 2018, [0006] (OLED displays can “us[e] the arrangement of the RGB sub-pixels” from an LCD).) In fact, the prior art even explains that the very same “pixel pattern” shown in Figure 11b of Phan is useful with both “passive-matrix or active matrix” OLEDs. (*E.g.*, Ex. 1015, 2:61-67, 4:8-15: Fig. 1; *see also* Ex. 1018, 67:8-69:8, 70:5-22, 71:19-73:18.) Patent Owner’s arguments are in direct conflict with what the art teaches. *Homeland Housewares, LLC v. Whirlpool Corp.*, 865 F.3d 1372, 1378 (Fed. Cir. 2017) (no weight given to arguments “plainly inconsistent with the record.”)

2. Phan Teaches Virtual Squares

Patent Owner next argues that Phan does not teach a “virtual square.” Response, 33. Patent Owner fixates on Fig. 12 of Phan—which it contends depicts “spacings between each quad-pixel”—and cites to various other, different pixel arrangements that employ irregular spacing. *Id.*, 35-36.

But all of Phan’s figures show displays with the dots/sub-pixels regularly spaced in a consistent, repeating pattern. (Phan, Figs. 2a, 2b, 7, 9, 9.1-9.8, 12-12d.) This is also exactly how Phan teaches that its pixels are to be arranged. Pixels are “regularly disposed” in a repeating “grid” or “matrix.” (*Id.*, 2:51-53; 4:29-50.) And “the arrangement of the different dots” making up the display is “identical” from pixel-to-pixel. (*Id.*) Figure 12 is no different. All of that figure’s dots are regularly spaced in a repeating matrix. (*Id.*, Fig. 12.) The boxes drawn on this figure are not

meant to show the physical boundaries of—or space between—the display’s pixels. Instead, they merely encircle/label the groups of dots making up static pixels 17. (*Id.*) This is emphasized by Figures 12a-b. These figures depict the same “screen,” just with the groups of dots forming “dynamic pixels 18” labeled. (*Id.*, 5:55-60; Figs. 12a-12d.) Identical amounts of space are once again present between all the dots. (*Id.*) Phan includes no figure showing and never says that there can be variable amounts of space between its display’s dots. Patent Owner has substituted its own speculation for Phan’s actual teachings. (*See also* Ex. 2009, ¶¶ 251-252 (contradictorily explaining that “additional arbitrary spacing” between Phan’s pixels is “unwarranted”).)

Patent Owner also argues that “modification” of Figure 12 to “remove the gaps between quad-pixels” is “incompatible with Phan’s dynamic pixel approach.” Response, 36-37. Again, Figure 12 shows no “gaps.” All of the dots are evenly spaced. And it is Patent Owner—not Petitioner—that renders Phan’s dynamic pixels unworkable. Phan explains that its “static pixel[s] 17” and the “dynamic pixel[s] 18” have the same “matrix” “geometry.” (Phan, 6:4-23; *see also* 7:59-67 (both the “static” and “dynamic” “pixel groups” form a “square”). And in every figure, Phan’s dynamic pixels have the same shape and geometry across the display. (*Id.*, Figs. 2a-2b, 4a-4b, 5, 7, 8-8.12, 9-9.8, 12a-12-d.) This is purposeful: employing dynamic

pixels that “overlap[]” the “static pixels” allows a “given grid” to have an “enhanced” or “higher” “resolution.” (*Id.*, Abstract, 2:51-53.)

As Patent Owner interprets Phan, however, the display would include **differently and irregularly** sized and shaped dynamic pixels:



FIG. 12

(Ex. 1017, ¶¶ 60-87.) A POSITA would have recognized that differently sizing the dynamic pixels—as Patent Owner does—presents numerous issues. Perceived brightness would vary from pixel-to-pixel, and the added space would reduce blending and increase the risk that sub-pixels would be separately visible. (*Id.*, ¶¶ 73-79.) This would all be contrary to Phan’s teaching that its dynamic pixels are meant “not to be perceivable by the human eye.” (Phan, 2:57-59.) Moreover, Patent Owner’s expert explained that OLED display pixels generally are uniformly shaped across the display. (Ex. 1018, 105:9-12, 106:2-6.) And while he did point to certain

example displays with space between pixels, he was unsure if any of those are prior art or if they employ both static and dynamic pixels as Phan does. (*Id.*, 107:9-109:17.)

C. Ground 3: Obviousness Over Phan and Yamada

1. Phan and Yamada Are Not Incompatible

Here, Patent Owner argues that a POSITA would not have considered Yamada because Phan “concerns passive-matrix displays” and “criticiz[es] ... active matrix” displays employing “TFTs.” Response, 38. Phan, however, states that its teachings apply to all OLED displays. (Phan, 1:18-28.) It is not limited to passive-matrix displays. Moreover, it was known that the very same pixel arrangement Phan teaches can be used in an active-matrix OLED. (Ex. 1015, Fig. 1.) And while Phan does note that “LCD displays” employ “a great number” of TFTs (Phan, 2:35-37), it says nothing about OLED TFTs.

2. A POSITA Would Have Modified Phan in the Way Discussed in the Petition

Patent Owner also argues that the Petition’s example application of Yamada to Phan “violates Phan’s requirement of adjusting the pixel sizes along a crosspoint.” Response, 40, 41. It does not. Phan explains that “[t]he precise arrangement of the various color dots ... is not critical” so long as this arrangement is “identical” from pixel-to-pixel. (Phan, 4:37-40; 5:3-5.) “Other pixel shapes are contemplated” besides those shown. (*Id.*, 5:32.) And per Phan, pixels’ light emitting areas can be

“adjust[ed]” using a black mask/barrier. (*Id.*, Abstract, 1:30-34.) So, far from “violat[ing]” any “requirement” in Phan, the Petition merely follows Phan’s teachings.

3. Patent Owner’s Other Arguments Are Repetitive

Patent Owner also repeats many of the same arguments it makes elsewhere, *i.e.*, applying Yamada would not extend display life, that the art teaches away from use of Yamada, that a POSITA would employ only a “stripe pattern” or quad-pixels with two blue dots, and that Phan does not include a “virtual square.” *E.g.*, Response, 40-47. As explained, these arguments lack merit. *Supra* Sections II.A.3, II.B.2

D. Ground 4: Obviousness Over Murai and Yamada

1. Murai Teaches OLED Displays

Patent Owner also disputes that Murai teaches OLED displays. Response, 47-49. But just like Phan, Murai unambiguously states that its pixel layout applies to “organic EL display devices.” (Murai, ¶ [0058].) It also repeatedly notes that each of its display’s pixels has an associated TFT. (*Id.*, ¶ [0041].) Per Patent Owner, a TFT is a hallmark of an active-matrix OLED. *E.g.*, Response, 11, 34, 38; *see also* Ex. 1019, Fig. 1; Ex. 1020, Fig. 2 (showing AMOLEDs with a single TFT).

2. Murai Teaches the Claimed Virtual Square

Next, contrary to Patent Owner’s argument (*e.g.*, Response, 49), Murai does teach pixels arranged in a “virtual square.” Here, Patent Owner argues that the pixels

in Murai's figures are depicted as rectangular. *Id.* It also alleges that if Murai's pixels were made square, a POSITA would space them apart. *Id.*, 51-53. This misunderstands the Petition and ignores Murai.

The Petition did not argue that Murai's figures alone teach a "virtual square." It is both the figures and the rest of Murai that renders the claims obvious. *E.g.*, Petition, 66-67. All of Murai's figures show pixels that are evenly and regularly spaced. (Murai, Figs. 1-4). Further, Murai explains that its pixels are "disposed as a grid in the vertical and horizontal direction," arranged along "diagonals," and organized in repeating groups of four "[r]espectively disposed to surround one point." (*Id.*, [0006], [0010], [0015], [0017], [0019]-[0020], [0034].) The pixels also form a "rectangle made up of four rectangles." (*Id.*, [0017], [0030].) This "rectangle" can be a "square." (*Id.*) All this together leads to the conclusion that Murai teaches evenly spaced, square pixels arranged in a square grid. This in turn results in the claimed "virtual square." Petition, 66-67. While Murai also teaches other possible arrangements—such as the rectangular pixels—the mere teaching of alternatives does not render claims non-obvious. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004).

Next, Patent Owner's argument that Murai's pixels would be unevenly spaced apart if square (*e.g.*, Response, 51-52) finds no support in the record. No figure in Murai show variable, different amounts of space between sub-pixels. Moreover,

Murai explains that it “effectively utilize[s]” “all regions of the screen” to improve “overall aperture ratio.” (Murai, [0042].) Even Patent Owner recognizes this, explaining that Murai would lead a POSITA to “pack[] pixels closely together.” Response, 53. Patent Owner’s interpretation—which includes unnecessary space between adjacent pixels—disregards and is inconsistent with this.

3. A POSITA Would Have Been Motivated to Combine Murai and Yamada

Patent Owner moves on to argue that a POSITA would purportedly have “no reason” to combine Murai and Yamada. Response, 53. It begins by noting that the two references are incompatible because Murai relates only to LCDs. But Murai says it also applies to OLEDs. *Supra* Section II.D.1. Next, Patent Owner argues that a POSITA would not have “needlessly” reduced Murai’s aperture ratio by following Yamada. This modification is not “needless”: it would have improved the life of Murai’s display. Petition, 80-81. Patent Owner also takes issue with the example demonstrative application of Yamada to Murai. Response, 54-56. Patent Owner argues that the demonstrative’s pixels are too “densely packed,” not sized to the same scale as Yamada’s examples, and could generate “visual artifacts.” *Id.* The Petition’s example, however, was merely meant to conceptually illustrate one way to apply Yamada. Petition, 71-74. Murai is open to the use of variably sized pixels with differently arranged cutouts. (*E.g.*, Murai, [0013], [0048]-[0052].) The Petition simply noted that this invites application of Yamada. Petition, 81-82. And it would

have been well within the ability of a POSITA to balance the benefits provided by Murai's pixel arrangement with Yamada's teachings to implement a working display. *Id.*

Patent Owner concludes by once again repeating its arguments regarding display lifetime, the use of stripes instead of quad-pixels, and the use of two blue pixels. Response, 56-57. These fare no better here. *Supra* Sections II.A.3.

E. Any “Secondary Considerations” Are Inapposite

Patent Owner's purported “secondary considerations” both lack support and do not overcome the Petition's strong showing of obviousness.

1. Patent Owner's Arguments Lack Evidence

Patent Owner introduced *no evidence at all* from Samsung. Patent Owner presumably knows how its products are structured, how many are sold, and the products' market share. But it relies exclusively on third-party hearsay. This is not admissible and does not support secondary consideration arguments.

2. There Is No Nexus

For secondary considerations to be relevant, there must be a nexus between the claims and the considerations. *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019).

One way to show this nexus is to establish that secondary considerations are “tied to a specific product” that both “embodies” and is “coextensive” with the claims. *Id.* The “coextensiveness requirement” “ensure[s] that [a] nexus is only

presumed” when a product giving rise to alleged secondary considerations “is the invention disclosed and claimed.” *Id.* at 1374.

To show a nexus, Patent Owner cites a claim chart (Ex. 2028) purportedly comparing the “Samsung Galaxy S22 Ultra” to the claims. It also includes a figure that superimposes Figure 5 over that product’s pixel layout. Response, 72-73. But it does not otherwise explain in its response why it purports any product is covered by the claims. Moreover, “coextensiveness is a separate requirement.” *Volvo Penta*, 81 F.4th at 1211. Patent Owner has not even alleged—yet alone established—that the products it identifies are “coextensive” with the claims. This makes sense, as the Samsung Galaxy S22 Ultra—and the other referenced products—are smartphones. The ’803 patent is not directed to a smartphone. (See Ex. 1018, 24:8-25:3, 27:5-30:10, 31:3-21, 32:5-18, 33:17-35:20, 37:9-43:18, 49:11-51:11 (repeatedly agreeing that claims do not require active-matrix displays, mobile devices, HD displays, high pixel densities, or even the same arrangement as the figures). The patent claims only a generic pixel arrangement. *Fox Factory*, 944 F.3d at 1375 (no nexus when the claims embraced a mere “component” of another product).

There can also be a nexus if the “secondary considerations [are] the direct result of the unique characteristics” of the claims and not the prior art. *Id.* at 1373-74. But as explained, the claimed pixel arrangement is taught by multiple prior art references. Moreover, by Patent Owner’s own admission, pixel arrangement is at

best ***indirectly*** responsible for any purported success, praise, and need satisfaction: it simply “allowed [Patent Owner] to overcome manufacturing and design obstacles....” Response, 73-74. It is actually Patent Owner’s “highly sophisticated evaporation technology” that permits higher OLED resolutions. (Ex. 2065, 5; *see also* Ex. 1018, 45:6-22 (confirming importance of manufacturing method).) Moreover, further distancing the patent from any purported secondary considerations, Patent Owner has simultaneously argued that multiple different patents—including the ’803, ’683, ’578, and ’599 patents—are somehow all simultaneously responsible for any success, praise, and the like. But these patents claim different things. For instance, while the ’803 patent requires pixels arranged in a “virtual square,” the broadest claims of the ’683 and ’578 patents do not. And the ’599 patent does not even claim a pixel arrangement at all: it is directed to underlying pixel circuitry. *Fox Factory*, 944 F.3d at 1377-78 (different patents that “do not cover the same invention” cannot have a nexus with the same product).

3. Patent Owner Relies on Unclaimed Features

Next, even if Patent Owner had shown the required nexus—it did not—that showing is rebutted. Any supposed praise, success, or the like are rooted in “extraneous factors other than the patented invention.” *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1329 (Fed. Cir. 2016). Showing this, Patent Owner repeatedly relies on unclaimed features, including the use of an active-matrix driving, HD screen

resolution, manufacturing improvements, reduced screen reflectance, and display controlling software and calibration. *E.g.*, Response, 58-59. None of this is claimed. (Ex. 1018, 49:11-51:11.) Any connection between Patent Owner’s “secondary considerations” and the claims is at best extraordinarily weak. (*See also* Ex. 1017, ¶¶ 88-122; *see also* Ex. 1018, 51:19-57:20 (no evidence related to many claimed displays).)

a) Purported Long Felt Need

According to Patent Owner, there was a long-felt need for “AMOLED displays” with “sufficiently high pixel densities” and “full-HD” “graphics in mobile devices.” *Id.*, 58-59. None of this is claimed. So, even if there were a “need” for the type of device referenced by Patent Owner, the need was not met by the ’803 patent.

Additionally, the exhibits cited by Patent Owner show not only optimism, but that there were numerous available OLED displays on the market long before the patent was filed. (*E.g.*, Ex. 2016, 1 (“AMOLED” mobile devices were “considered to be realistic” by 2006); Ex. 2019, 14 (“OLEDs” “show[ed] promise” for “mobile devices” by 2008); Ex. 2020, 3, 7 (“AMOLED ... displays” were “successfully commercialized” by 2010); Ex. 2023, 1 (commercial AMOLED mobile devices available in 2010); Ex. 2025, 2 (various “impressive” OLED mobile devices available in 2010); Ex. 2039, 2 (“displays using ... OLEDs” appeared in

“Smartphones” by 2010); Ex. 2074, 15 (“OLED technology” in 1998 met “standards for luminance and contrast”).)

Moreover, Patent Owner’s exhibits explain that the “full-HD” and increased “pixel density” supposedly provided by Patent Owner’s products is unnecessary and does little more than facilitate marketing puffery. (*E.g.*, Ex. 2039, 3 (“[I]t is absolutely pointless to further increase ... display resolution”; this is a “silly marketing wild goose chase ... with no visual benefit”).)

b) Purported Failure of Others

Similarly, whether or not “full-HD AMOLED displays suitable for mobile devices” were available (Response, 61) is irrelevant. The claims do not require AMOLED displays, HD, or mobile devices. And, numerous working AMOLED displays existed before the ’803 patent. *Supra* Section II.E.3.a.

c) Purported Praise

To begin, Patent Owner points almost exclusively to purported “praise” for the “Samsung Galaxy S4” and the “iPhone X.” Response, 66-68. But when attempting to show a “nexus,” it discusses only the “Galaxy S22 Ultra.” *Id.*, 71-72. Similarly, Patent Owner points to an award issued by the Korean Patent Office. (Ex. 2066.) But it does not explain how this relates to the U.S. patent here. Patent Owner must set forth and explain its positions. It did not.

Next, pixel arrangement is simply one among many product features discussed in Patent Owner's exhibits. For example, "[w]hat makes the iPhone X the Best Smartphone display is the impressive Precision Display Calibration Apple developed." (Ex. 2039, 2.) Various other features, such as lower "screen reflectance," "high dynamic range," "night shift mode," "true tone viewing," "super dim setting," and "viewing angle performance" are also important. (*Id.*, 3-5.) With respect to the Galaxy S4, "enhancements of the circuit structure" allowed improved "contrast ratio," "power consumption was reduce," "outside visibility" was increased, and the display "became thinner" with a reduced "bezel." (Ex. 2037, 4.) None of this has anything to do with the '803 patent.

d) *Purported Copying*

While Patent Owner alleges that there has been "widespread" copying, it does nothing more than (1) allege infringement and (2) compare product images. Response, 68-71. "[M]ore is needed than merely showing that similarity exists between the patent and the competitor's ... product." *Liqwd, Inc. v. L'Oreal USA, Inc.*, 941 F.3d 1133, 1137 (Fed. Cir. 2019); *Iron Grip Barbell Co. v. USA Sports Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) (infringement is insufficient); *Instiute Pasteur v. Focarino*, 738 F.3d 1337, 1347-48 (Fed. Cir. 2013) (summarizing evidence showing "access"). Patent Owner had the burden to show not just similarity between products, but "copying." It did not.

e) Purported Commercial Success

Patent Owner has presented no actual, admissible evidence of its products' sales or market share. *Tec Air, Inc. v. Denso Mfg. Mich. Inc.*, 192 F.3d 1353, 1360-61 (Fed. Cir. 1999) ("market data" or "sales figures" can show commercial success). Instead, it simply declares that those products have been "successful." In any event, the record is replete with various unclaimed reasons for any purported success. *Supra* Section II.E.c.

III. CONCLUSION

For the reasons outlined above—and in the Petition—the '803 patent's claims are obvious.

Respectfully submitted,

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Dated: June 24, 2024

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CERTIFICATE OF WORD COUNT

The undersigned certifies that the foregoing paper complies with the type-volume limitation in 37 C.F.R. § 42.24. According to the utilized word-processing system's word count, the paper contains 5,593 words.

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