

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. IPR2023-01075
U.S. Patent No. 11,594,578

PETITIONER'S REPLY

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LISTING OF EXHIBITS

Exhibit	Description
1001	U.S. Patent No. 11,594,578 B2 to Lee
1002	Excerpts from the File History of U.S. Patent No. 11,594,578 B2 to Lee
1003	Declaration of P. Morgan Pattison, Ph.D.
1004	U.S. Patent No. 6,897,855 B1 to Matthies et al.
1005	U.S. Patent No. 6,366,025 B1 to Yamada
1006	U.S. Pub. 2009/0302331 A1 to Smith et al.
1007	U.S. Patent No. 3,971,065 to Bayer
1008	U.S. Patent No. 7,250,722 to Cok et al.
1009	U.S. Patent No. 9,818,803 to Lee
1010	Excerpt from Complainant's Opening Claim Construction Brief in ITC Inv. No. 337-TA-1351
1011	U.S. Pub. 2011/0234550 A1 to Hong et al.
1012	U.S. Patent No. 8,786,645 to Gu et al.
1013	U.S. Patent No. 8,754,913 to Hwang et al.
1014	U.S. Pub. 2003/0128179 A1 to Credelle
1015	U.S. Patent No. 7,274,383 B1 to Brown Elliot
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	U.S. Pub. 2010/0259563 A1 to Tokuda et al.
1020	U.S. Patent No. 6,867,549 to Cok et al.
1021	U.S. Patent No. 8,004,183 to Seo et al.

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.

In addition to ignoring the art, Patent Owner repeatedly theorizes that merely because there are different, known ways to design an OLED display 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 '578 patent requires.

Likewise, Patent Owner's arguments regarding the art's use a "pixel defining layer" and different pixel shapes lack merit. The art makes clear—and the '578 patent concedes—both that OLED displays routinely included the claimed layers, and that different pixel shapes were known and considered interchangeable.

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 and Yamada, or the use of different display layers and pixel shapes, 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 ’578 patent allowed for “active-matrix” OLED displays providing “full-HD” and increased “pixel densities” on mobile devices. But the ’578 patent neither discloses nor claims any of this. Thus, Patent Owner’s secondary considerations lack the required nexus with the claims. 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. GROUND 1: OBVIOUSNESS OVER MATTHIES/YAMADA

A. A POSITA Would Have Been Motivated to Combine Matthies and Yamada

1. Matthies Is Not Limited to Passive-Matrix Displays

Most of Patent Owner’s arguments here 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. (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, 16 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, 108 (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. 1006, [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. 2004, 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 ’578 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, 58:21-61:11.) 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 ’578 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 ’578 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, 14-16.

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, 69. 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, 14-15. 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. 2004, 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, 15-16. But Matthies includes a variety of **extra** circuitry that compensates for the fact that similarly sized pixels age differently. Petition, 71-72. 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, 72. 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[s]” 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. 1006, [0006] (“checkerboard[s]”

“provide better visual performance”); Ex. 1015, 2:18-21 (“conventional stripes” are “non-optimal”); Ex. 1020, 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. 2004, 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. Brunswick 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 reduce the display’s aperture ratio. Response, 16. 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, 1:48-53 (recognizing tradeoff between aperture ratio/manufacturability); Ex. 1015, 3:41-50 (display aperture can vary from

“substantially non-existent” to “very pronounced”); Ex. 1006, [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.

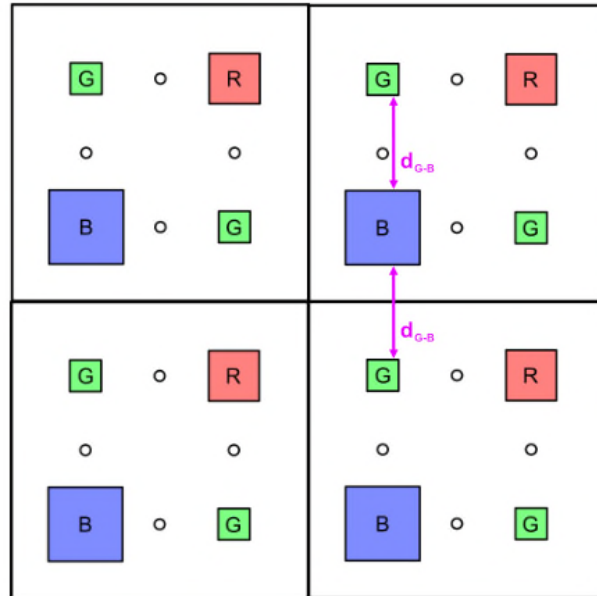
Patent Owner also argues the Petition “ignore[ed] the role of chromaticity” when combining Matthies and Yamada. Response, 23. According to Patent Owner, when considering “chromaticity”—and when using materials different from Yamada’s—other different pixel sizes could be preferred. *Id.*, 24. But Yamada 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. (Yamada, 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. 2004, 2:15-28 (teaching an “OLED display device” using a pixel “relative size” that is a “function of” “lifetime,” “efficiency,” and “number”). Further, they also 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, 24-30. 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. The Art Teaches Everything the Claims Require

1. “Pixel Defining Layer”

Patent Owner’s argument that Matthies/Yamada lack a “pixel defining layer” (Response, 30-32) ignores the art’s collective teachings.

Per the ’578 patent, OLED displays routinely included a “pixel definition layer to define an area and a shape of each pixel.” (Ex. 1001, 1:36-44.) One such “known” layer is “insulation” surrounding OLED pixels. (*Id.*, 1:36-44, 4:1-12.) This is what Matthies and Yamada disclose.

Matthies teaches pixels that are located in their own layer and have a specific, defined shape. (Matthies, 5:56-61, 6:6-7; 6:18-22; Figs. 3, 10B.) A POSITA would

have understood that Matthies display would also include (or at least obviously could include) a layer of insulation surrounding these pixels. Showing this, the display can include “[a]dditional” undepicted “layers ... to improve the function or life the display layers.” (*Id.*, 6:37-39.) Similarly, other “structural layer(s) such as” an “insulator” may be included. (*Id.*, 7:24-26.) And Matthies pixel-containing “display layer” can include “inactive areas[.]” (*Id.*, 14:63-67.) A surrounding layer of insulation is one such “inactive area.”

Next, Yamada provides an example of an OLED display with an “insulating film 167” surrounding pixels in an “emissive element layer 165.” (Yamada, 9:13-35; Fig. 6B.) This “insulating film 167” defines the “emissive area” of each pixel. (*Id.*; *see also* Ex. 1021, 6:38-63; Figs. 2B, 3B (showing both active and passive-matrix displays employing the same pixel surrounding “insulating bank” 203/303).)

Patent Owner does not dispute that Yamada’s insulating film is a “pixel defining layer.” Instead, it argues only that a POSITA would not use such a layer to Matthies because this would add “manufacturing steps and materials.” Response, 32. But Matthies already allows for the inclusion of additional layers. Patent Owner also posits that a “pixel defining layer” is neither required by nor compatible with Matthies is limited to just a “passive-matrix structure.” *Id.*, 32-33. Matthies is not so limited. *Supra* Section II.A.1.

2. Dependent Claim 5

Patent Owner separately addresses dependent claim 5. Response, 33. Here it argues that the Petition is “inconsistent” because the claim 1 and 5 discussions reference two slightly different red pixel sizes. Response, 34-35. But Yamada itself teaches that an OLED display’s “emissive area of the display pixels” can be relatively sized such that either “green<red<blue” or “green<red=blue.” (Yamada, 10:49-11:3.) Moreover, both similarly “serve[] to extend the life of the EL elements” and improve display performance. (*Id.*)

The ’578 patent confirms that claim 5 embraces a simple design choice. Figure 1 shows an arrangement with similarly sized red and the blue pixels. (Ex. 1001, Fig. 1.) Figure 2, however, shows larger blue pixels. (*Id.*, Figs. 2, 5.) Despite this, the ’578 patent—just like Yamada—attributes no special significance to either arrangement. Both are acceptable and purportedly provide the same benefits. (*E.g.*, *id.*, 5:26-36; 6:41-51; *see also* Ex. 1018, 40:10-41:3 (larger blue and larger red pixels both claimed).)

Patent Owner also argues that the Petition “failed to show” that a pixel arrangement with slightly larger red pixels satisfies claim 1. Response, 35. But no missing limitation is identified. In any event, nothing about Matthies’ pixel arrangement changed except the size of the red pixels. Petition, 45-46. Because of this, no further analysis was required: the pixel arrangement continues to be covered

by claim 1 for the same reasons. *Id.* Moreover, Patent Owner itself has explained that the '578 patent's claims are so straightforward that claim coverage can be established simply by "look[ing] at the pictures in evidence." Paper 25, 3. The Petition did more: it included not only annotated images, but also explanation as to why the claim 1 analysis continues to apply. *See* Petition, 45-46.

3. Dependent Claims 41, 44, and 52

Patent Owner's claim 41, 44, and 52 arguments fail for similar reasons. Here, Patent Owner argues Matthies must use square and cannot use "rectangular shaped sub-pixels." Response, 36.

Matthies is not limited to square pixels: it also allows for "different pixel geometries." (Matthies, 12:8-10, 12:28-30.) In fact, it even depicts repeating arrays formed from evenly spaced, rectangular pixels. (*Id.*, Figs. 3, 9; *see also* 17:16-33, 19:8-12, 25:48-49.) The art in general also repeatedly notes that rectangular pixels are interchangeable with other pixel shapes. (*See, e.g.*, Ex. 1005, 12:32-36 ("square," "rectangular," or "any" other pixel "shape that does not hinder" light "emission" can be used); *see also* Ex. 1006, [0010]; Ex 1012, 13:57-67; Ex. 2015, 4:1-5; Ex. 2021, [0030].)

Despite this, Patent Owner argues that a POSITA would be neither motivated to use nor expect to succeed when using such a pixel with Matthies. Response, 36. This assumes that there is something special or unusual about rectangular pixels.

There is not. Indeed, the '578 patent—just like the prior art—explains that there is no significance to pixel shape: any “polygonal shape” can be used. (*E.g.*, Ex. 1001, 3:51-56; *see also* Ex. 1018, 89:11-92:22.)

Patent Owner concludes by arguing that the Petition “failed to show” that a display using rectangular, elongated pixels satisfies claim 1. Response, 37. But just as it did with claim 5, Patent Owner points to no missing limitation. And again, only the shape of the pixels has changed. Relative pixel spacing, grouping, and arrangement all remain the same. Petition, 60-61.

III. GROUND 2: OBVIOUSNESS OVER MATTHIES/YAMADA/HONG

Patent Owner’s Ground 2 arguments also conflict with the prior art and the '578 patent.

A. Octagonal Pixels Are Taught in the Prior Art

Patent Owner argues that the “Petition’s pixel shape ... appears to be made out of whole cloth.” Response, 40. Matthies, however, teaches the use of elongated, rectangular pixels. (Matthies, Figs. 3, 9.) Hong supplements this by explaining that a “rectangular” pixel’s corners can be “truncated.” (Hong, ¶ [0061].) Moreover, Hong confirms that pixels can be relatively resized to improve the display. (*Id.*, [0074].) So, the Petition did not make up its own pixel shape: it simply followed the teachings of Matthies and Hong to their logical conclusion. There is also nothing

unusual about “octagonal” pixels: this shape was considered acceptable for use with OLED displays. (*E.g.*, Ex 1012, 13:57-67; Ex. 2015, 4:1-5; Ex. 2021, [0030].)

B. A POSITA Would Have Been Motivated to Use Octagonal Pixels

Next, Patent Owner argues that a POSITA would not be motivated to employ octagonal pixels with Matthies/Yamada. Response, 41-42. It first disputes that octagonal pixels constitute a mere “design choice.” *Id.* But again, the ’578 patent itself explains that all “polygonal shapes, such as octagonal or hexagonal” are interchangeable and appropriate for use. (Ex. 1001, 3:51-56, 5:36-42, 6:10-16, 7:6-12.) The prior art similarly explains that elongated, octagonal pixels were nothing more than one of many shapes that would have been considered by a POSTIA. (*E.g.*, Ex 1012, 13:57-67 (pixel shape “may vary” and can be an “octagon”); *see also* Ex. 2012, 9:4-7; Ex. 2015, 4:1-5; Ex. 2021, [0030].) Moreover, Matthies’ pixels can be formed using “various thin film deposition techniques” including differently shaped “masks.” (Matthies, [0076], [0121].) Hong simply provides an example of how a mask can be employed to form octagonal pixels. (Hong, ¶ [0073], Fig. 10B.)

Next, Patent Owner argues that use of octagonal pixels would supposedly produce “no benefit.” Response, 40. But as the Petition explained, octagonal pixels are easier to manufacture. Petition, 82. Patent Owner responds that any manufacturing benefits are limited to the “specific design and manufacturing method” employed by “Smith (Ex. 1006).” Response, 46. This is not what the art

says. While Smith does reference “ink jet printing,” it also teaches that pixels without “tight corners”—like octagonal pixels—are easier to manufacture via “other deposition techniques.” (Ex. 1006, [0035].) This pixel shape also allows for a “higher resolution display.” (*Id.*) Other references likewise identify octagonal pixels as beneficial regardless of manufacturing method employed. (See, e.g., Ex. 1013, 7:58-67 (“octagonal” pixels “optimize the FMM process”); Ex. 1019, [0146] (an octagonal shape improves manufacturability).)

Patent Owner is also wrong when it argues that the combined display of Matthies, Yamada, and Hong would “reduce” aperture ratio. Response, 45. This does not account for the art’s overall disclosure: it ignores that while Matthies’ pixels have had their corners truncated (as exemplified by Hong) they have also been elongated (as both Matthies and Hong teach) increasing their size and the aperture ratio. (See also Ex. 1011, ¶ [0061] (removing corners allows for “enlarged” pixel area” and improved “aperture ratio”).)

Patent Owner also repeats the various arguments it made when addressing claim 1. *E.g.*, Response, 39, 41-42, 44. These arguments fail for the same reasons discussed. *Supra* Sections II.A.1-3.

C. Matthies, Yamada, and Hong Are Compatible

Patent Owner next points to various supposed incompatibilities between Matthies, Yamada, and Hong. For example, re-sizing is supposedly “antithetical[]

to Hong” because it would result in its pixels being closer together. Response 39-40, 54. But, this reverses the Petition’s argument. The Petition applied Hong’s truncated corners to Matthies and Yamada. It did not graft Matthies and Yamada onto Hong. In any event, Hong does teach that an OLED display’s pixels can and should be re-sized for purposes of prolonging their life. (Ex. 1011, [0057].)

Next, Patent Owner argues that Matthies cannot accommodate Hong’s teachings—including pixels with truncated corners—because Matthies is a passive-matrix display. It is not. *Supra* Section II.A.1. Patent Owner’s argument that “Hong’s zigzag arrangement is incompatible with Matthies” similarly improperly limits the art. Response, 39, 44-45. The Petition did not attempt to bodily graft the entirety of Hong onto Matthies. Instead, it explained that it would have been obvious to modify the shape of Matthies’ pixels—which would continue to be arranged in the same way—following Hong’s teachings.

D. The Petition Did Explain How the Display of Matthies, Yamada, and Hong Satisfies the Claims

Patent Owner concludes by again arguing that the Petition “fails to discuss” how Matthies/Yamada/Hong satisfy claim 1. Response, 40-41, 54-56. Here, as with ’578 patent’s other claims, only pixel shape changed. Pixel layout, grouping, and relative spacing—as shown in exemplary figures in the Petition—remain the same. See Petition, 77-80. Claim 1 continues to be satisfied for the same reasons.

IV. 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.

A. 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.

B. 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, 69. 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 any of 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 ’578 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, 58:21-61:11 (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. 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 '578 patent simply requires arrangement of pixels in “groups” and along “lines,” the '803 patent requires pixels arranged in a “virtual square.” 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).

C. 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, 58:21-61:11.) Any connection between Patent Owner’s “secondary considerations” and the claims is at best extraordinarily weak. (*See also*

Ex. 1017, ¶¶ 60-94; *see also* Ex. 1018, 51:19-57:20 (no evidence related to many claimed displays).)

1. 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.*, 57-58. 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 ’578 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”).)

2. Purported Failure of Others

Similarly, whether or not “full-HD AMOLED displays suitable for mobile devices” were available (Response, 60) is irrelevant. The claims do not require AMOLED displays, HD, or mobile devices. And, numerous working AMOLED displays existed before the ’578 patent. *Supra* Section IV.C.1.

3. Purported Praise

To begin, Patent Owner points almost exclusively to purported “praise” for the “Samsung Galaxy S4” and the “iPhone X.” Response, 65-67. But when attempting to show a “nexus,” it discusses only the “Galaxy S22 Ultra.” *Id.*, 70-72. 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 ’578 patent.

4. 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, 67-70. “[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); *Institute 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.

5. 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 IV.C.3.

V. CONCLUSION

For the reasons outlined above—and in the Petition—the ’578 patent’s claims are obvious.

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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 5,598 words.

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