

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BOE TECHNOLOGY GROUP CO., LTD.
Petitioner,

v.

SAMSUNG DISPLAY CO., LTD.
Patent Owner.

Patent No. 10,832,616

Inter Partes Review No. IPR2025-01544

**PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *et seq.***

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Exhibit List

Exhibit Description	Exhibit #
U.S. Patent No. 10,832,616 to Lee	EX1001
Declaration of Thomas Credelle	EX1002
Prosecution history of U.S. Patent No. 10,832,616	EX1003
U.S. Patent No. 6,867,549 to Cok et al.	EX1004
U.S. Patent No. 7,492,379 to Credelle et al.	EX1005
U.S. Patent Pub. No. 2004/0051724 to Elliott et al.	EX1006
K. Nishimura et al., “New Green and Red Phosphorescent Host Materials for Highly-efficient and Long-lifetime OLEDs,” <i>SID Digest</i> (2009)	EX1007
U.S. Patent Pub No. 2011/0234550 to Hong et al.	EX1008
I. Vogels, “The Visibility of a Local Deviation in Luminance and White-Point of a Display,” <i>SID Symp. Of Tech Papers</i> (2003).	EX1009
U.S. Patent No. 7,274,383 to Elliot	EX1010
U.S. Patent Pub. No. 2008/0001525 to Chao et al.	EX1011
U.S. Pub. No. 2009/0302331 to Smith et al.	EX1012
U.S. Patent Pub. No. 2003/0128179 to Credelle	EX1013
U.S. Patent Pub. No. 2006/0274090 to Koyama et al.	EX1014
U.S. Patent No. 6,882,364 to Inuiya et al.	EX1015

Exhibit Description	Exhibit #
U.S. Patent Pub. No. 2004/0183764 to Kim et al.	EX1016
U.S. Patent Pub. No. 2003/0128225 to Credelle et al.	EX1017
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Petitioner BOE Technology Group Co., Ltd. (“Petitioner” or “BOE”) respectfully petitions for *inter partes* review of claims 1-13 of U.S. Patent No. 10,832,616 (the “’616 patent” (EX1001)) in accordance with 35 U.S.C. §§ 311-319 and 37 C.F.R. § 42.100 *et seq.*

I. INTRODUCTION

The claims of the ’616 patent are directed to a pixel arrangement structure for organic light emitting diode (OLED) displays. The pixel arrangement structure includes first, second, and third pixels, where the first pixel has a center coinciding with a center of a virtual square having vertices at the centers of the second and third pixels. The second pixel has a larger area than that of the third pixel. As described in the specification and the dependent claims, the first pixel and another first pixel are green pixels, the second pixel is a blue pixel, and the third pixel is a red pixel.

A pixel arrangement having two green pixels for every red and blue pixel, also known as an RGBG pixel arrangement, was well-known before the 2012 filing date of the ’616 patent. For example, U.S. Patent No. 6,867,549 to Cok et al. (“Cok” (EX1004)) disclosed an RGBG pixel arrangement structure for an OLED display as of 2004. Moreover, due to the rapid development of OLED technology, there were numerous materials that provided improved longevity and performance for OLED displays by 2012. A person of ordinary skill in the art (“POSITA”)

would have been motivated to use such materials and then optimize Cok's pixel arrangement by using the teachings of U.S. Patent Pub No. 2011/0234550 to Hong et al. ("Hong" (EX1008)). Hong is directed to organic electroluminescent display devices and teaches sizing pixels based on the efficiency of the materials used for each color pixel. Hong also teaches spacing adjacent pixels apart by a same distance to prevent or reduce shadowing effects.

The combination of U.S. Patent No. 7,492,379 to Credelle et al. ("Credelle-379" (EX1005)) with Hong and, for some claims, with U.S. Patent Pub. No. 2004/0051724 to Elliott et al. ("Elliott-724" (EX1006)), also teaches every limitation of the challenged claims. Credelle-379 teaches an RGBG pixel arrangement pattern, where pixels can be adjusted in size and aspect ratio. As described above, a POSITA would have been motivated to use improved OLED materials to improve the lifetime, as well as reduce power-consumption, of an OLED display. And a POSITA would have been motivated to use Hong's teaching regarding relative sizes of pixels based on OLED material properties to adjust the pixel arrangements of Credelle-379, especially given that Credelle-379 explicitly contemplates adjusting the sizes and aspect ratios of its pixels. Further, Elliott-724, which is a parent application of Credelle-379, teaches that pixels can be hexagonal, which is compatible with Credelle-379's teaching that any pixel shape is desirable so long as it is manufacturable.

Petitioner thus respectfully submits the challenged claims are unpatentable for the reasons set forth in this Petition. This Petition is supported by the Declaration of Thomas Credelle (EX1002).

II. SUMMARY OF THE '616 PATENT

A. Background Of The '616 Patent

The '616 patent discloses pixel arrangement structures for an OLED display. As explained in the Background section of the patent, prior art OLED displays generally include “a plurality of pixels for emitting light of different colors” where a pixel is “a minimum unit for displaying [] images.” (EX1001, 1:35-43.) A purported problem with conventional OLED displays is “[w]hen reducing a gap between the neighboring pixels to obtain a high aperture ratio of the pixels, deposition reliability may be deteriorated. On the other hand, when increasing the gap between the pixels to improve the deposition reliability, the aperture ratio of the pixels may be deteriorated.” (*Id.*, 1:51-56.)

The alleged innovation of the '616 patent is a pixel arrangement structure for an OLED display that purports to solve this problem. The patent proposes to improve the deposition process by forming “gaps of the first length L1 ... between adjacent pairs of the first pixels 100 and the second pixels 200, and between adjacent pairs of the first pixels 100 and the third pixels 300” and by forming “gaps of the third length L3 that is longer than the first length L1 ... between the

neighboring ones of the first pixels 100.” (*Id.*, 11:61-12:4.) It is not stated why or how this would improve the aperture ratio of the pixels.

As shown in FIG. 6 below, the pixels are arranged such that “a center of one of the first pixels 100 is positioned at the center of the virtual square VS, a center of one of the second pixels 200 is positioned at the first vertex P1 [of the virtual square], and a center of one of the third pixels 300 is positioned at the second vertex P2 [of the virtual square] to both improve deposition reliability of the

organic emission layer in the deposition process using the fine metal mask and improve an aperture of each of the first, second, and third pixels.” (*Id.*, 12:33-40.)

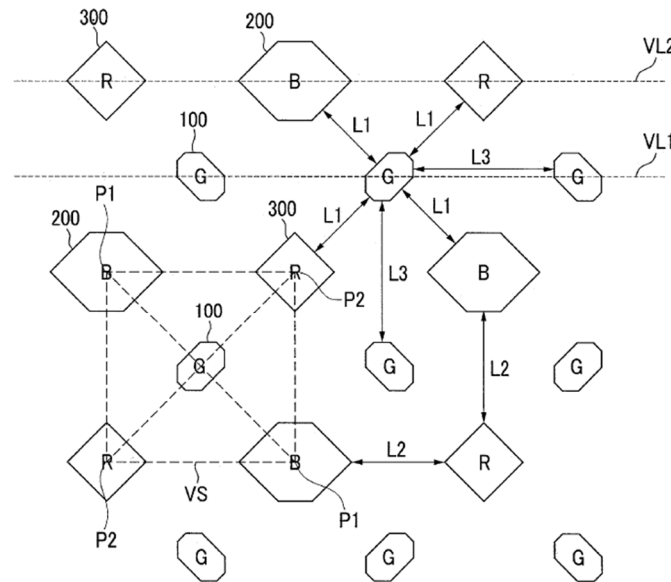


FIG. 6

Again, it is unclear why or how this arrangement would improve aperture ratio, particularly given the small areas of the pixels compared to the large distances between them, as shown by the patent’s figures. (*Id.*, FIGS. 1-6.)

B. Prosecution History Of The ’616 Patent

The ’616 patent was filed on April 26, 2013, as U.S. Application No. 13/872,018 and issued on November 10, 2020. The original application contained 13 claims with a single independent claim. (EX1003, 780-782.) At filing, the independent claim did not require the pixels to have any particular sizes or spacing between pixels. (*Id.*) Over the course of the prosecution, the Examiner rejected the claims as lacking novelty and as being obvious in light of a number of prior art

references, including U.S. Patent No. 7,274,383 to Elliott¹ (“Elliott-383” (EX1010)); U.S. Patent Pub. No. 2008/0001525 to Chao et al. (“Chao” (EX1011)); Cok (EX1004); U.S. Pub. No. 2009/0302331 to Smith et al. (EX1012); U.S. Patent Pub. No. 2003/0128179 to Credelle (“Credelle-179” (EX1013)); U.S. Patent Pub. No. 2006/0274090 to Koyama (EX1014); U.S. Patent No. 6,882,364 to Inuiya et al. (“Inuiya” (EX1015)); and U.S. Patent Pub. No. 2004/0183764 to Kim et al. (“Kim” (EX1016)).

The Patent Owner ultimately pursued an appeal, arguing against the Examiner’s reliance on Credelle-179 and Kim, particularly concerning pixel separation distances and configurations. (EX1003, 240-247.) The Board found claim 11 patentable. In its view, the Examiner failed to provide sufficient explanation of why Credelle-179 disclosed the claimed distances, because the Examiner vaguely asserted that “Adjacent pixels in a display panel should have some distance between them such as an (insulating) gap between them.” (*Id.*, 200, 240-247.) However, the Board concluded all the remaining claims were

¹ Although the patent refers to “Elliot” with one “t,” other patent publications to the same inventor utilize two “t”s. For consistency, Elliott is used with two “t”s throughout the Petition.

unpatentable, finding that it would have been obvious to change the pixel sizes in Credelle-179 to correct white balance and coordinate color. (*Id.*, 116-122.)

The Patent Owner did not further challenge the Board's decision, and, on remand, it amended claim 1 to incorporate the features of claim 11. (*Id.*, 70-74, 107-113.) The Examiner then allowed the application on February 19, 2020. (*Id.*, 70.) The Patent Owner subsequently filed a series of information disclosure statements, each time reopening prosecution; the patent finally issued on November 10, 2020. (*Id.*, 1-68.)

C. Level Of Ordinary Skill In The Art

A POSITA in the field of the '616 patent would have a bachelor's degree in electrical engineering or materials science and two years of experience working on display devices, including OLED displays, or an equivalent level of skill, knowledge, and experience. This POSITA would have been aware of and generally knowledgeable about OLED materials, display pixel design, layout, and operation. (EX1002, ¶40.)

III. CLAIM CONSTRUCTION

The Board construes claims under *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); *see also* 83 Fed. Reg. 51,340 (Oct. 11, 2018) (Board adopting same claim construction standard used by Article III federal courts and the ITC). Under *Phillips*, claims are given their ordinary and customary meaning in light of

the specification. 415 F.3d at 1315-17.

The '616 patent is the subject of co-pending litigation as identified in Section VI. The litigation has just begun, and a claim construction proceeding has not taken place or even been scheduled. Petitioner does not believe any claim construction is necessary for this Petition.² As set forth herein, the challenged claims are unpatentable under any reasonable interpretation of the claims.

IV. PRECISE REASONS FOR RELIEF REQUESTED

Pursuant to 37 C.F.R. § 42.104(b), Petitioner respectfully requests cancellation of claims 1-13 of the '616 patent based on the following references:

Prior Art Reference	Abbreviation (Ex. No.)
U.S. Patent No. 6,867,549	“Cok” (EX1004)
U.S. Patent No. 7,492,379	“Credelle-379” (EX1005)
U.S. Patent Pub. No. 2004/0051724	“Elliott-724” (EX1006)
U.S. Patent Pub. No. 2011/0234550	“Hong” (EX1008)

² If trial is instituted, Petitioner reserves its right to address construction of any terms raised at trial, or in the related district court action. Petitioner believes that the '616 patent claims are invalid under at least 35 U.S.C. § 112. Because such issues cannot be raised in an IPR, Petitioner reserves the right to raise those issues in the related district court action.

The statutory grounds for the challenge of each claim are set forth below.

All of the statutory citations are pre-AIA because Patent Owner may claim priority to a parent application filed on September 13, 2012, or an earlier date. If the Patent Owner does not claim priority, the analysis would be the same as the prior art relied upon in this Petition issued, filed, or were published years before the '616 patent's filing date.

Ground	35 U.S.C. §	Claims	Prior Art
1	103	1-5, 10, 11, 13	Cok & Hong
2	103	1-5, 10, 11, 13	Credelle-379 & Hong
3	103	6-9, 12	Credelle-379 & Hong & Elliott-724

Below, Petitioner discusses why the challenged claims are unpatentable under the statutory grounds raised, including how and where the prior art satisfies each element of each challenged claim, as required by 37 C.F.R. § 42.104(b).³ Petitioner's showing, including the accompanying Credelle Declaration (EX1002), establishes a reasonable likelihood that it will prevail on each ground of

³ Petitioner also shows how each claim preamble is satisfied, but does not concede that any preamble is limiting for any ground in the Petition.

unpatentability for each challenged claim.

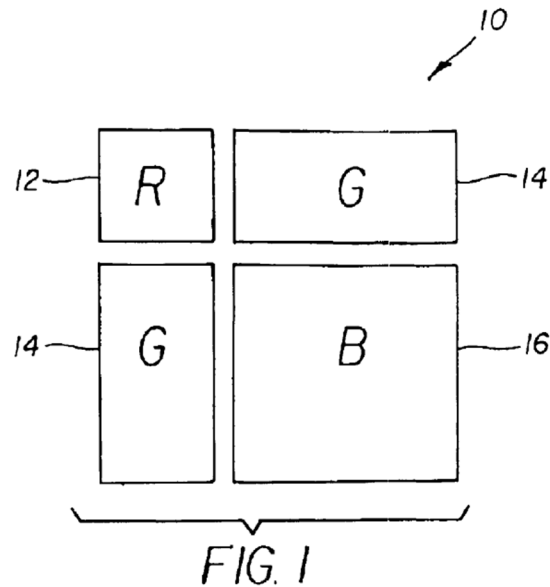
A. Ground 1: Cok in view of Hong Renders Obvious Claims 1-5, 10, 11, and 13

Cok was filed on December 10, 2002, published on June 10, 2004, and issued on March 15, 2005. (EX1004.) It qualifies as prior art to the '616 patent under at least §§ 102(a), (b), and (e). Although Cok was considered as a secondary reference during prosecution, the Examiner only cited FIG. 5 (which does not disclose an RGBG pixel arrangement and is not relied upon here) for teaching “each of the second pixels (the green light emitting element 14) is larger in area than each of the third pixels (the red light emitting element 12).” (EX1003, 516.)

Hong was filed on August 13, 2010, published September 29, 2011, and later issued as U.S. Patent No. 8,363,072 on January 29, 2013. It qualifies as prior art to the '616 patent under at least §§ 102(a) and (e). Hong was not considered by the Examiner during prosecution of the '616 patent.

1. Summary of Cok

Cok is directed to “OLED displays having repeated patterns of colored light emitting elements.” (EX1004, 1:8-10.) It discloses OLED displays having repeated RGBG patterns, as shown below in FIG. 1, with each pattern including two green light emitting elements 14, one red light emitting element 12, and one blue light emitting element 16.



Cok explains that the lifetime and color quality (over time) of an OLED display can be improved by adjusting relative sizes of the red, blue, and green light emitting elements based on the properties of the materials used. (*Id.*, 4:31-45.) For example, Cok describes “that the efficiency of light production by various OLED light emitters of different colors varies.” (*Id.*, 1:50-53.) To solve this problem, Cok describes that “[l]ight emitting elements made with higher efficiency materials can be made smaller than light emitting elements made with lower efficiency materials while producing the same light output.” (*Id.*, 3:18-24.)

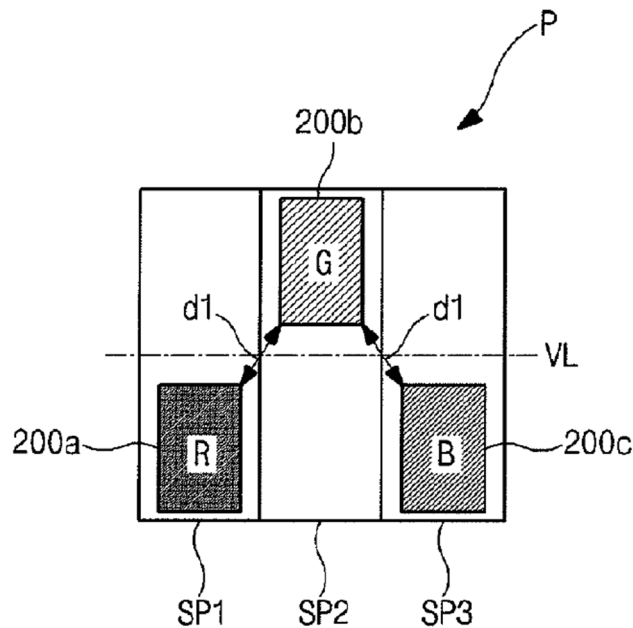
Accordingly, although FIG. 1 shows the red pixel being the smallest, “[d]ifferent materials may produce different relative sizes of pixel elements 12, 14, and 16.” (*Id.*, 4:16-21.) As an example, Cok describes that “for some combinations of materials, the green light emitting elements may be smaller than

both the red and blue light emitting elements.” (*Id.*) Thus, Cok recognizes that different materials can be used, and relative pixel size can be determined based on OLED material properties, including efficiency.

Cok is analogous art to the '616 patent at least because Cok is directed to the same problem (pixel arrangements) in the same field of endeavor (OLED displays) as the '616 patent. (EX1002, ¶52.)

2. Summary of Hong

Hong is directed to organic electroluminescent display devices and methods of fabricating such devices. Hong describes that regions between adjacent two sub-pixel regions in a display do not emit a predetermined colored light due to overlapping, which is referred to as a shadowing effect. (EX1008, [0010].) As described by Hong, “[t]o prevent the shadowing effect, the adjacent organic patterns 60 may be spaced apart by a first distance d1.” (*Id.*) For example, as illustrated by FIG. 5, “the first and second organic patterns 200a and 200b are spaced apart from each other by a first distance d1 for preventing a shadowing effect along a diagonal direction with respect to the first and second directions, and the second and third organic patterns 200b and 200c are spaced apart from each other by the first distance d1 along the diagonal direction.” (*Id.*, [0048].) The distance d1 is sufficient to prevent the shadowing effect and the subsequent mixing of colors during deposition of the organic patterns. (*Id.*, [0044], [0048].)

**FIG. 5**

Although FIG. 5 shows the red, blue, and green sub-pixels having the same size, Hong describes that “first, second and third organic patterns may be formed to have different areas based on an emission efficiency of each organic pattern.” (EX1008, [0074].) For example, “[w]hen the first, second and third organic patterns 250a, 250b and 250c emit red, green and blue colored lights, respectively, the emission efficiency of the first organic pattern 250a may be greater than the emission efficiency of the third organic pattern 250c and may be smaller than the emission efficiency of the second organic pattern 250b.” (*Id.*) To account for this difference in efficiency, “the area of the first [red] organic pattern 250a may be greater than the area of the second [green] organic pattern 250b and may be smaller than the area of the third [blue] organic pattern 250c so that the lights

emitted from the first, second and third organic patterns 250a, 250b and 250c can have the same brightness as each other.” (*Id.*) Such an arrangement would improve “uniformity in brightness and controllability of white balance.” (*Id.*)

Hong also describes how the organic electroluminescent display device is fabricated using a shadow mask. (EX1008, [0072].) The shadow mask (or shadow masks if the subpixels have different areas) includes a plurality of open portions 350, through which organic material is deposited during a vacuum thermal evaporation process to form the subpixels. (*Id.*) Hong describes that “[s]ince the shadow mask 300 is formed of a metallic material, the shadow mask 300 may expand due to heat to cause deformation such as warpage while the first, second and third organic patterns 250a, 250b and 250c are formed through a vacuum thermal evaporation method.” (*Id.*) Such “deformation of the shadow mask 300 causes a shadowing effect.” (*Id.*) The shadowing or color mixing can occur even if multiple masks are used because all masks will experience deformations such as warpage. (EX1002, ¶55.)

Hong is analogous art to the ’616 patent at least because Hong is directed to the same problem (pixel arrangements) in the same field of endeavor (OLED displays) as the ’616 patent. (*Id.*, ¶56.)

3. Claim 1

a. Preamble

A pixel arrangement structure of an organic light emitting diode (OLED) display, comprising:

Cok meets the preamble. For example, it discloses “an OLED display device for displaying a color image that includes an array of different colored independently controllable light emitting elements arranged in repeated patterns.” (EX1004, 2:14-18; Abstract; EX1002, ¶57.) Although Cok describes the individual light emitting elements as “light emitting elements,” a POSITA would have understood that this term is merely referring to the same components as the claimed “pixels” in the ’616 patent. (EX1002, ¶57.)

b. 1[A]

a plurality of individually addressable pixels for displaying images, the individually addressable pixels being minimum addressable units of the OLED display and comprising:

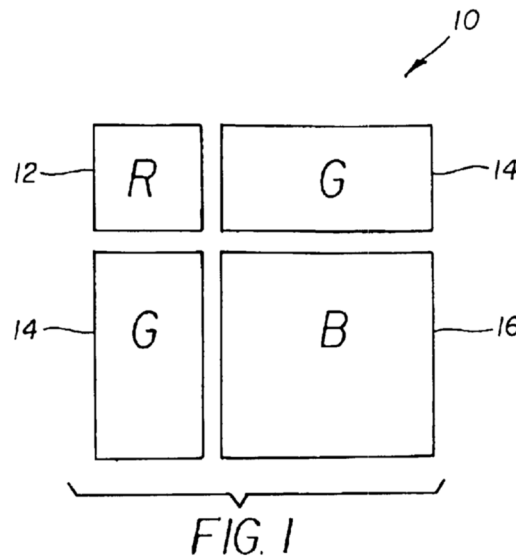
Cok meets limitation 1[A], e.g., as set forth above with respect to the Preamble. (EX1002, ¶58.)

c. 1[B]

a first pixel having a center coinciding with a center of a virtual square;

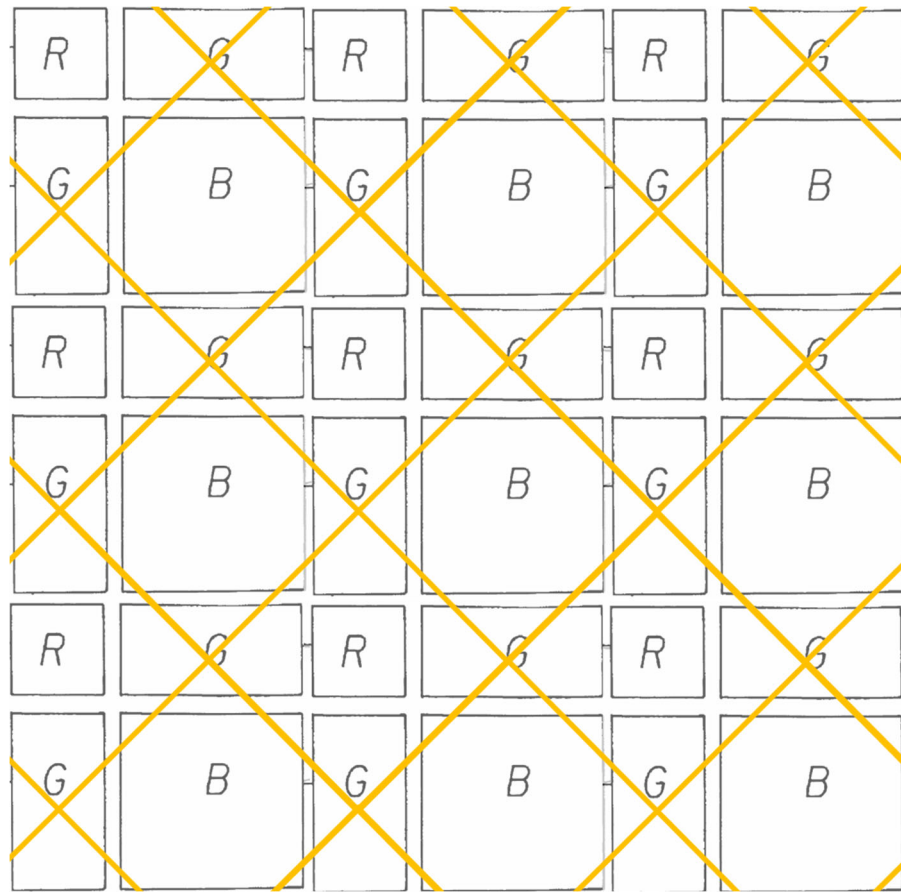
As discussed above, Cok discloses “an array of different colored independently controllable light emitting elements arranged in repeated patterns.” (EX1004, 6:1-4.) Further, “the repeated patterns are aligned with each other.”

(*Id.*, 6:25-26.) One such pattern is “the square pixel arrangement” shown in FIG. 1, which includes “two green light emitting elements 14 having a first size (area), a red light emitting element 12 having a second smaller size, and a blue light emitting element 16 having a larger size.” (*Id.*, 4:8-13; EX1002, ¶59.) A POSITA would have recognized that, in Cok’s square pixel arrangement unit, the red and blue pixels are squares, and the two green pixels are identical save for their orientation. (EX1002, ¶59.)



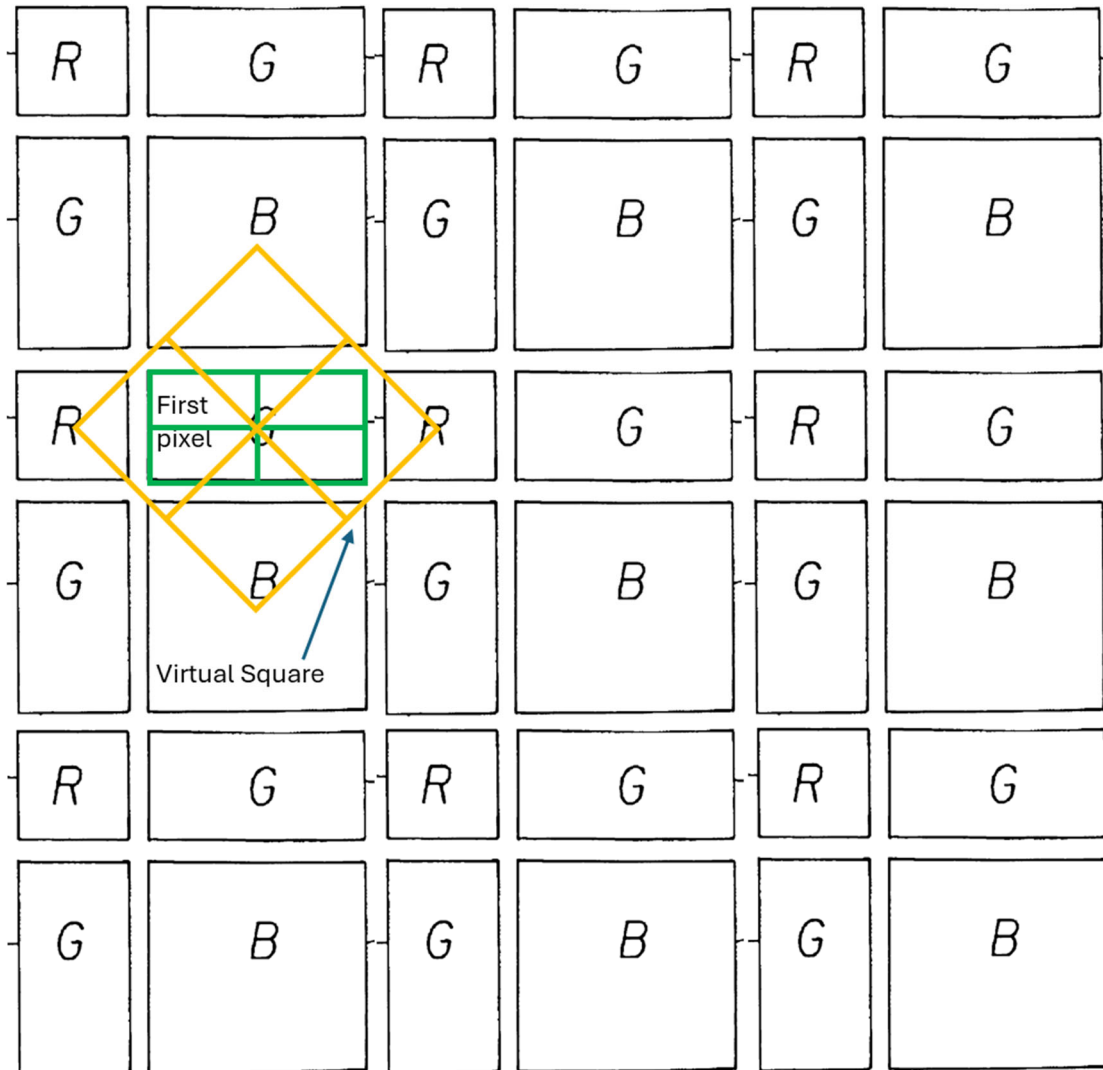
Cok teaches repeating such patterns to form an array. (EX1004, 6:1-4; 6:25-26.) The pattern shown in FIG. 1 of Cok can be repeated as shown below. (EX1002, ¶60.) The green pixels are positioned such that the centers of the green pixels are on an equal grid spacing, as shown by the orange grid below. (*Id.*) A POSITA would have maintained the relative centers of the light emitting elements, such that the centers of each pixel line up as shown in the pattern of FIG. 1.

(EX1004, 3:65-67; EX1002, ¶60.) Further, a POSITA would have repeated the RGBG pattern as taught by Cok, of four pixels with equal spacing between the four-pixel pattern, because it is important for the accurate display of information that digital image data be displayed on a uniform, equal-spaced grid of RGBG patterns. (EX1002, ¶60.)



As shown below, a green light emitting element (*e.g.*, corresponding to the claimed “first pixel”) has a center coinciding with a center of a virtual square. (*Id.*, ¶61.) A POSITA would have recognized this virtual object to be a square because (1) the red and blue pixels are squares (*id.*, ¶59) so as to make each angle of the

object—with a vertex at the center of either a red or blue pixel—90 degrees, and
 (2) because the symmetry of the arrangement ensures that each side of the object
 has a length equal to the uniform distance between diagonally adjacent red and
 blue pixels. (*Id.*, ¶61.)

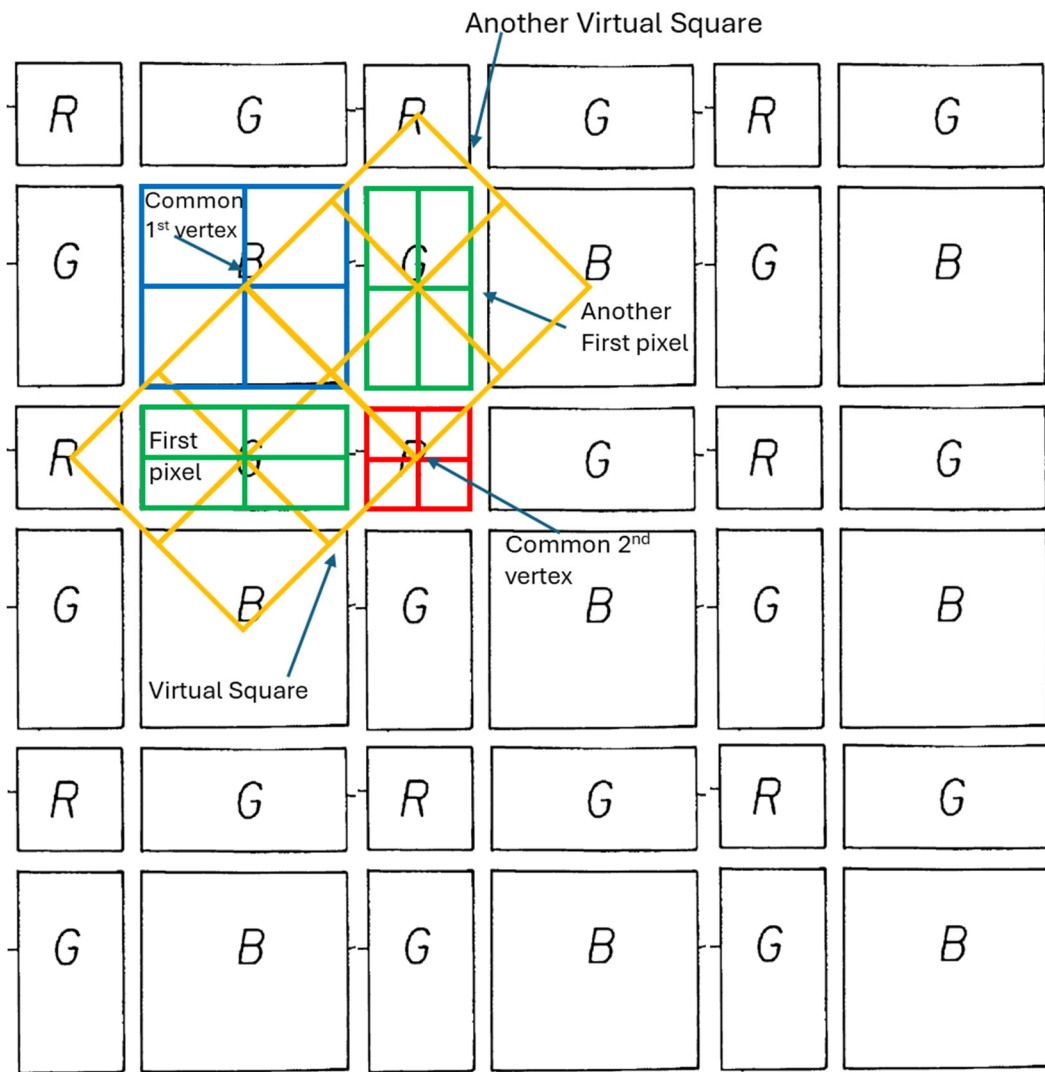


d. 1[C]

another first pixel having a center coinciding with a center of another virtual square, the virtual squares sharing a common side having endpoints

at a common first vertex and a common second vertex of the virtual squares, with neighboring vertices in each of the virtual squares corresponding to pixels configured to emit different color light;

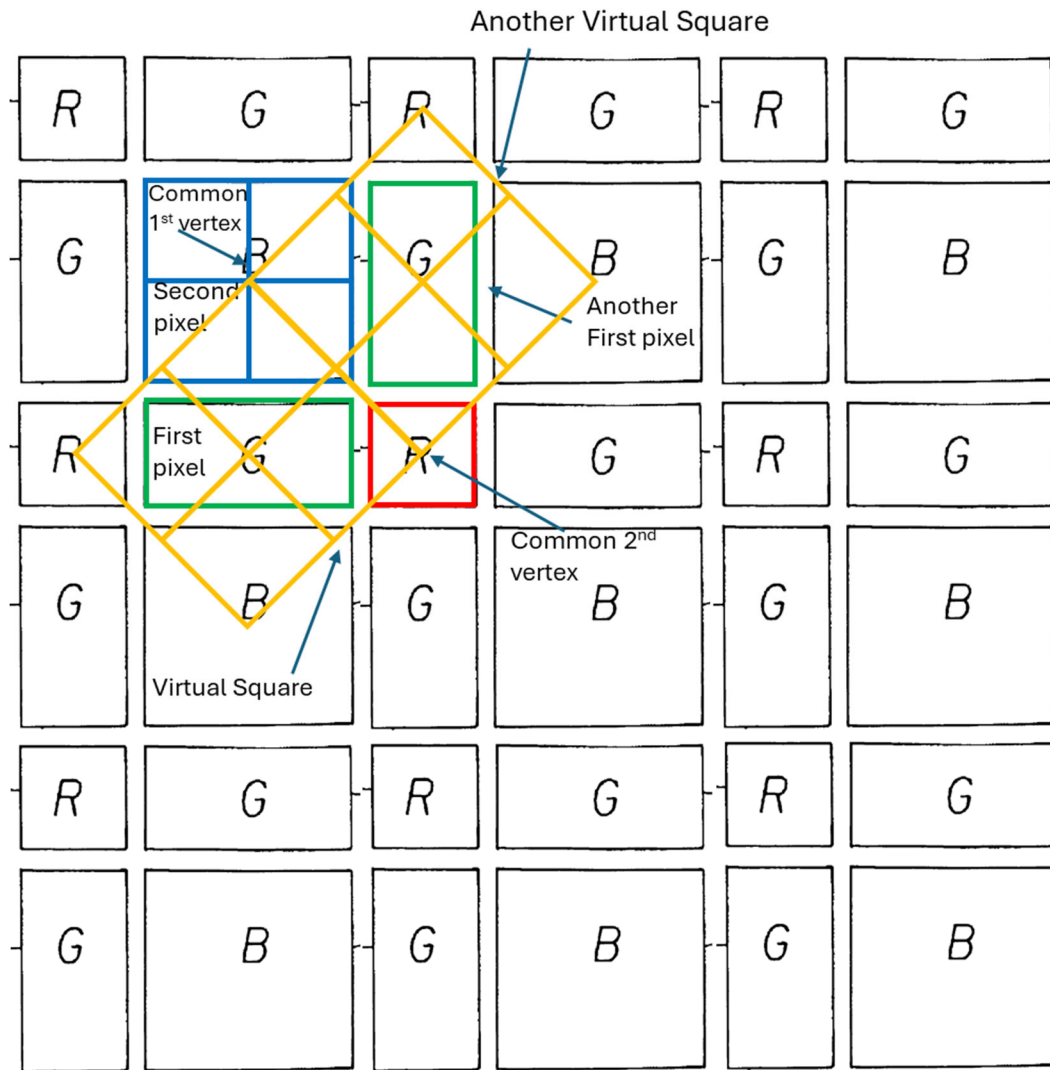
As shown below, another green pixel (*e.g.*, corresponding to the claimed “another first pixel”) is at the center of another virtual square having a shared side and two common vertices with the first virtual square, with neighboring vertices corresponding to pixels having different colors (*e.g.*, blue and red). (EX1002, ¶62.)



e. 1[D]

a second pixel separated from the first pixels and having a center at the first vertex;

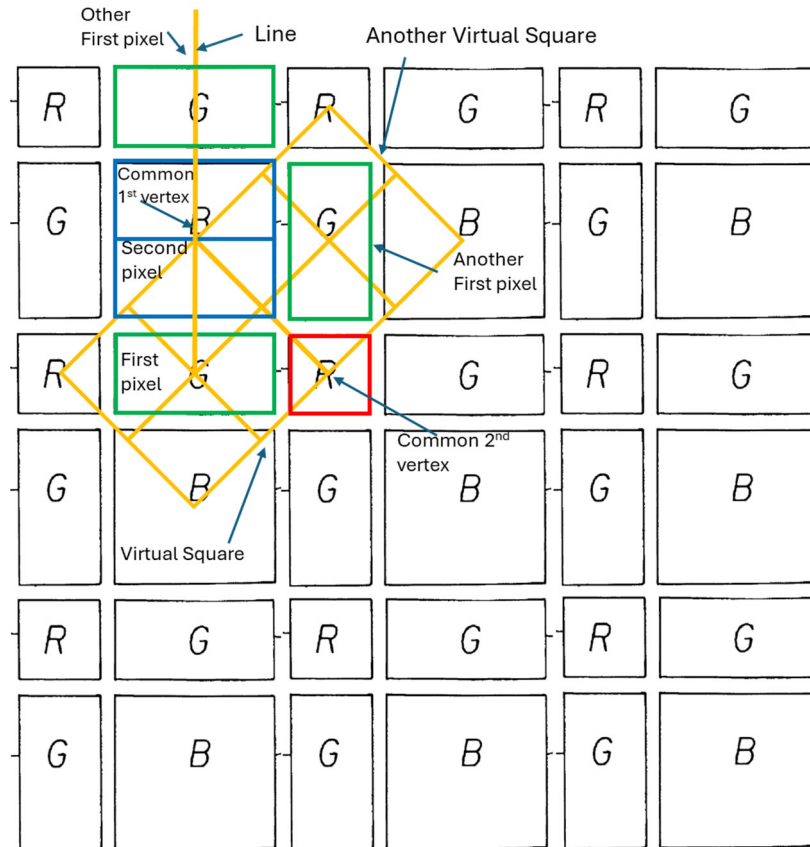
The blue pixel (e.g., corresponding to the claimed “second pixel”) is separated from the first (e.g., green) pixels, and has a center at the first vertex of the virtual square, as shown below. (EX1002, ¶63.)



f. 1[E]

an other first pixel on a line defined by the center of the virtual square and the first vertex, the first pixel, the second pixel, and the other first pixel being consecutive pixels on the line; and

As shown below, an “other” green pixel⁴ (*e.g.*, corresponding to the claimed “an other first pixel”) is located on a line defined by the center of the first virtual square, with the first pixel, the second pixel, and the other pixel being consecutive pixels on the line. (EX1002, ¶64.)

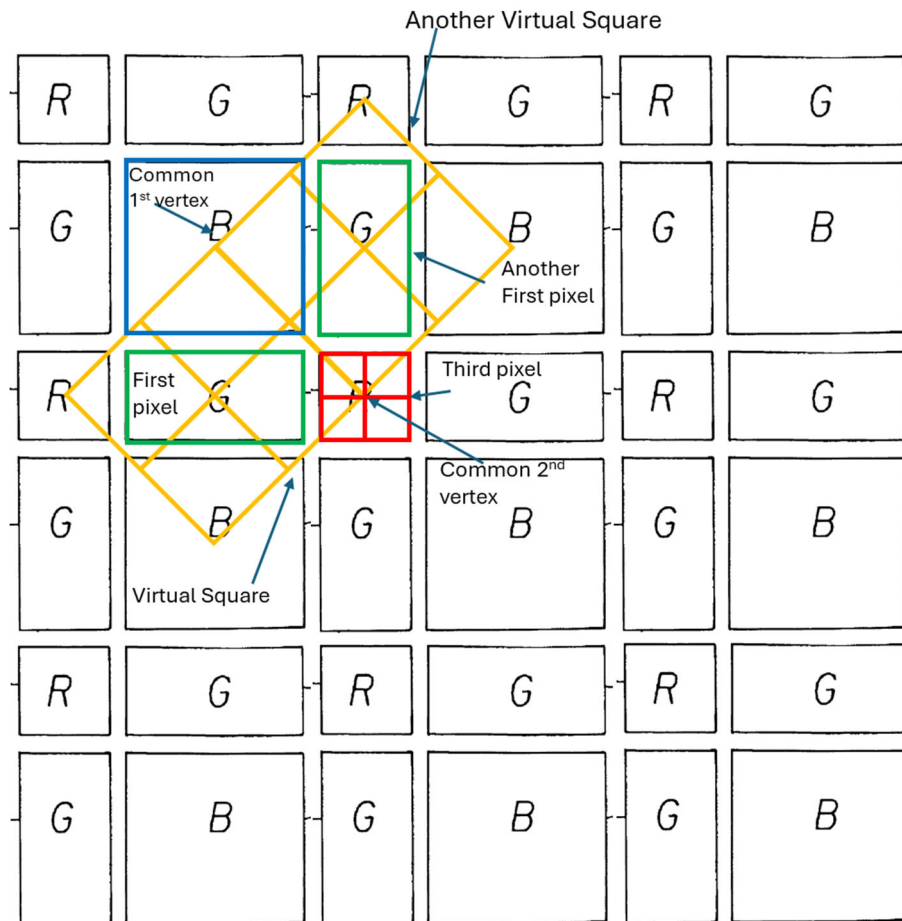


⁴ Petitioner reserves the right to challenge the use of “another” and “an other” first pixel under 35 U.S.C. § 112.

g. 1[F]

a third pixel separated from the first pixels and the second pixel, and having a center at the second vertex,

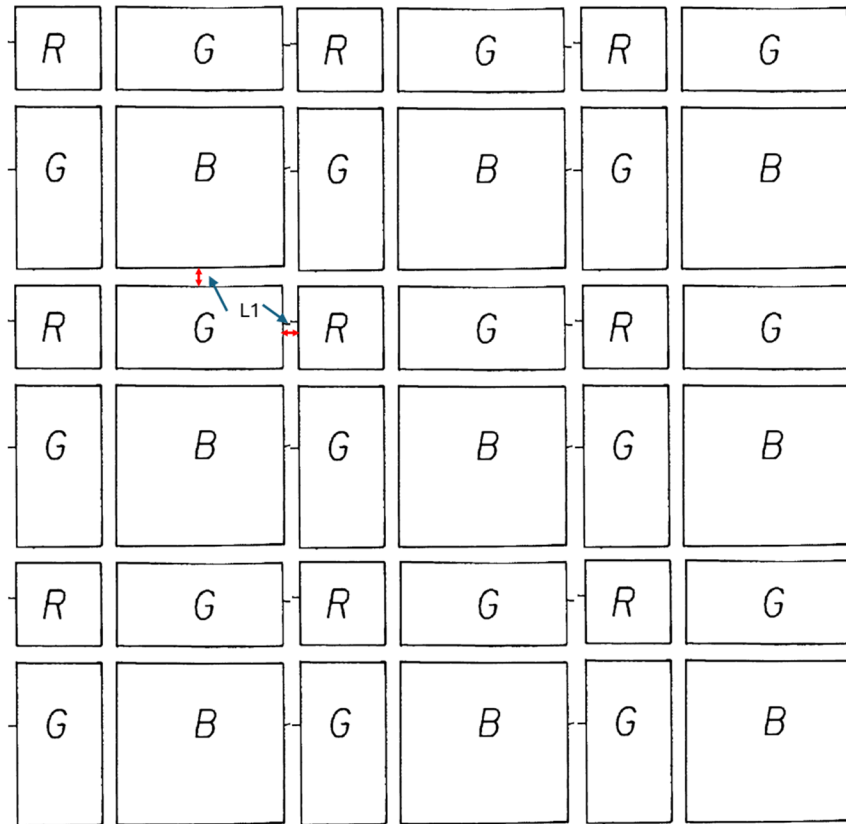
The red pixel (e.g., corresponding to the claimed “third pixel”) is separated from the first (e.g., green) pixels and the second (e.g., blue) pixel, and has a center at the second vertex of the virtual square, as shown below. (EX1002, ¶65.)



h. 1[G]

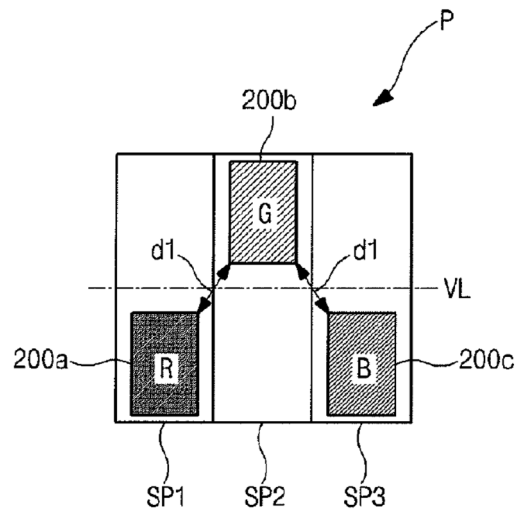
wherein a shortest distance between the first pixel and the second pixel as well as a shortest distance between the first pixel and the third pixel is a same first length,

This limitation is met by Cok. As described above, a POSITA would have repeated the RGBG pattern as taught by Cok, of four pixels with equal spacing between the four-pixel pattern, because it is important for the accurate display of information that digital image data be displayed on a uniform, equal-spaced grid of RGBG patterns. (EX1002, ¶66.) Under the Cok arrangement, the shortest distance L1 between the first pixel (green) and the second pixel (red) as well as the shortest distance L1 between the first pixel (green) and the third pixel (blue) is a same first length d1 due to the equal spacing between the four-pixel pattern, as shown below:

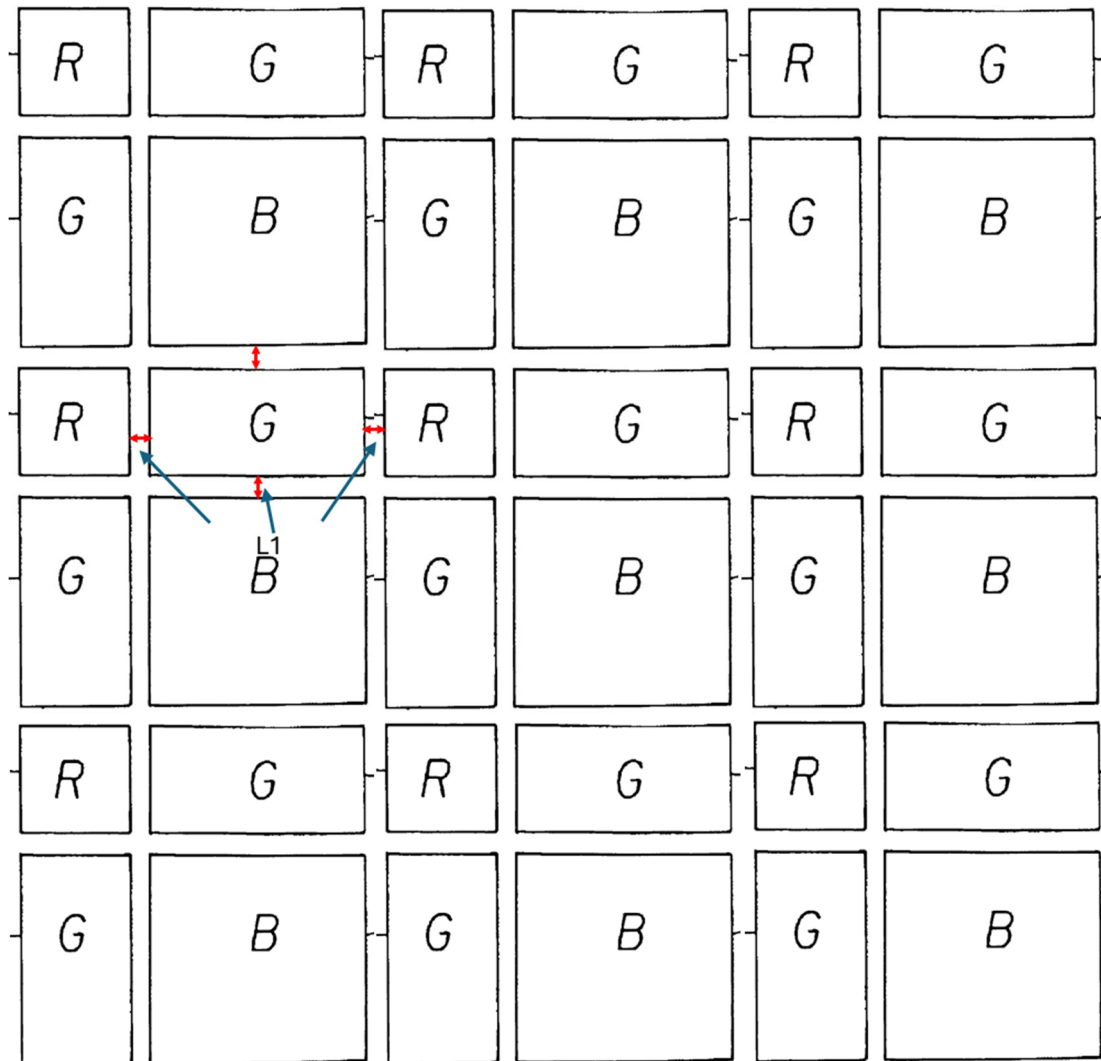


To the extent a POSITA would not have understood this element to be disclosed by or obvious from Cok, the POSITA would nevertheless have found it obvious to provide even spacing between adjacent green-red and green-blue pairs of pixels based on the teachings of Hong.

FIG. 5 of Hong below shows, for example, how “the first and second organic patterns 200a and 200b are spaced apart from each other by a first distance d_1 for preventing a shadowing effect along a diagonal direction with respect to the first and second directions, and the second and third organic patterns 200b and 200c are spaced apart from each other by the first distance d_1 along the diagonal direction.” (EX1008, [0048]; EX1002, ¶67.)

**FIG. 5**

That is, Hong teaches a pixel arrangement layout where the distance between the first (e.g., green) pixel and the second (e.g., blue) pixel as well as a shortest distance between the first (e.g., green) pixel and the third (e.g., red) pixel is a same first length $d1$ in order to prevent shadowing. (EX1008, [0048]; EX1002, ¶67.) In accordance with this teaching, a POSITA would have been motivated to modify Cok as shown below, such that the distance between the first (e.g., green) pixel and the second (e.g., blue) pixel as well as a shortest distance between the first (e.g., green) pixel and the third (e.g., red) pixel is a same first length $d1$ in order to prevent shadowing. (EX1002, ¶67.)



Motivation to Combine Cok with Hong

A POSITA would have found it obvious to implement the pixel arrangement pattern of Cok in view of Hong's disclosures regarding spacing. Both Cok and Hong are analogous art because they are in the same field as the '616 patent.

Wyers v. Master Lock Co., 616 F.3d 1231, 1238-39 (Fed. Cir. 2010). (See also EX1002, ¶68.) Like the '616 patent, Cok is directed to "OLED displays having repeated patterns of colored light emitting elements." (EX1004, 1:6-10.)

Similarly, Hong is directed to an “organic electroluminescent display (ELD) device.” (EX1008, [0005].)

A POSITA would have been motivated to make this combination in order to improve the manufacturability and performance of an OLED display. (EX1002, ¶69.) Doing so would have been a simple application of the spacing taught by Hong to form the OLED display taught by Cok with predictable results because the two references describe the same, underlying OLED technology. (*Id.*) Indeed, a POSITA would have viewed Hong as disclosing just one more way to space the pixels in the OLED display of Cok. (*Id.*)

Furthermore, modifying the device of Cok to have the spacings of Hong would be advantageous to prevent shadowing. For example, as described by Hong, spacing the green pixels from the blue pixels and the green pixels from the red pixels “by a first distance d_1 ” can prevent a shadowing effect along the direction of the space between the pixels. (EX1008, [0048]; EX1002, ¶70.)

Additionally, a POSITA would have recognized that such a spacing would improve the manufacturability of an OLED display by preventing or reducing shadowing caused by the deposition process. (EX1002, ¶71.) Cok is silent with respect to manufacturing an OLED display, and thus a POSITA would have looked to Hong to supply those details. (*Id.*) As discussed above, Hong teaches the use of a shadow mask for patterning the pixels. (*Id.*)

Such a shadow mask, because it is made of metal, is susceptible to thermal expansion, such that the shadow mask may warp while the pixels are being formed during a vacuum thermal evaporation method. (EX1008, [0072]; EX1002, ¶71.) A POSITA would have understood that shadowing or color mixing can occur even if multiple masks are used because all masks will experience deformations such as warpage. (EX1002, ¶71.) The POSITA would have also recognized that the equal spacing taught by Hong can minimize the effects of such warpage and thermal deformation. (*Id.*) This is at least because a POSITA would have known that thermal expansion in any direction is proportional to the original length of the material in that direction and that the error in position can occur in any direction. (*Id.*)

Because the direction and extent mask deformations are unknown, a POSITA would have understood that keeping the spacings between the green-blue pixel pairs and the green-red pixel pairs the same will result in the least amount of shadowing. (EX1002, ¶72.) This consistency of spacing and positioning allows for a more consistent application of each color, reducing the likelihood of color mixing or unintended patterns that can arise from uneven deposition. (*Id.*) Additionally, because the direction and extent of mask deformations are unpredictable, maintaining equal spacings acts as a safeguard, ensuring that any deformation will have a consistent effect rather than creating localized areas of

excessive shadowing or color mixing. (*Id.*)

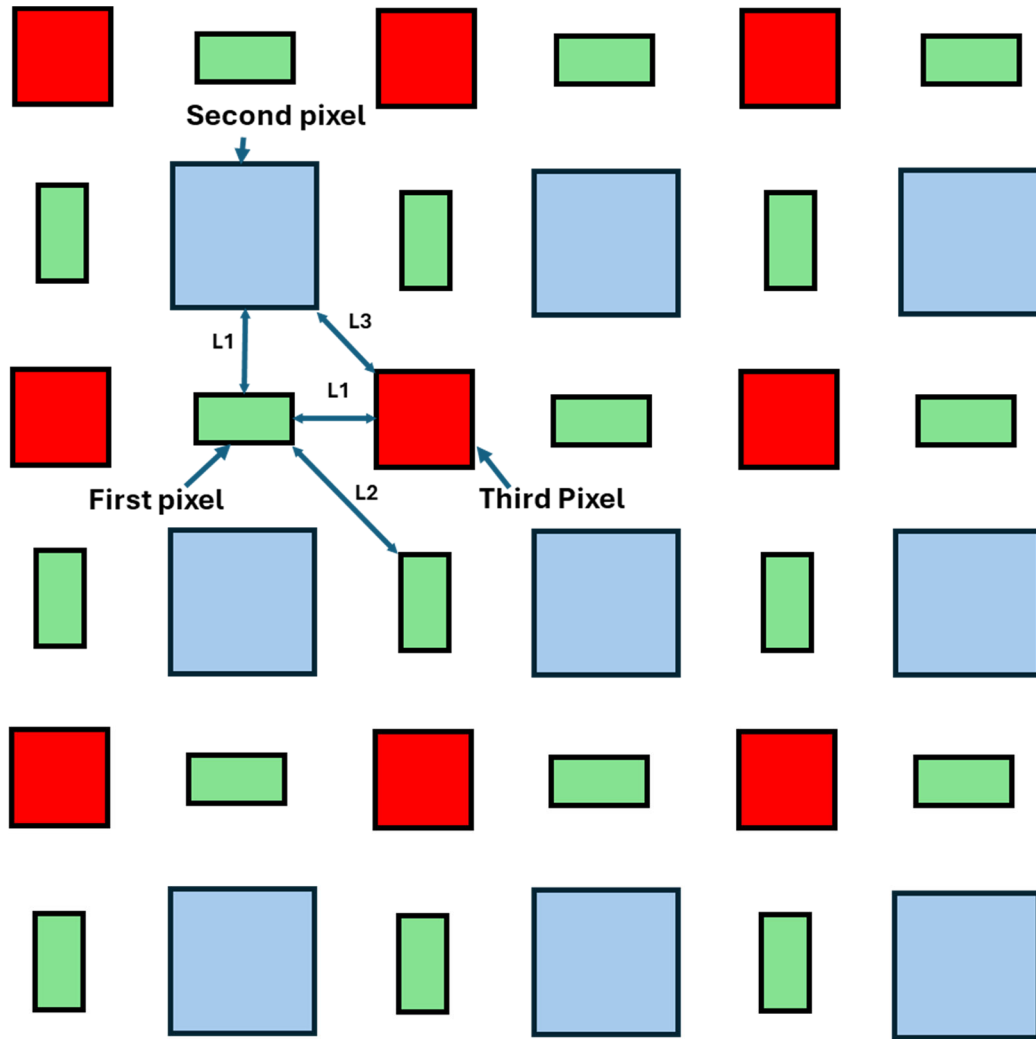
Thus, the POSITA would have been motivated to maintain an equal minimum distance between the green-blue pixel pairs and the green-red pixel pairs, such that the shadowing effect will be reduced equally in any direction. (EX1002, ¶73.) Similarly, a POSITA would have recognized that shadow masks for forming a display with unequal subpixel sizes would benefit in the same manner as with equal size subpixels; that is, a minimum equal distance between the green-blue pixel pairs and the green-red pixel pairs will mitigate the shadowing effect. (*Id.*) Accordingly, the POSITA would have recognized that adopting Hong's teaching of equal distances between the green-blue pixel pairs and the green-red pixel pairs would mitigate the adverse effects of thermal expansion. (*Id.*) If the distances between the patterns are equal, any expansion that occurs will affect all patterns consistently, thus maintaining the integrity of the design and reducing the likelihood of shadowing. (*Id.*)

A POSITA would have reasonably expected the combination to succeed. (EX1002, ¶74.) Both references relate to OLED display technology. (*Id.*) A POSITA would have viewed Hong as disclosing just one more way to space Cok's pixels. (*Id.*) The combination of Cok and Hong, with its resulting pixel arrangement above, would have been straightforward. (*Id.*)

i. 1[H]

wherein a shortest distance between the first pixels is a second length that is longer than the first length and a shortest distance between each of the second pixels and the third pixels,

A POSITA would have been motivated to modify the sizes of the pixels in the Cok arrangement based on Hong's teachings, such that a shortest distance between the first (green) pixels is a second length L2 that is longer than the first length L1 and a shortest distance between each of the second (blue) pixels and the third (red) pixels L3, as shown below. (EX1002, ¶75.)



Motivation to Combine Cok with Hong

A POSITA would have found it obvious to modify the pixel sizes of Cok based on the teachings of Hong. (EX1002, ¶76.) As discussed above, Cok and Hong are analogous art. (*Id.*) A POSITA would have been motivated to make this combination, as above, in order to improve the lifetime and performance of an OLED display. (*Id.*) As taught by both Cok and Hong, the sizes of different color pixels can be different based on the emission efficiency of the material used for

each color pixel. (EX1004, 3:18-24; EX1008, [0074].) Between the publication date of Cok in 2004 and the earliest claimed priority date of the '066 patent in 2012, there was “rapid development” of OLED technology, including in the organic materials used for the emission layers of an OLED display. (EX1007 (“Nishimura”), 310; EX1002, ¶76; *see also* EX1026 and EX1027.) A POSITA would have known that such materials provided better longevity and performance for OLED displays. (EX1002, ¶76.)

For example Hong, filed in 2010, when describing known efficiencies of materials commonly used at the time, discloses that green pixels can be the most efficient, blue pixels can be the least efficient, and red pixels can have an intermediate efficiency. (EX1008, [0074].) In another example, Nishimura (circa 2009) describes new phosphorescent host materials for red and green phosphorescent emitters, such that green pixels can be the most efficient, blue pixels can be the least efficient, and red pixels can have an intermediate efficiency. (EX1007, Table 3.) Nishimura also discloses that such improved materials demonstrated lower driving voltages, higher efficiency, and longer lifetimes. (EX1007, 310-312; EX1002, ¶¶77-78.) In view of this knowledge, a POSITA would have been motivated to use such improved materials to improve the lifetime, as well as reduce power-consumption, of an OLED display. (EX1002, ¶¶77-78.)

To account for the difference in efficiency when using such improved

materials, the POSITA would have been motivated to make the green pixels the smallest and the blue pixels the largest, with the red pixels having an intermediate size compared to the green and blue pixels, in accordance with the teachings of both Hong and Cok. (EX1004, 3:18-24; EX1008, [0074]; EX1002, ¶79.) Such a modification would have been a simple application of the sizing taught by Hong to form the OLED display taught by Cok with predictable results because the two references describe the same, underlying OLED technology. (EX1002, ¶79.)

As Cok does not teach absolute sizes, to achieve these area ratios, a POSITA would have begun, as taught by Cok (EX1004, 3:57-67), with choosing the size of one of the light emitting elements, and used the area ratios to adjust the size of the other light emitting elements accordingly. (EX1002, ¶79.) Furthermore, in determining how to implement the area ratios relative to Cok's RGBG arrangement, the POSITA would have recognized that there were four possible options: 1) changing the size of each pixel, 2) maintaining the red pixels and adjusting the blue and green pixels relative to the red, 3) maintaining the green pixels and adjusting the red and blue pixels relative to the green, and 4) maintaining the blue pixels and adjusting the red and green pixels relative to the blue. (*Id.*) Depending on other design choices, the POSITA would have understood that all or only some of these four options would have been viable, but in any event would have found each to be obvious to try with a reasonable

expectation of success. (*Id.*) A POSITA would have recognized that maintaining the size of the red pixels relative to Figure 1 of Cok was particularly suitable to avoid pixel overlap while keeping the positions of the pixel centers constant (an important consideration, as explained in the next paragraph). (*Id.*)

When altering the sizes of the pixels, POSITA would have maintained the relative centers of the pixels, such that the centers of each pixel line up as shown in the pattern of FIG. 1. (EX1004, 3:65-67; EX1002, ¶80.) Further, a POSITA would have repeated the RGBG pattern as taught by Cok, of four pixels with equal spacing between the four-pixel pattern, because it is important for the accurate display of information that digital image data be displayed on a uniform, equal-spaced grid of RGBG patterns. (EX1002, ¶¶81-82.)

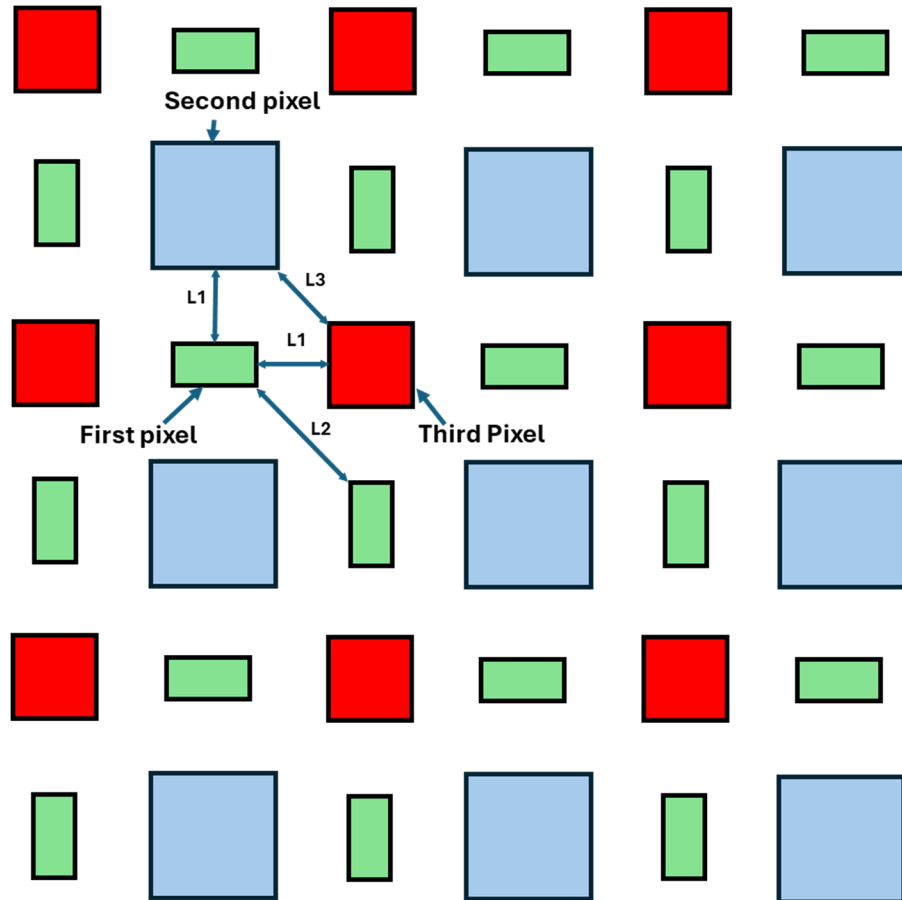
A POSITA would also have found it obvious to maintain the aspect ratios of the pixels shown in FIG. 1 because these aspect ratios are part of the specified pattern of FIG. 1. (EX1004, 3:65-67; EX1002, ¶83.) A POSITA, when considering the teachings of Cok, would have identified two possible options: using the aspect ratios taught by FIG. 1 of Cok or further modify FIG. 1 of Cok to use different area ratios. (EX1002, ¶83.) Considering these finite options, it would have been obvious to try maintaining the aspect ratios shown in FIG. 1 of Cok when modifying the pixel sizes, with a reasonable expectation of success. (*Id.*) A POSITA would have then repeated the resulting pattern to form the OLED display

as shown above. (EX1004, 3:65-67; EX1002, ¶83.)

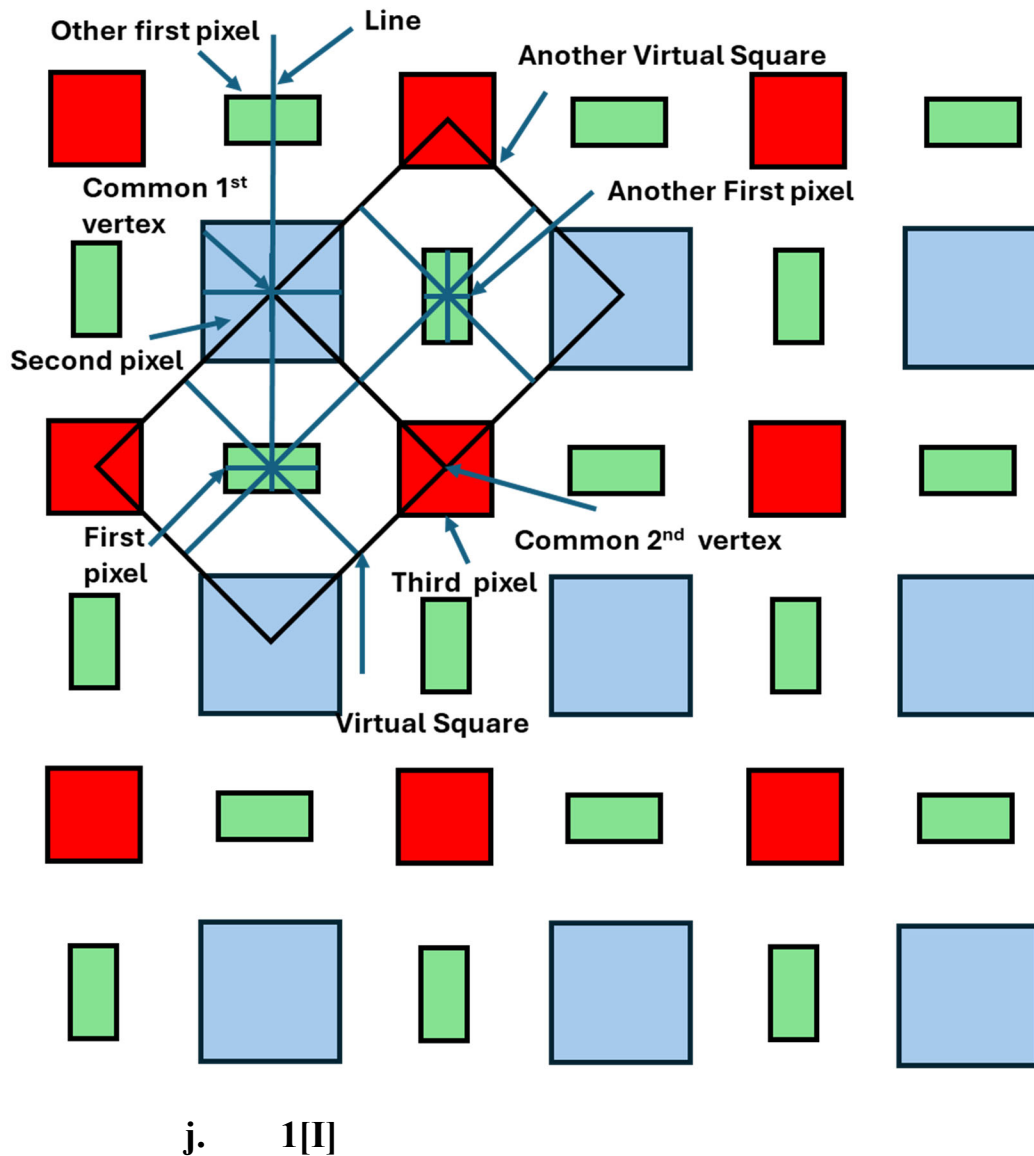
Moreover, a POSITA would have recognized that the combination would provide benefits. (EX1002, ¶84.) As taught by Hong, adjusting the sizes of the pixels in this manner would allow the different color pixels to “have the same brightness as each other,” such that “uniformity in brightness and the controllability of white balance are improved.” (EX1008, [0074]; EX1002, ¶84.) At the same time, the POSITA would have sought to weigh the benefits of the white balance taught by Hong with the benefits of reducing the effect of shadowing taught in the same reference. (EX1002, ¶84.) The POSITA would therefore have sought to maintain the equal green-red and green-blue spacing between adjacent pixels (as described above under element 1[G]) when resizing pixels to achieve better white light and brightness profiles. (*Id.*)

A POSITA would have reasonably expected the combination to succeed. (EX1002, ¶85.) Both references relate to OLED display technology. And Cok itself discloses that the relative sizes of the pixels can be changed according to the efficiencies of the materials used and that “for some combinations of materials, the green light emitting elements may be smaller than both the red and blue light emitting elements.” (EX1004, 3:18-24; 4:16-21.) A POSITA would have viewed Hong as disclosing just one more way to dimension Cok’s pixels given improvements in OLED materials between the filing date of Cok and the filing

date of Hong. (EX1002, ¶85.) The combination of Cok and Hong, with its resulting pixel arrangement above, would have been straightforward. (*Id.*) As illustrated below, when the green (first) pixels are the smallest and the blue (second) pixels are the largest, L2 is greater than both L1 and L3. (*Id.*, ¶86.)

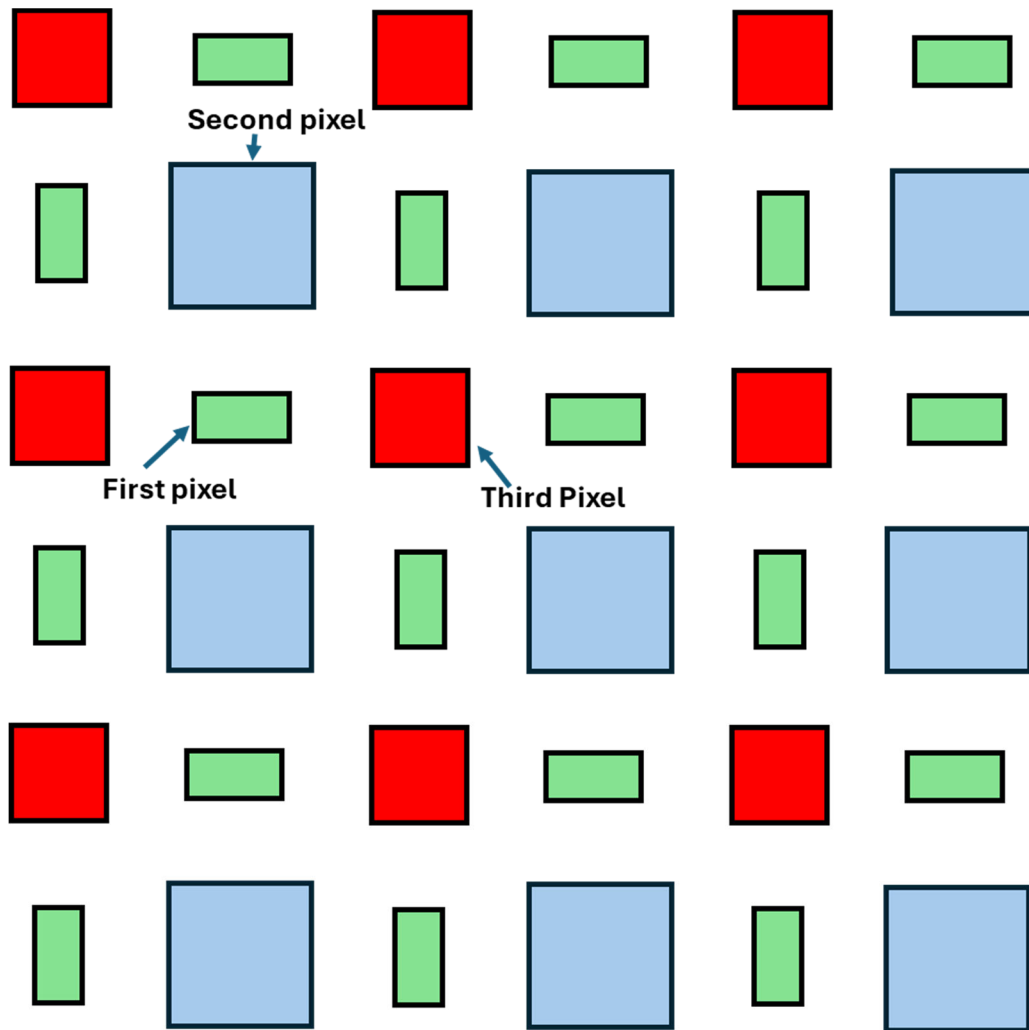


Such a modification would also preserve the aspects of Cok that teach limitations 1[A]-1[G], as shown below, because it would preserve the relative spacing of the centers of the pixels. (EX1002, ¶87.)



wherein the second pixel and the third pixel have polygonal shapes, and,

FIG. 1 of Cok, as modified, shows rectangle and square pixels. As described in the '616 patent, a polygonal shape can include “shapes such as an octagon, a hexagon, and a quadrangle.” (EX1001, 12:29-30; EX1002, ¶88.)



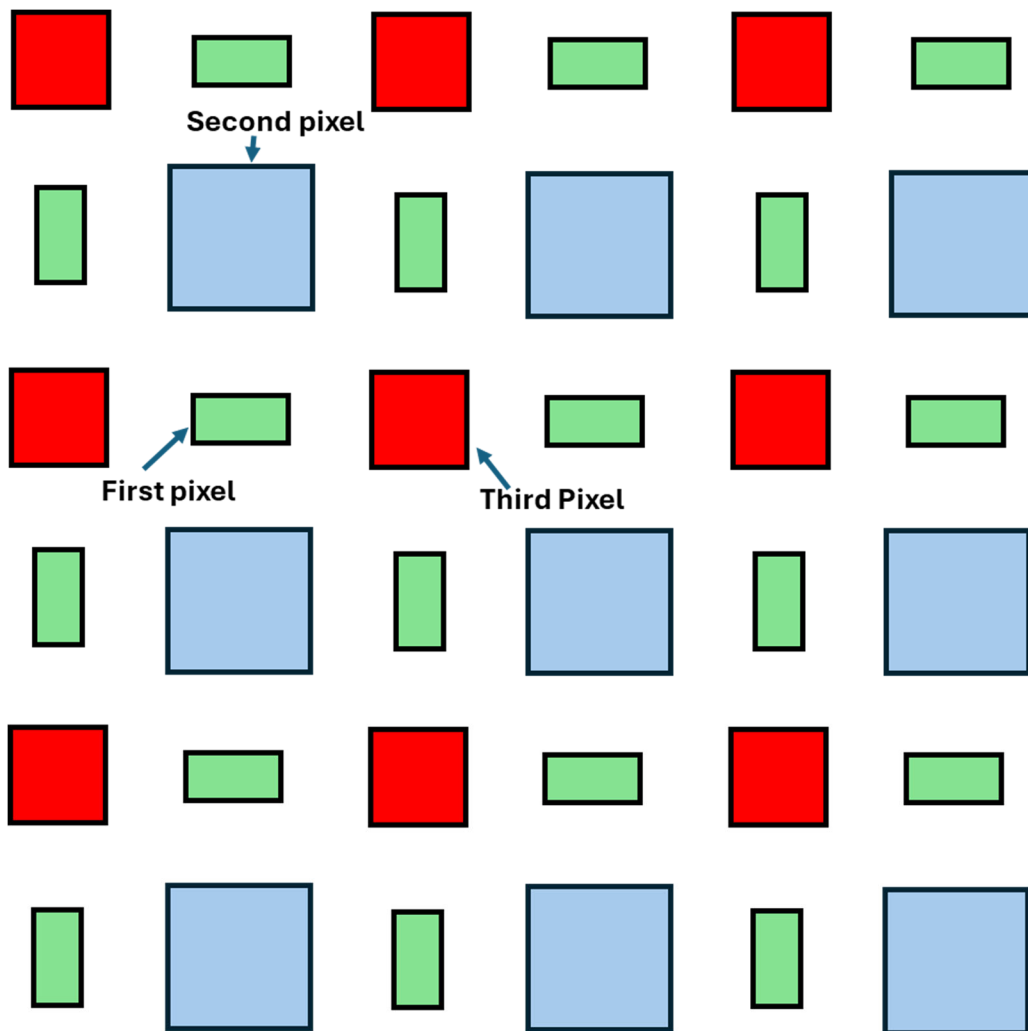
k. 1[J]

wherein the second pixel has a larger area than that of the third pixel.

Cok discloses “a pixel pattern 10 in an OLED display device according to one embodiment of the present invention includes two green light emitting elements 14 having a first size (area), a red light emitting element 12 having a second smaller size, and a blue light emitting element 16 having a larger size.” (EX1004, 4:8-15; EX1002, ¶89.) Cok also discloses that “[f]or example, for some

combinations of materials, the green light emitting elements may be smaller than both the red and blue light emitting elements.” (EX1004, 4:16-21; EX1002, ¶89.)

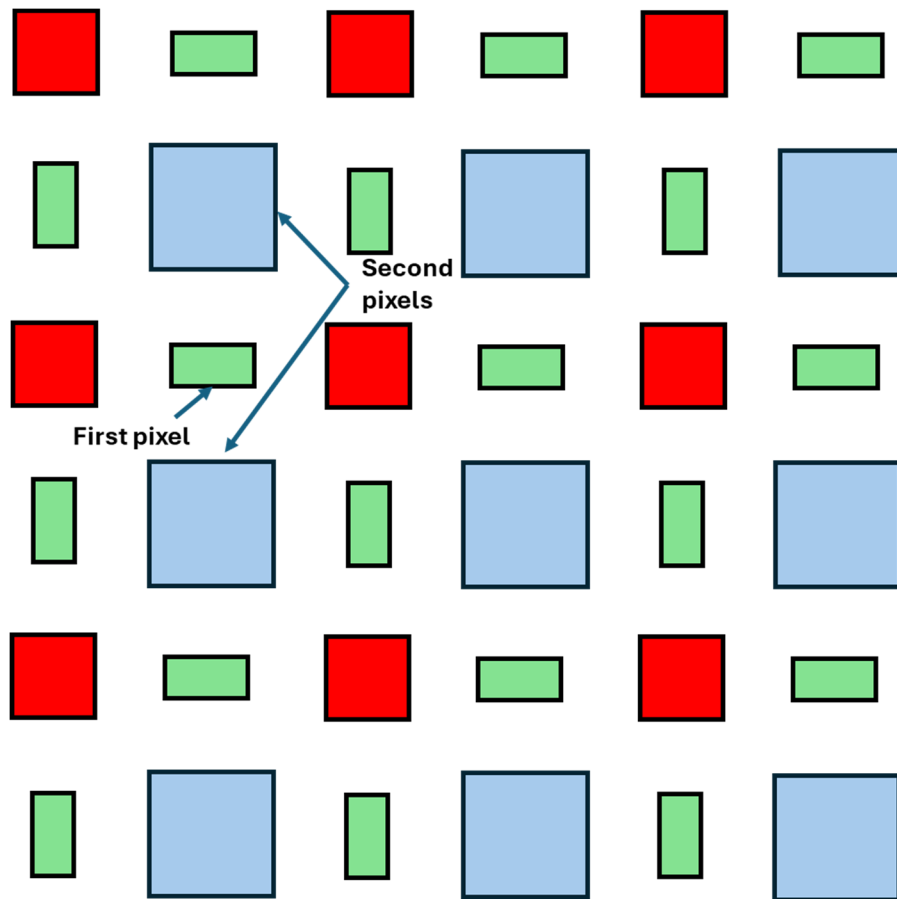
Additionally, as explained above, when considering the teachings of Hong, a POSITA would have modified Cok as shown below, with the blue pixel (e.g., the second pixel) having a larger area than the red pixel. (EX1002, ¶89.)



4. Claim 2

The pixel arrangement structure of claim 1, wherein the second pixel comprises a pair of second pixels, and the second pixels are separated from each other by the first pixel.

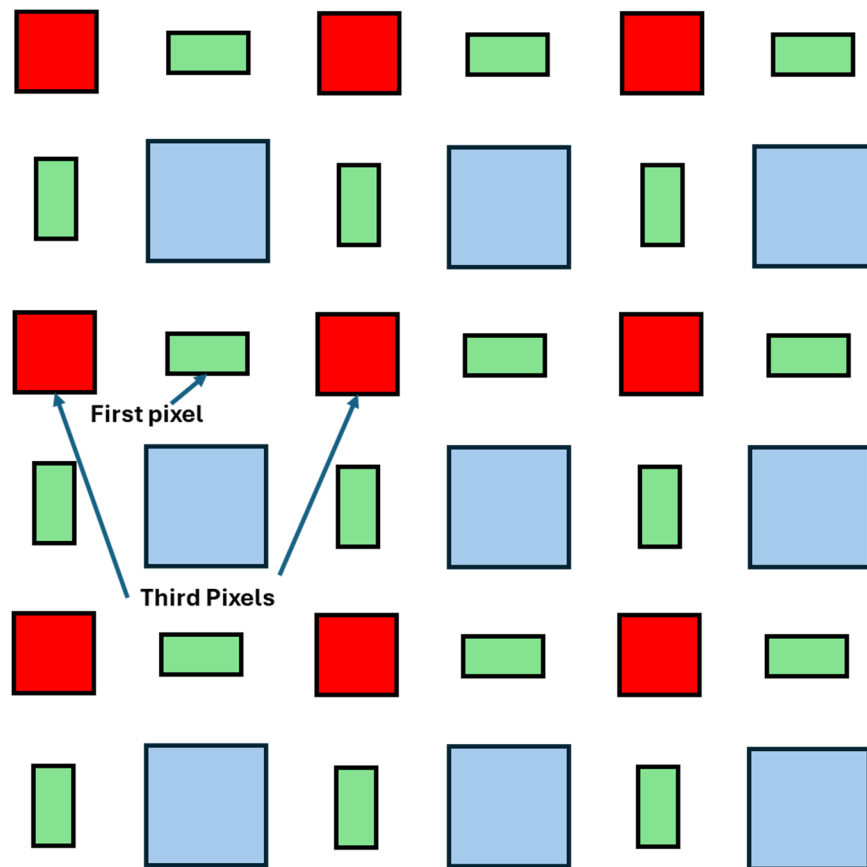
There is a pair of blue pixels (e.g., corresponding to the claimed “pair of second pixels”), which are separated by a green pixel (e.g., the first pixel), as shown below. (EX1002, ¶90.)



5. Claim 3

The pixel arrangement structure of claim 1, wherein the third pixel comprises a pair of third pixels, and the third pixels are separated from each other by the first pixel.

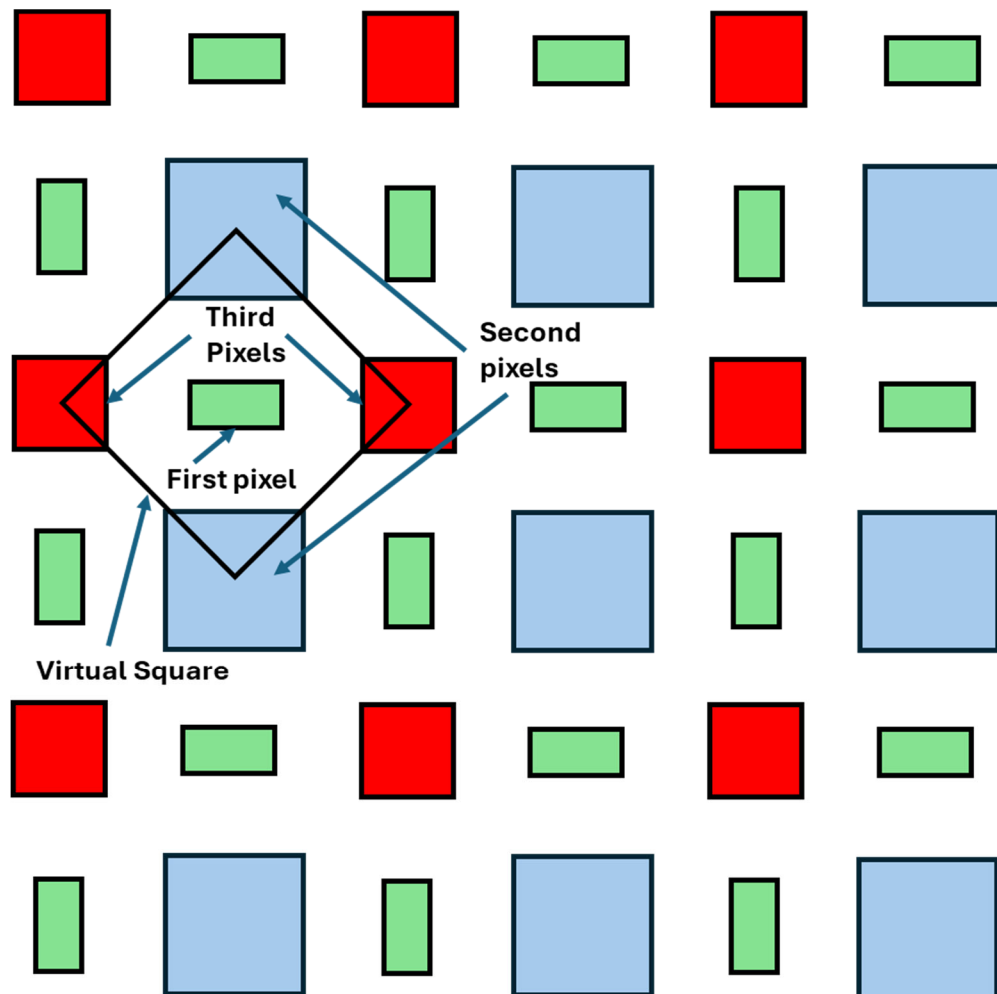
As shown below, there is a pair of red pixels (e.g., corresponding to the claimed “pair of third pixels”), which are separated by a green pixel (e.g., the first pixel). (EX1002, ¶91.)



6. Claim 4

The pixel arrangement structure of claim 1, wherein the second pixel comprises a pair of second pixels, the third pixel comprises a pair of third pixels, and the second pixels and the third pixels enclose the first pixel in the virtual square.

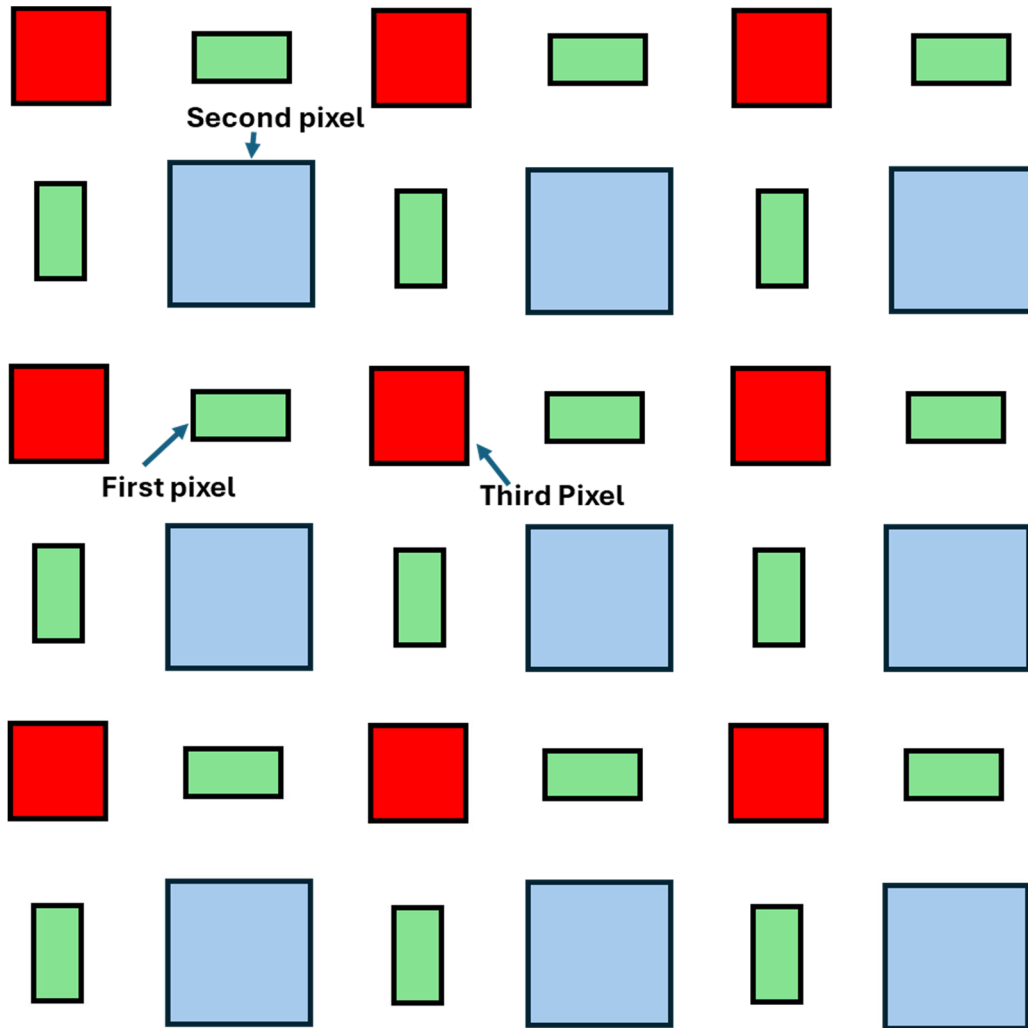
As shown below, there is a pair of blue pixels (e.g., a pair of second pixels) and a pair of red pixels (e.g., a pair of third pixels), which enclose a pixel (e.g., the first pixel) in a virtual square. (EX1002, ¶92.)



7. Claim 5

The pixel arrangement structure of claim 4, wherein each of the second pixels and the third pixels is larger in area than the first pixel.

Cok discloses that “for some combinations of materials, the green light emitting elements may be smaller than both the red and blue light emitting elements.” (EX1004, 4:16-21; EX1002, ¶93.) Additionally, as explained above, when using the relative sizes taught by Hong with the arrangement of Cok, a POSITA would have modified Cok as shown below, with the blue pixel (*e.g.*, the second pixel) having the largest area, the red pixel (*e.g.*, the third pixel) having an intermediate area, and the green pixel having the smallest area. (EX1002, ¶93.)



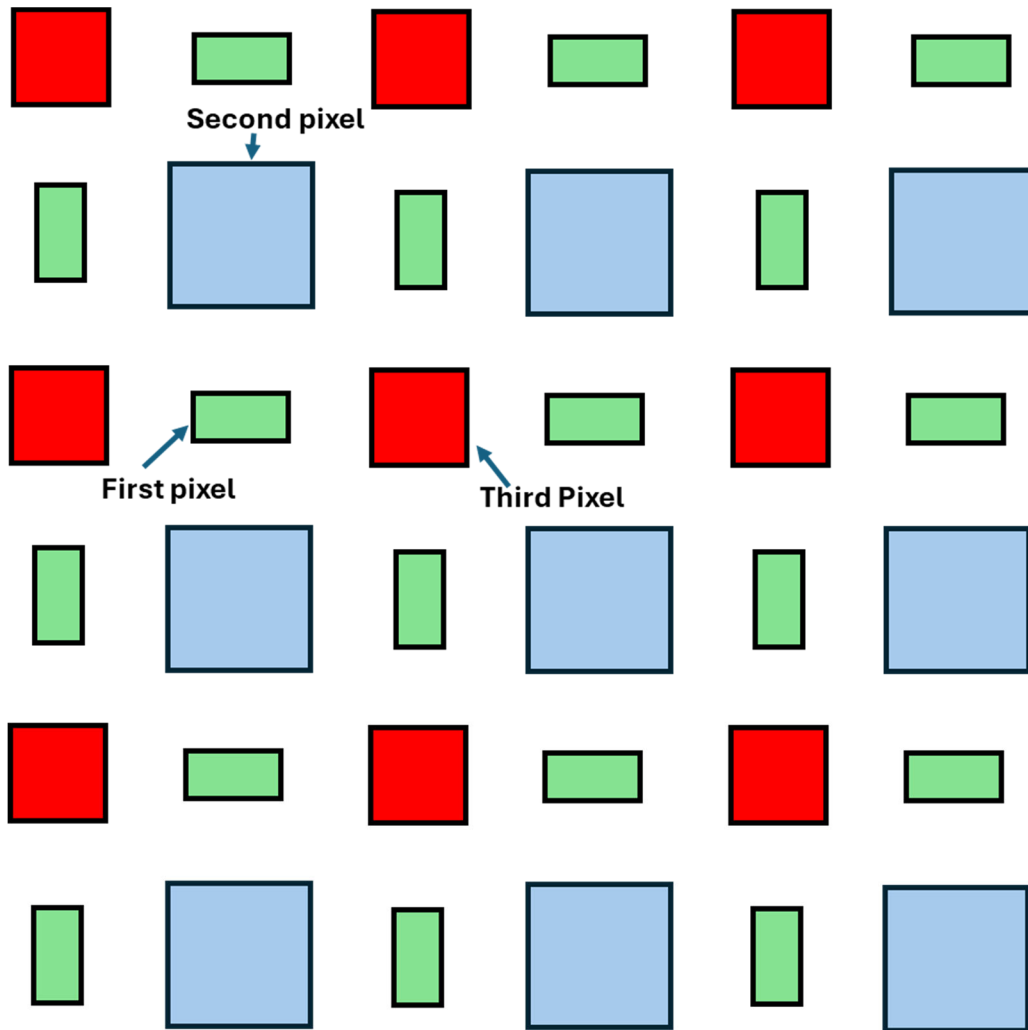
8. Claim 10

The pixel arrangement structure of claim 1, wherein the first pixel, the second pixel, and the third pixel are configured to emit different color light.

Cok discloses “a pixel pattern 10 in an OLED display device according to one embodiment of the present invention includes two green light emitting elements 14 having a first size (area), a red light emitting element 12 having a second smaller size, and a blue light emitting element 16 having a larger size.”

(EX1004, 4:8-15; EX1002, ¶94.) This is also shown below in Cok’s FIG. 1, as

modified. (EX1002, ¶94.)

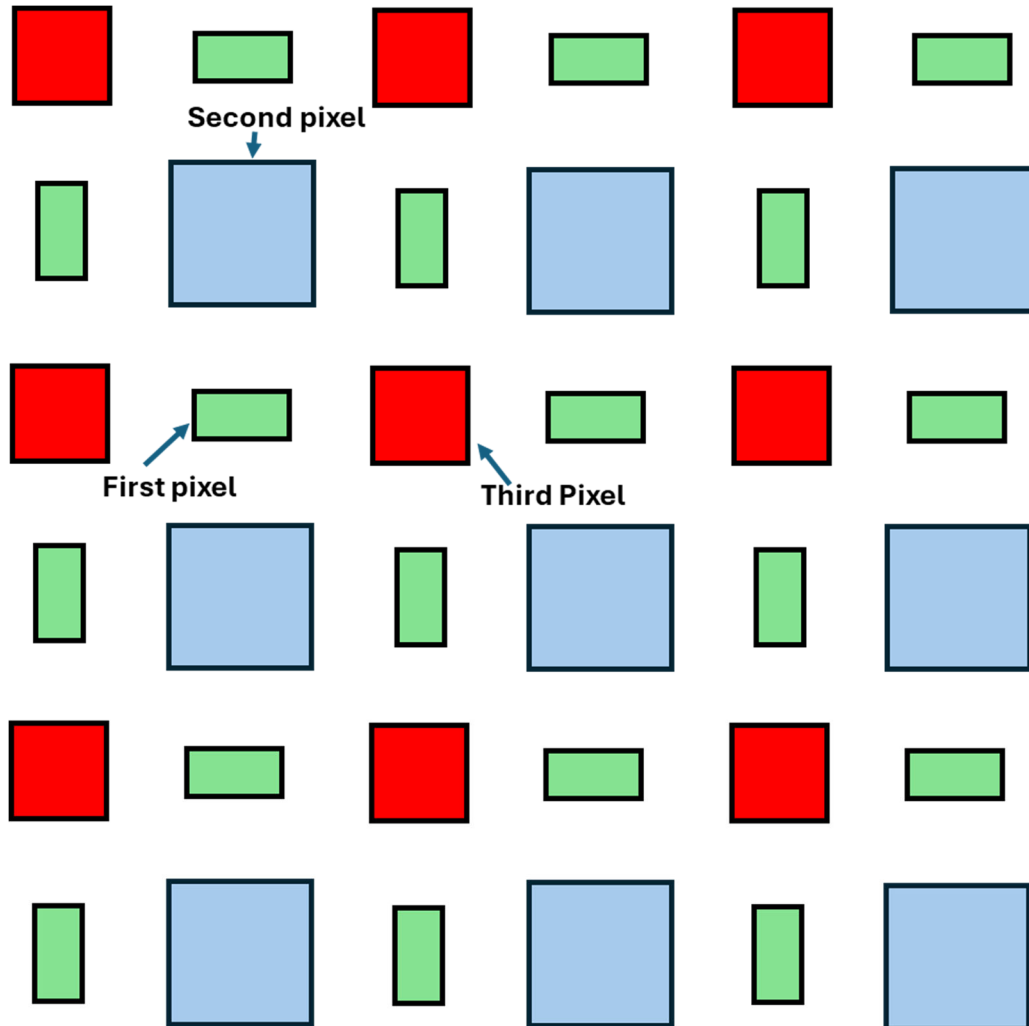


9. Claim 11

The pixel arrangement structure of claim 1, wherein the first pixel is configured to emit green light, one of the second pixel and the third pixel is configured to emit blue light, and another of the second pixel and the third pixel is configured to emit red light.

Cok discloses “a pixel pattern 10 in an OLED display device according to one embodiment of the present invention includes two green light emitting

elements 14 having a first size (area), a red light emitting element 12 having a second smaller size, and a blue light emitting element 16 having a larger size.”
 (EX1004, 4:8-15; EX1002, ¶95.) This is also shown below in Cok’s FIG. 1, as modified.



10. Claim 13

a. Preamble

A pixel arrangement structure of an organic light emitting diode (OLED) display, comprising:

Cok meets the preamble as set forth for claim 1, Preamble. (EX1002, ¶96.)

b. Limitation 13[A]

a plurality of individually addressable pixels for displaying images, the individually addressable pixels being minimum addressable units of the OLED display and comprising:

Cok meets this element as set forth for limitation 1[A]. (EX1002, ¶97.)

c. Limitation 13[B]

a first pixel having a center coinciding with a center of a virtual square;

Cok meets this element as set forth for limitation 1[B]. (EX1002, ¶98.)

d. Limitation 13[C]

another first pixel having a center coinciding with a center of another virtual square, the virtual squares sharing a common side having endpoints at a common first vertex and a common second vertex of the virtual squares, with neighboring vertices in each of the virtual squares corresponding to pixels configured to emit different color light;

Cok meets this element as set forth for limitation 1[C]. (EX1002, ¶99.)

e. Limitation 13[D]

a second pixel separated from the first pixels and having a center at the first vertex;

Cok meets this element as set forth for limitation 1[D]. (EX1002, ¶100.)

f. Limitation 13[E]

a third pixel separated from the first pixels and the second pixel, and having a center at the second vertex,

Cok meets this element as set forth for limitation 1[F]. (EX1002, ¶101.)

g. Limitation 13[F]

the second pixel and the third pixel have polygonal shapes,

Cok meets this element as set forth for limitation 1[I]. (EX1002, ¶102.)

h. Limitation 13[G]

a shortest distance between the first pixel and the second pixel as well as a shortest distance between the first pixel and the third pixel is a same first length, and

Cok in view of Hong meets this element as set forth for limitation 1[G].

(EX1002, ¶103.)

i. Limitation 13[H]

a shortest distance between the first pixels is a second length that is longer than the first length and a shortest distance between each of the second pixels and the third pixels.

Cok in view of Hong meets this element as set forth for limitation 1[H].

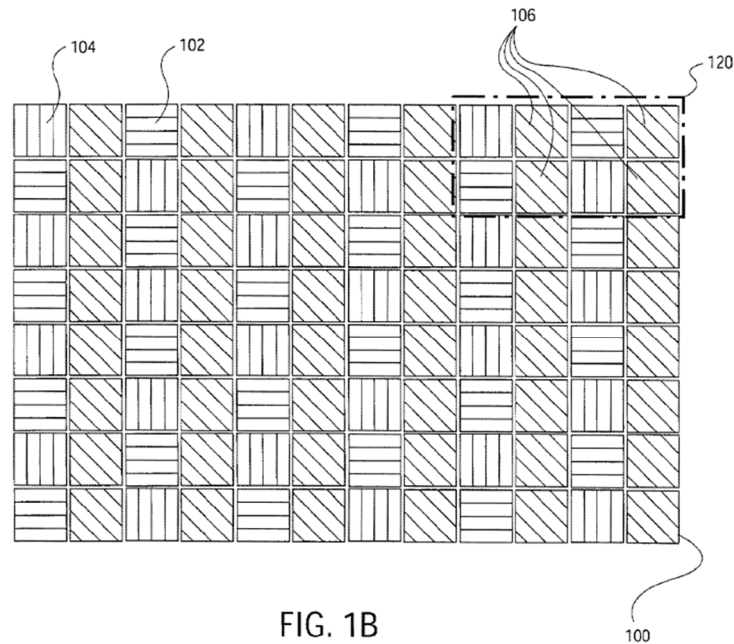
(EX1002, ¶104.)

B. Ground 2: Credelle-379 And Hong Render Obvious Claims 1-5, 10, 11, and 13

Credelle-379 was filed on October 22, 2002, published on July 10, 2003, and issued on February 17, 2009. (EX1005.) Credelle-379 qualifies as prior art to the '616 patent under at least §§ 102(a), (b), and (e). Credelle-379, as a published application (EX1017), was considered by the Examiner, but the Examiner never applied the published application in any rejection and, in fact, only considered the published application after the claims were allowed. (EX1003, 42, 59-60, 70-71.)

1. Summary of Credelle-379

Credelle-379 discloses “improved color pixel arrangements” which can be “implemented in other display technologies such as Organic Light Emitting Diode (OLED).” (EX1005, 1:45-46, 10:52-54.) Credelle-379 discloses arrangements of sub-pixel emitters comprising repeated octal groupings 120, as shown below in FIG. 1B (below), where “the colors are assigned as red 104, blue 102, and non-luminance balanced green 106.” (*Id.*, 4:22-23.) Each octal pattern 120 includes “twice as many green 106 as there are of the other two colors, red 104 and blue 102,” creating an RGBG pixel pattern. (*Id.*, 4:24-25.)



Credelle-379 also describes various ways the pixel arrangement of FIG. 1B can be altered. For example, FIG. 1C shows the sub-pixels adjusted “in size and aspect ratio,” with the green sub-pixels 106 reduced in size compared to the blue and red sub-pixels 102 and 104. (*Id.*, 4:11-14.)

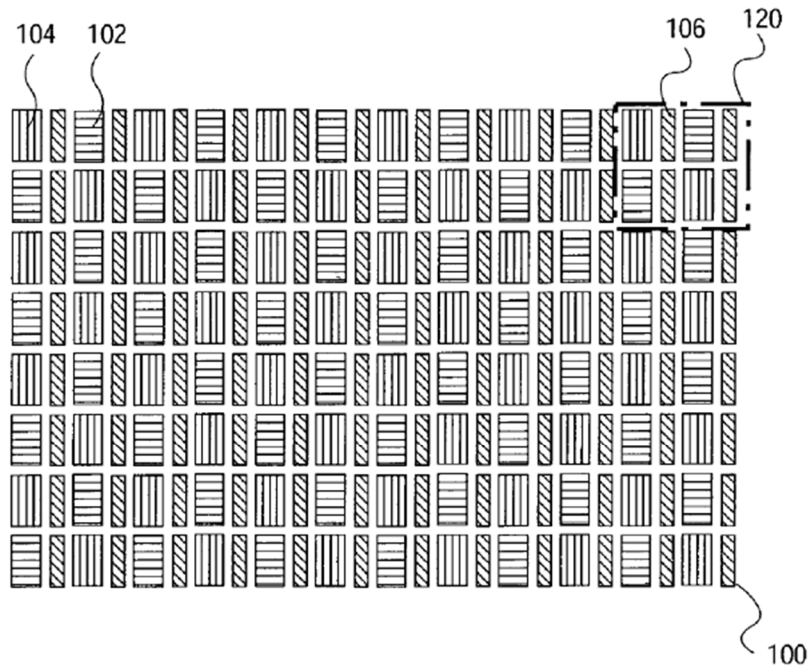


FIG. 1C

Credelle-379 also discloses that the sub-pixels are spaced apart from one another, as seen in FIGS. 1B and 1C, as well as FIG. 12. The pixel array in FIG. 12 also teaches that the pixels are arranged in a grid with equal spacing between the centers of the pixels. For example, FIG. 12 of Credelle-379 also shows the distance between the center of a blue pixel and the center of a red pixel is 160 μm for a typical display in the 2000s.

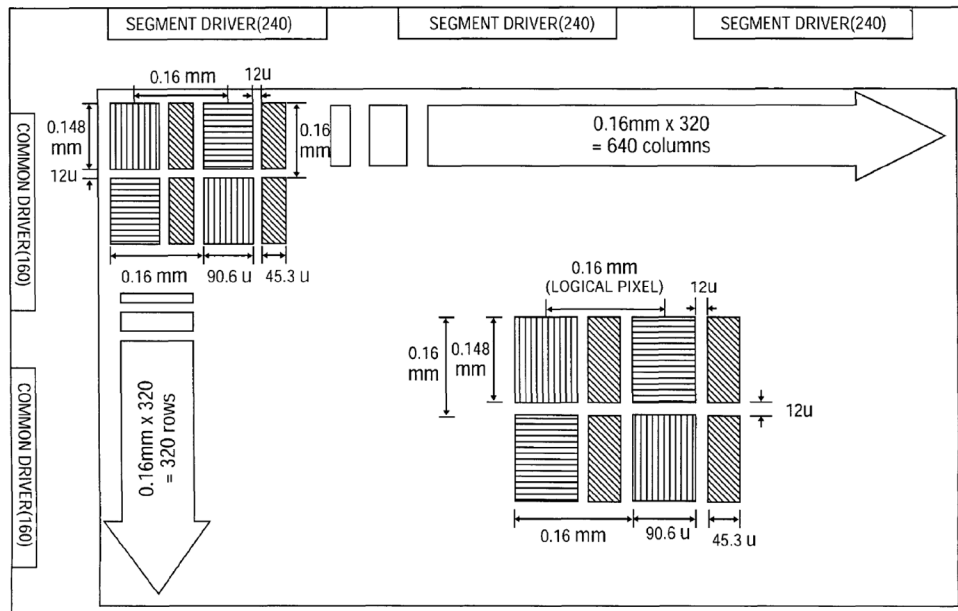
FIG. 12

FIG. 12 shows a spacing of 12 μm between edges of the sub-pixels, but Credelle-379 explains that “[a]lthough various sub-pixel dimensions are also disclosed in FIG. 12, it should be appreciated that other dimensions would also suffice and that FIG. 12 is merely offered for illustrative purposes for a single embodiment.” (EX1005, 10:39-44.)

As seen in FIGS. 1B and 1C, the sub-pixels are spaced apart, and when the sizes and aspect ratios of the sub-pixels are altered, the spacings between the sub-pixels are also altered to achieve the desired repeat group 120 shape. (*Id.*, FIGS. 1B and 1C.) For example, Credelle-379 discloses that “the sub-pixel aspect ratios may be adjusted so that the display array 100 consists of square repeat cell groups 120. This will put the majority color sub-pixel emitter 106 on a square grid. It will also put the minority color sub-pixel emitters 102 and 104 on, or nearly on, an

idealized “checkerboard.” (*Id.*, 4:27-32.)

Beyond changing the sizes, aspect ratios, and spacings of the sub-pixels, Credelle-379 also discloses that “so too may the exact positions of the subpixels be varied under the scope of the present invention. For example, FIGS. 8A and 8B depict a similar octal subpixel grouping wherein one or both of the majority stripes 106 are offset (relatively or otherwise) from the other subpixels 102 and 104. Other vertical offsets are also possible.” (*Id.*, 4:59-65.)

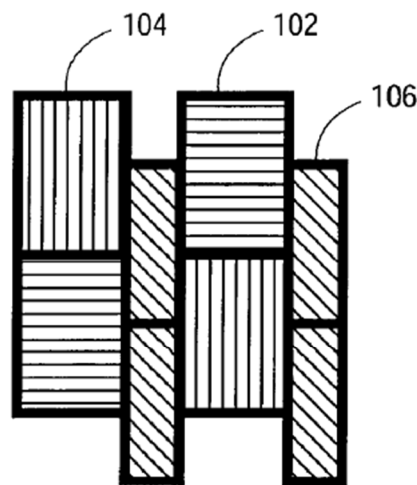


FIG. 8A

Although the figures show rectangular sub-pixels, Credelle-379 explains that “[i]t should be appreciated that other shapes to the subpixels are also possible and are contemplated within the scope of the present invention. For example, a multitude of other regular or irregular shapes for the subpixels are possible and are

desirable if manufacturable. It suffices only that there is an octal grouping of colored subpixels in the fashion herein described.” (*Id.*, 4:51-57.)

Credelle-379 is analogous art to the '616 patent at least because Credelle-379 is directed to the same problem (pixel arrangements) in the same field of endeavor (OLED displays) as the '616 patent. (EX1002, ¶112.)

2. Claim 1

a. Preamble

A pixel arrangement structure of an organic light emitting diode (OLED) display, comprising:

Credelle-379 discloses that “[t]he present application relates to improvements to display layouts, and, more particularly, to improved color pixel arrangements,” which can be used for display technologies such as “Active Matrix Organic Light Emitting Diode Display (AMOLED).” (EX1005, 1:44-46, 5:55-57, 13:26-33; EX1002, ¶113.)

b. Limitation 1[A]

a plurality of individually addressable pixels for displaying images, the individually addressable pixels being minimum addressable units of the OLED display and comprising:

Credelle-379 discloses “improved color pixel arrangements,” which can be used for display technologies such as “Active Matrix Organic Light Emitting

Diode Display (AMOLED).” (EX1005, 1:44-46, 5:55-57, 13:26-33.) Although Credelle-379 describes the individual light emitting elements as “emitters” or “sub-pixels,” a POSITA would have understood that these terms are merely referring to the same components as the claimed “pixels” in the ’616 patent. (*Id.*, 2:34-37; EX1002, ¶114.) A POSITA would have known that a characteristic of AMOLEDs is that each sub-pixel of Credelle-379 (corresponding to the claimed “pixels”) has its own dedicated circuitry, such that the sub-pixels are individually addressable. (EX1002, ¶114.)

c. Limitation 1[B]

a first pixel having a center coinciding with a center of a virtual square;

Credelle-379 teaches the pixel arrangement shown in FIG. 1C, below.

(EX1005, FIG. 1C.) The green pixels are positioned such that the centers of the green pixels are on an equal grid spacing, as shown by the red square (*e.g.*, a virtual square) below. (EX1002, ¶115.)

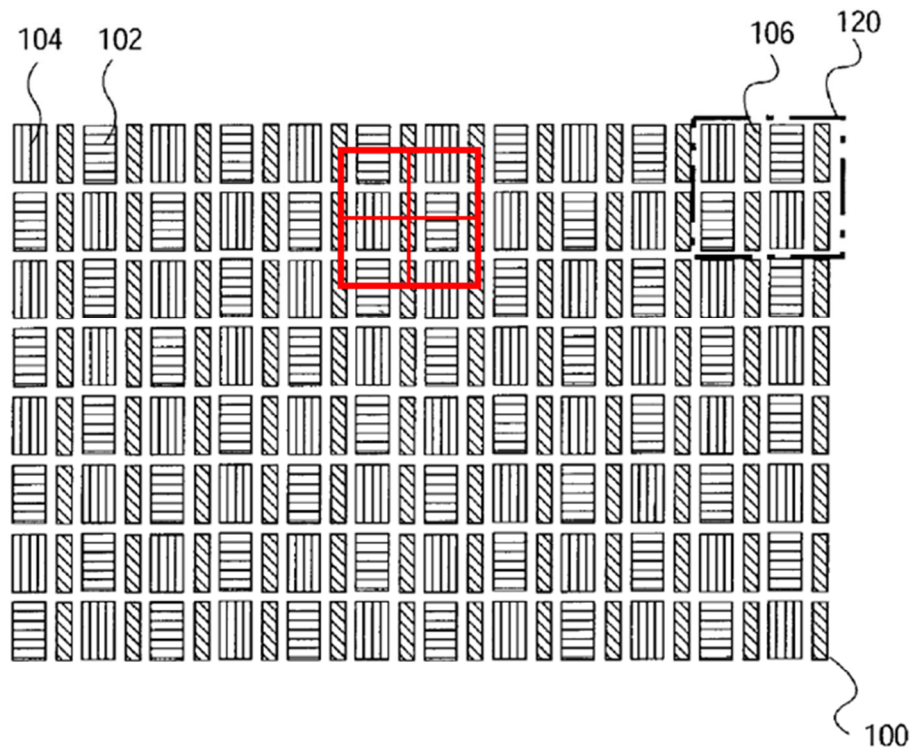
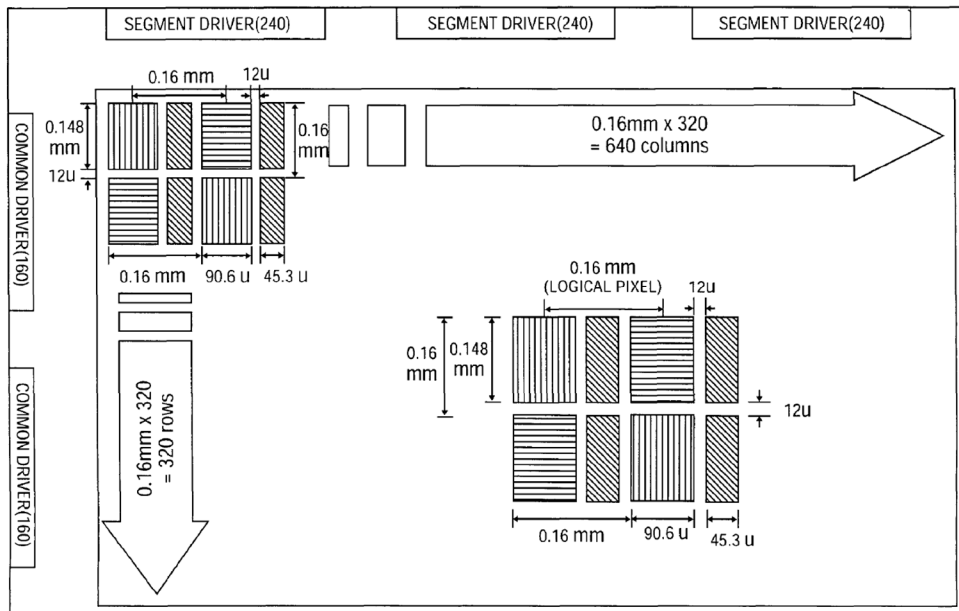
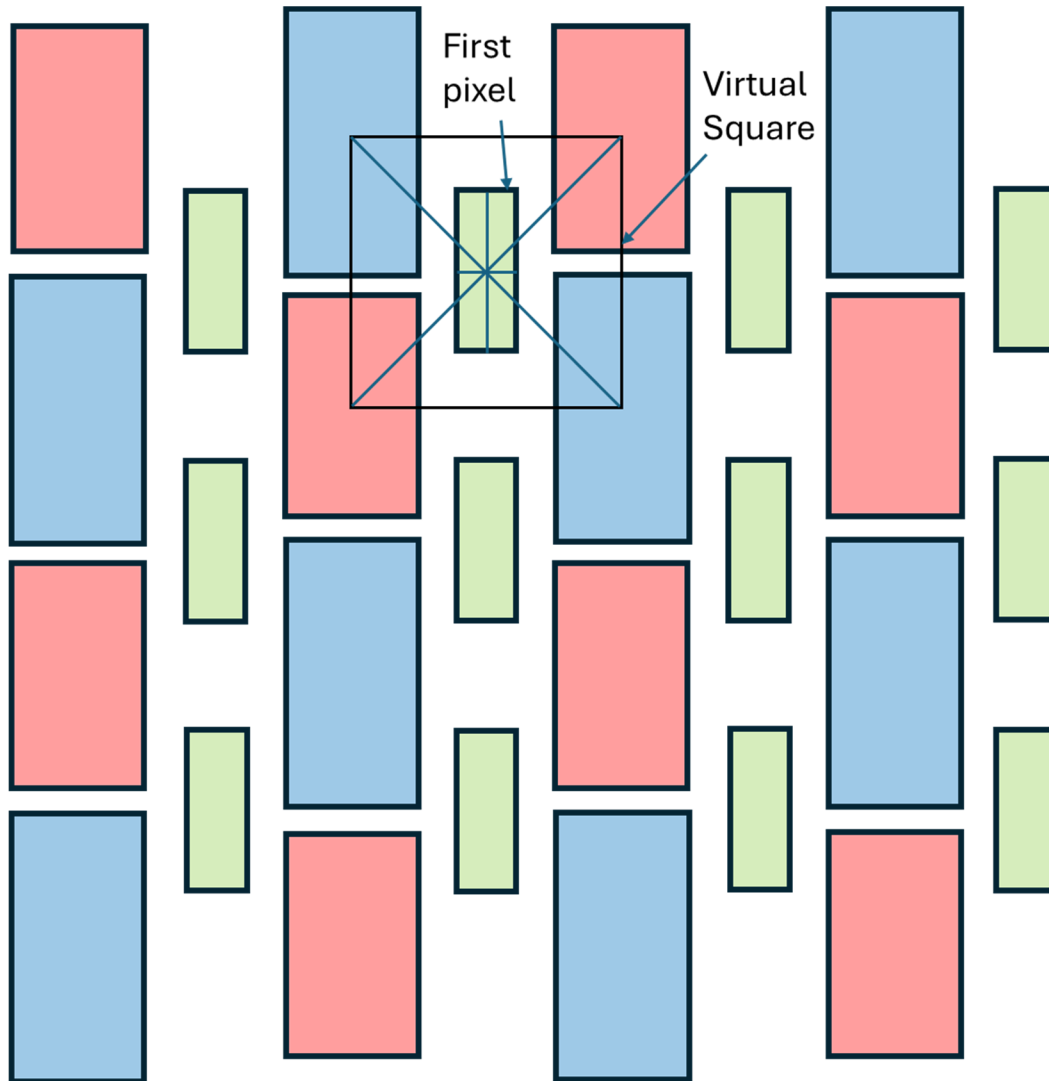


FIG. 1C

FIG. 12 of Credelle-379 also teaches that the spacing between the centers of the blue and red pixels, and correspondingly, the spacing between the centers of the green pixels, is 160 μm for an exemplary display. (EX1005, FIG. 12.)

FIG. 12

As discussed above, Credelle-379 teaches that the relative sizes, aspect ratios, spacings (*e.g.*, as shown by the modification of the pixel arrangement structure of FIG. 1B to the one shown in FIG. 1C), and positions (*e.g.*, particularly vertical offsets as shown in FIG. 8A and 8B) of the pixels can be altered. (EX1005, 4:27-32, 4:52-57, 4:59-65, 10:39-44, FIGS. 1B, 1C, 8A, and 8B; EX1002, ¶117.) As discussed below, a POSITA would have been motivated to modify FIG. 1C of Credelle-379 as follows, with a green sub-pixel (*e.g.*, the claimed “first pixel”) of Credelle-379 having a center coinciding with a center of a virtual square. (EX1002, ¶117.)



Motivation to Combine Credelle-379 with Hong

A POSITA would have been motivated to modify FIG. 1C of Credelle-379 in order to improve the lifetime and performance of an OLED display. (EX1002, ¶118.) Between the publication date of Credelle-379 in 2003 and the publication of Hong in 2011, and certainly by the priority date of the challenged patent here, there was “rapid development” of OLED technology, including in the organic materials used for the emission layers of an OLED display. (EX1007, 310.) For

example, Hong (filed in 2010), when describing known efficiencies of materials commonly used at the time, discloses that green pixels can be the most efficient, blue pixels can be the least efficient, and red pixels can have an intermediate efficiency. (EX1008, [0074].) In another example, Nishimura (circa 2009) describes new phosphorescent host materials for red and green phosphorescent emitters, such that green pixels can be the most efficient, blue pixels can be the least efficient, and red pixels can have an intermediate efficiency. (EX1007, Table 3.) In view of this knowledge, a POSITA would have been motivated to use such improved materials to improve the lifetime, as well as reduce power-consumption, of an OLED display. (EX1002, ¶118.)

To account for the difference in efficiency when using such improved materials, the POSITA would have been motivated to make provide the least area to the green pixels the smallest and the most to the blue pixels the largest, with the red pixels having an intermediate size area compared to the green and blue pixels, in accordance with the teachings of Hong. (EX1004, 3:18-24; EX1008, [0074]; EX1002, ¶119.) As shown in Figure 12, the Credelle-379 layout assigns equal total area to each color: the red and blue pixels have the same size, which is twice the size of each green pixel, offsetting the fact that there are twice as many green pixels as red or blue. (EX1002, ¶119.) Thus, a POSITA would have followed Hong in increasing the area of the blue pixels and decreasing the area of the green

pixels. (*Id.*) Such a modification would have been a simple application of the sizing taught by Hong to form the OLED display taught by Credelle-379 with predictable results because the two references describe the same, underlying OLED technology. (*Id.*)

Further, a POSITA would have understood that vertically offsetting the green pixels as taught by FIG. 8A of Credelle-379 would create an array with improved visual properties and improved manufacturability. (EX1002, ¶120.) For example, the pixel arrangement in Fig. 8A creates a pattern with a green pixel at the center and surrounded by shared red and blue pixels. (*Id.*) Additionally, a POSITA would have known that shifting the green sub-pixels vertically by one half of the pixel spacing would have allowed the array of pixels to be rotated. (*Id.*) This would have allowed for manufacturing flexibility in the position of thin film transistors and interconnections. (*Id.*) A POSITA would have also known that offsetting the green pixel is compatible with sub-pixel rendering. (*Id.*)

A POSITA would also have maintained the spacing between the centers of the blue and red pixels, and correspondingly, the spacing between the centers of the green pixels, as 160 μm . (EX1002, ¶¶121, 124.) This is at least because Credelle-379 also discloses that the sub-pixels are spaced apart from one another, as seen in FIGS. 1B and 1C, as well as FIG. 12. (*Id.*, ¶107.) The pixel array in FIG. 12 also teaches that the pixels are arranged in a grid with equal spacing

between the centers of the pixels. (*Id.*) For example, FIG. 12 of Credelle-379 also shows the distance between the center of a blue pixel and the center of a red pixel is 160 μm for a typical display in the 2000s. (*Id.*)

Combining Hong's teachings with FIG. 1C of Credelle-379 and vertically offsetting the green sub-pixels as shown in FIG. 8A of Credelle-379, a POSITA would arrive at the arrangement shown above. (EX1002, ¶122.)

The POSITA would have also recognized that such a modification would be compatible with the teaching of Hong to maintain the distance between the first (*e.g.*, green) pixel and the second (*e.g.*, blue) pixel as well as a shortest distance between the first (*e.g.*, green) pixel and the third (*e.g.*, red) pixel as a same first length d_1 in order to prevent or reduce shadowing. (EX1008, [0048]; EX1002, ¶126.)

A POSITA would have found it obvious to use the relative sizes taught in Hong for adjusting the pixel arrangement of Credelle-379. Both Credelle-379 and Hong are analogous art because they are in the same field as the '616 patent. *Wyers*, 616 F.3d at 1238-39. (*See also* EX1002, ¶127.) Like the '616 patent, Credelle-379 is directed to "improvements to display layouts, and, more particularly, to improved color pixel arrangements" that can be used in OLED (including AMOLED) displays. (EX1005, 1:44-46, 5:55-57.) Similarly, Hong is directed to "organic electroluminescent display (ELD) device." (EX1008, [0005].)

Making this combination would have been a simple substitution of one set of dimensions (the relative areas taught by Hong) for another (the relative areas of Credelle-379 FIG. 1C) with predictable results given that the two references describe the same, underlying OLED technology. (EX1002, ¶128.) Indeed, a POSITA would have viewed Hong as disclosing just one more way to dimension Credelle-379's sub-pixels given improvements in OLED materials. (*Id.*)

Moreover, a POSITA would have recognized that the substitution would provide benefits. (EX1002, ¶129.) As taught by Hong, adjusting the sizes of the pixels in this manner would allow the different color pixels to “have the same brightness as each other,” such that “uniformity in brightness and the controllability of white balance are improved.” (EX1008, [0074].)

Additionally, as found by the Board—and unrebutted by Patent Owner—during the original examination of the '616 patent, “an artisan would have been motivated at the time of the invention to combine [Credelle-179's] system with Kim's different sub-pixel sizes because the different sub-pixel sizes can correct white balance and color coordinate.” (EX1003, 121.) Although the Examiner's analysis refers to Credelle-179, which taught different shapes and vertical offsets and not explicitly different sizes, the same analysis applies even more strongly to Credelle-379, which explicitly contemplates altering pixel size in addition to altering shapes and vertical offsets. (EX1003, 121; EX1005, 4:27-32, 4:52-57,

4:59-65, 10:39-44, FIGS. 1B, 1C, 8A, and 8B; EX1002, ¶130; *see also* EX1018 for a comparison of Credelle-179 and Credelle-379.)

Further, the POSITA would have recognized that maintaining the distance between the first (*e.g.*, green) pixel and the second (*e.g.*, blue) pixel as well as a shortest distance between the first (*e.g.*, green) pixel and the third (*e.g.*, red) pixel as a same first length, as taught by Hong, would improve the manufacturability of an OLED display by preventing or reducing shadowing caused by the deposition process. (EX1002, ¶131.) Credelle-379 is silent with respect to manufacturing an OLED display, and thus a POSITA would have looked to Hong to supply those details. (*Id.*) As discussed above, Hong teaches the use of a shadow mask for patterning the pixels. (EX1008, [0070]-[0072].) Such a shadow mask, because it is made of metal, is susceptible to thermal expansion, such that the shadow mask may warp while the pixels are being formed during a vacuum thermal evaporation method. (*Id.*, [0072].) A POSITA would have understood that shadowing or color mixing can occur even if multiple masks are used because all masks will experience deformations such as warpage. (EX1002, ¶131.) The POSITA would have also recognized that the equal spacing taught by Hong can minimize the effects of such warpage and thermal deformation. (*Id.*)

Because the direction and extent of mask deformations are unknown, a POSITA would have understood that keeping the spacings between the green and

red pixels the same as the spacing between the green and blue pixels would result in the least amount of shadowing. (EX1002, ¶132.) This consistency in spacing and positioning allows for a more consistent application of each color, reducing the likelihood of color mixing or unintended patterns that can arise from uneven deposition. (*Id.*) Additionally, because the direction and extent of mask deformations are unpredictable, maintaining equal spacings between the green-blue pixel pairs and the green-red pixel pairs acts as a safeguard, ensuring that any deformation will have a consistent effect rather than creating localized areas of excessive shadowing or color mixing. (*Id.*)

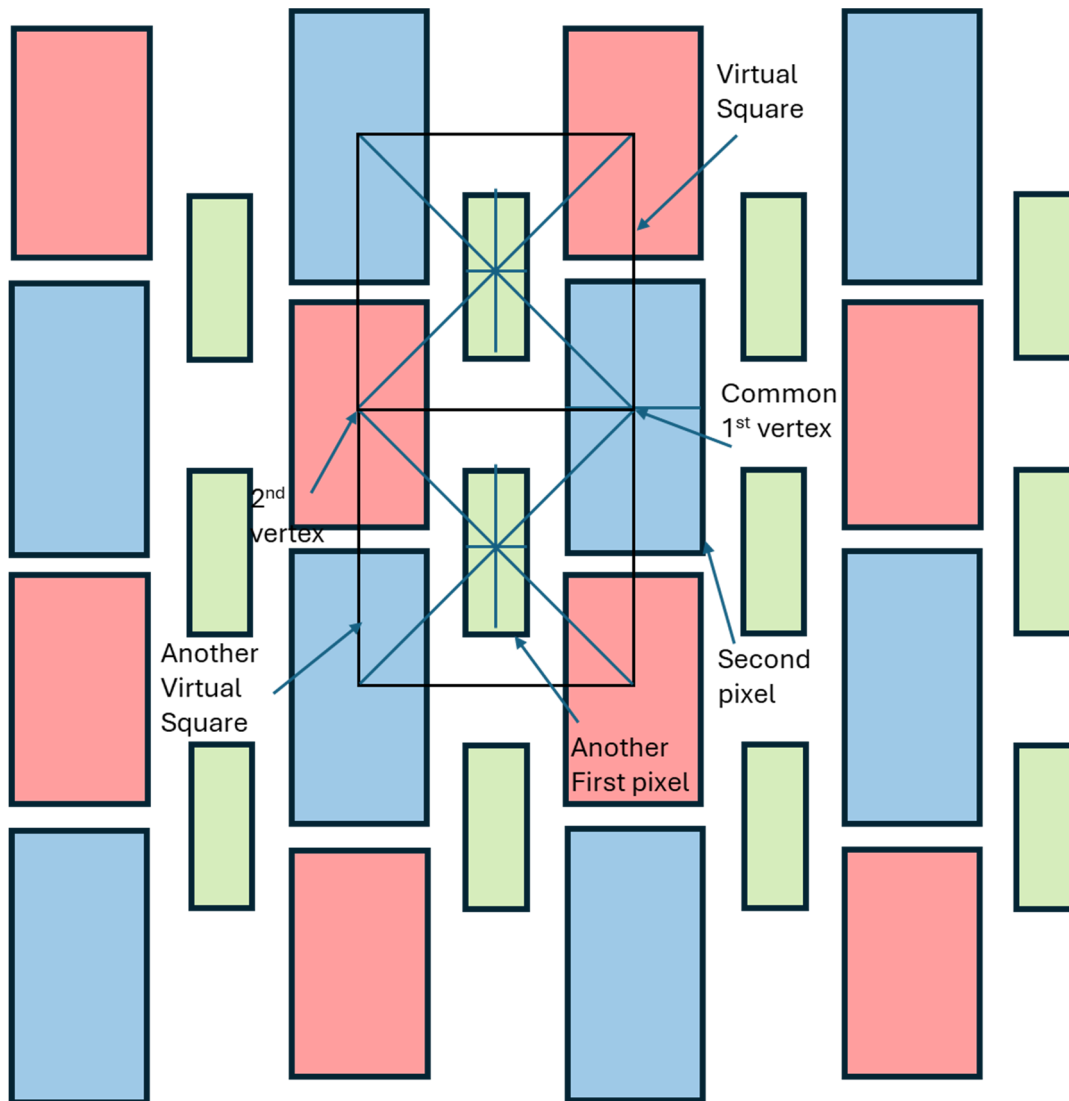
Thus, the POSITA would have been motivated to maintain an equal minimum distance between the green-blue pixel pairs and the green-red pixel pairs, such that the shadowing effect will be reduced equally in those directions. (EX1002, ¶133.) Similarly, a POSITA would have recognized that shadow masks for forming a display with unequal subpixel sizes would benefit in the same manner as with equal size subpixels; that is, a minimum equal distance between the green-blue pixel pairs and the green-red pixel pairs will mitigate the shadowing effect. (*Id.*) Accordingly, the POSITA would have recognized that adopting Hong's teaching of equal distances between the green-blue pixel pairs and the green-red pixel pairs would mitigate the adverse effects of thermal expansion. (*Id.*)

A POSITA would have reasonably expected the combination to succeed. (EX1002, ¶134.) Both references relate to OLED display technology. (*Id.*) And Credelle-379 itself discloses that the relative sizes, aspect ratios, spacings (*e.g.*, as shown by the modification of the pixel arrangement structure of FIG. 1B to the one shown in FIG. 1C), and positions (*e.g.*, particularly vertical offsets as shown in FIG. 8A and 8B) of the pixels can be altered. (EX1005, 4:27-32, 4:52-57, 4:59-65, 10:39-44, FIGS. 1B, 1C, 8A, and 8B.) The combination of Credelle-379 and Hong, with its resulting pixel arrangement above, would have a reasonable expectation of success. (EX1002, ¶134.)

d. Limitation 1[C]

another first pixel having a center coinciding with a center of another virtual square, the virtual squares sharing a common side having endpoints at a common first vertex and a common second vertex of the virtual squares, with neighboring vertices in each of the virtual squares corresponding to pixels configured to emit different color light;

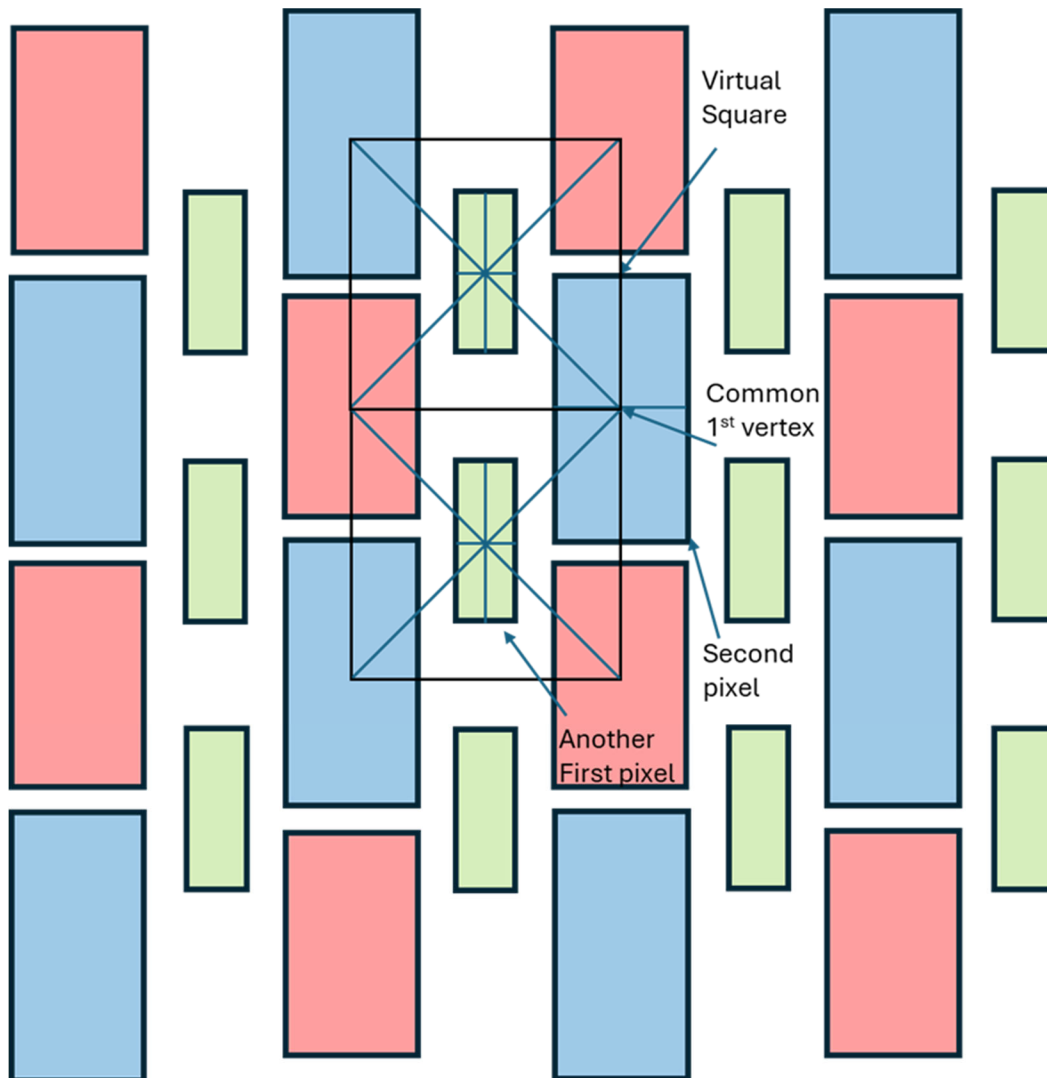
As shown below, another green sub-pixel (*e.g.*, corresponding to the claimed “another first pixel”) is at the center of another virtual square having a shared side and two common vertices with the first virtual square, with neighboring vertices corresponding to sub-pixels having different colors (*e.g.*, blue and red). (EX1002, ¶135.)



e. Limitation 1[D]

a second pixel separated from the first pixels and having a center at the first vertex;

As shown below, the blue sub-pixel (*e.g.*, corresponding to the claimed “second pixel”) is separated from the first (*e.g.*, green) sub-pixels, and has a center at the first vertex of the virtual square. (EX1002, ¶136.)

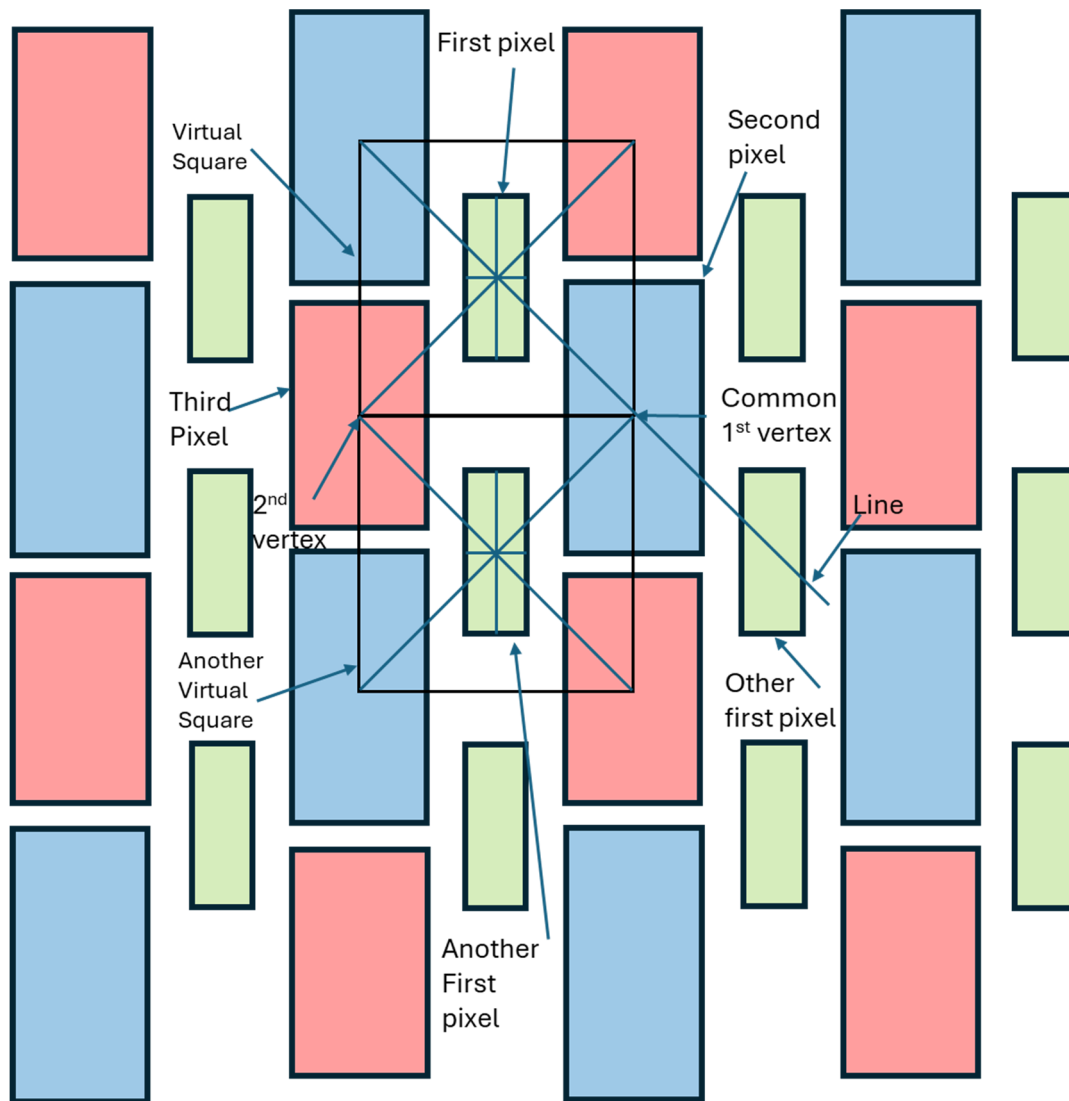


f. Limitation 1[E]

an other first pixel on a line defined by the center of the virtual square and the first vertex, the first pixel, the second pixel, and the other first pixel being consecutive pixels on the line; and

As shown below, an other green sub-pixel (e.g., corresponding to “an other first pixel”) is located on a line defined by the center of the first Virtual Square, with the pixel, second, and other pixel being consecutive pixels on the line.

(EX1002, ¶137.)



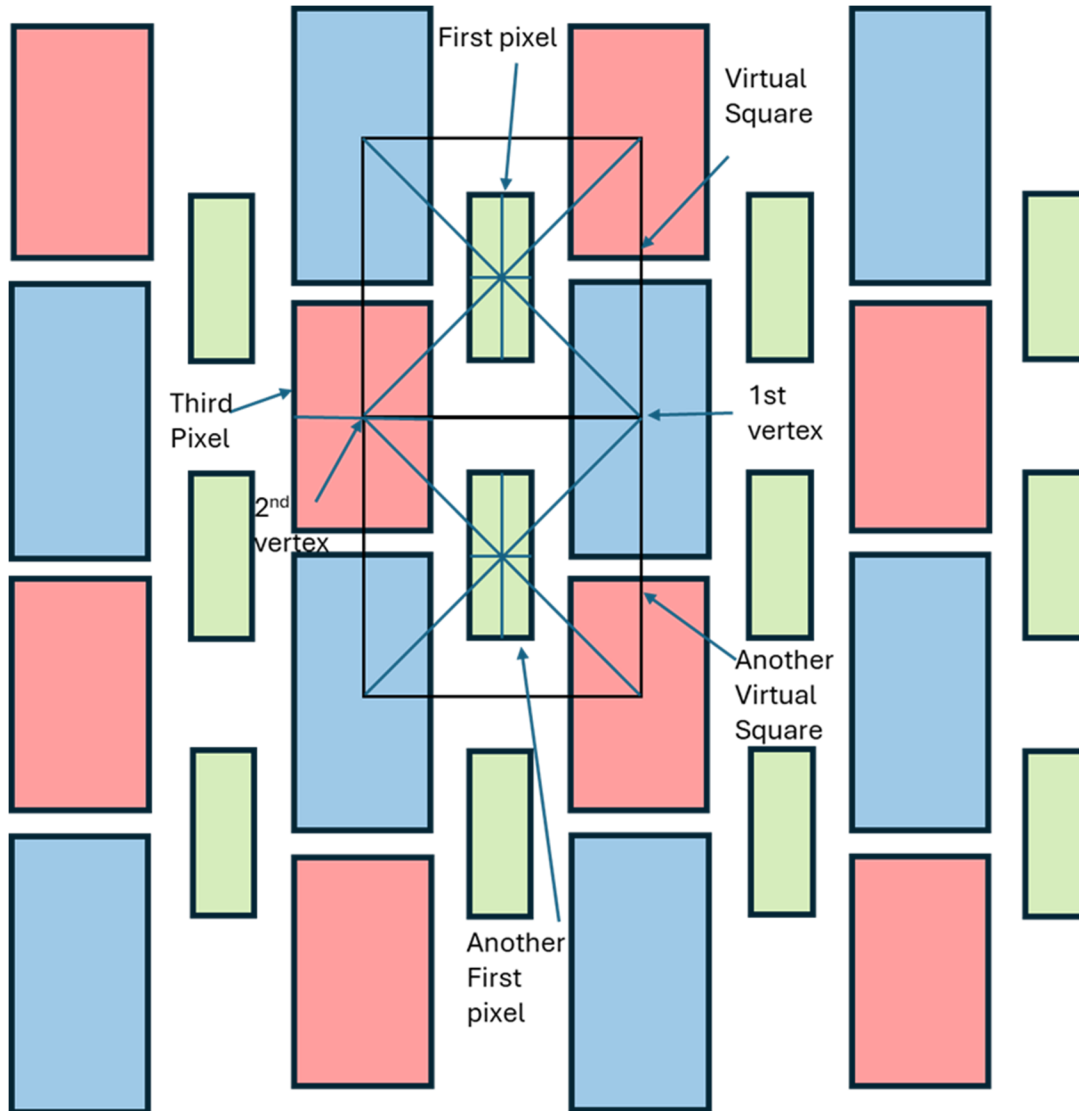
g. Limitation 1[F]

a third pixel separated from the first pixels and the second pixel, and having a center at the second vertex,

The red sub-pixel (e.g., corresponding to the claimed “third pixel”) is separated from the first (e.g., green) sub-pixels and the second (e.g., blue) sub-

pixel, and has a center at the second vertex of the virtual square, as shown below.

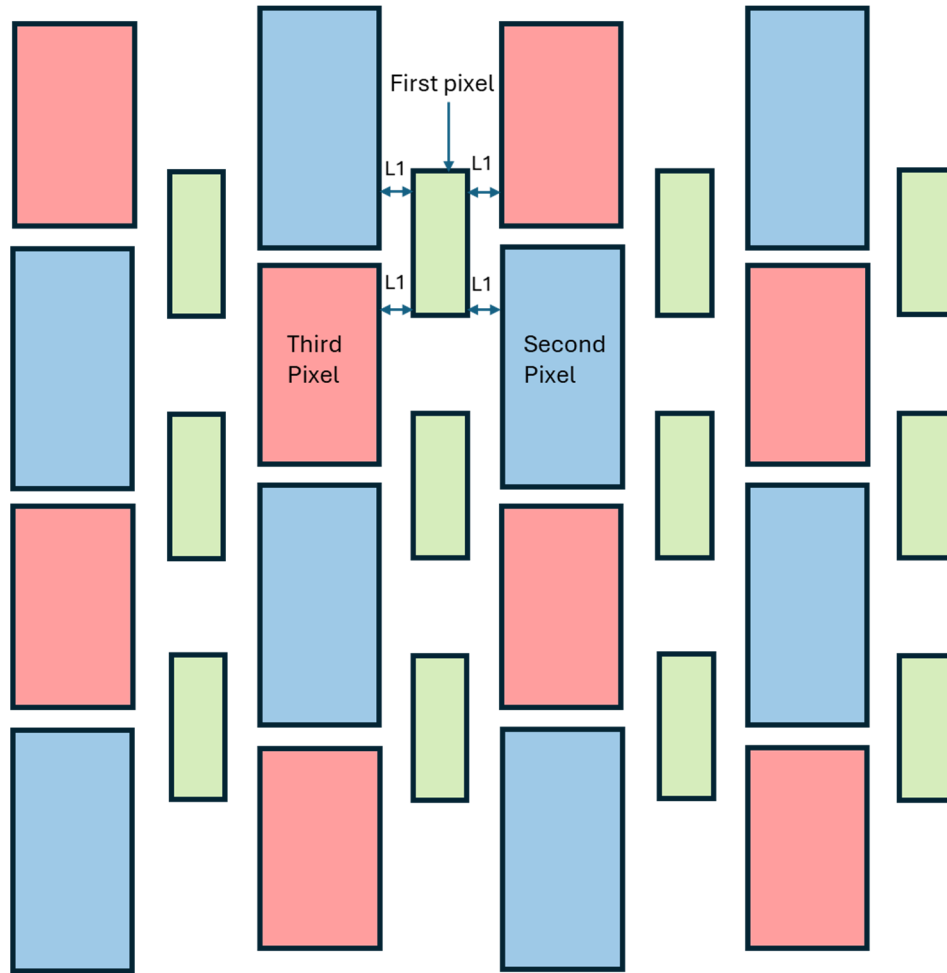
(EX1002, ¶138.)



h. Limitation 1[G]

wherein a shortest distance between the first pixel and the second pixel as well as a shortest distance between the first pixel and the third pixel is a same first length,

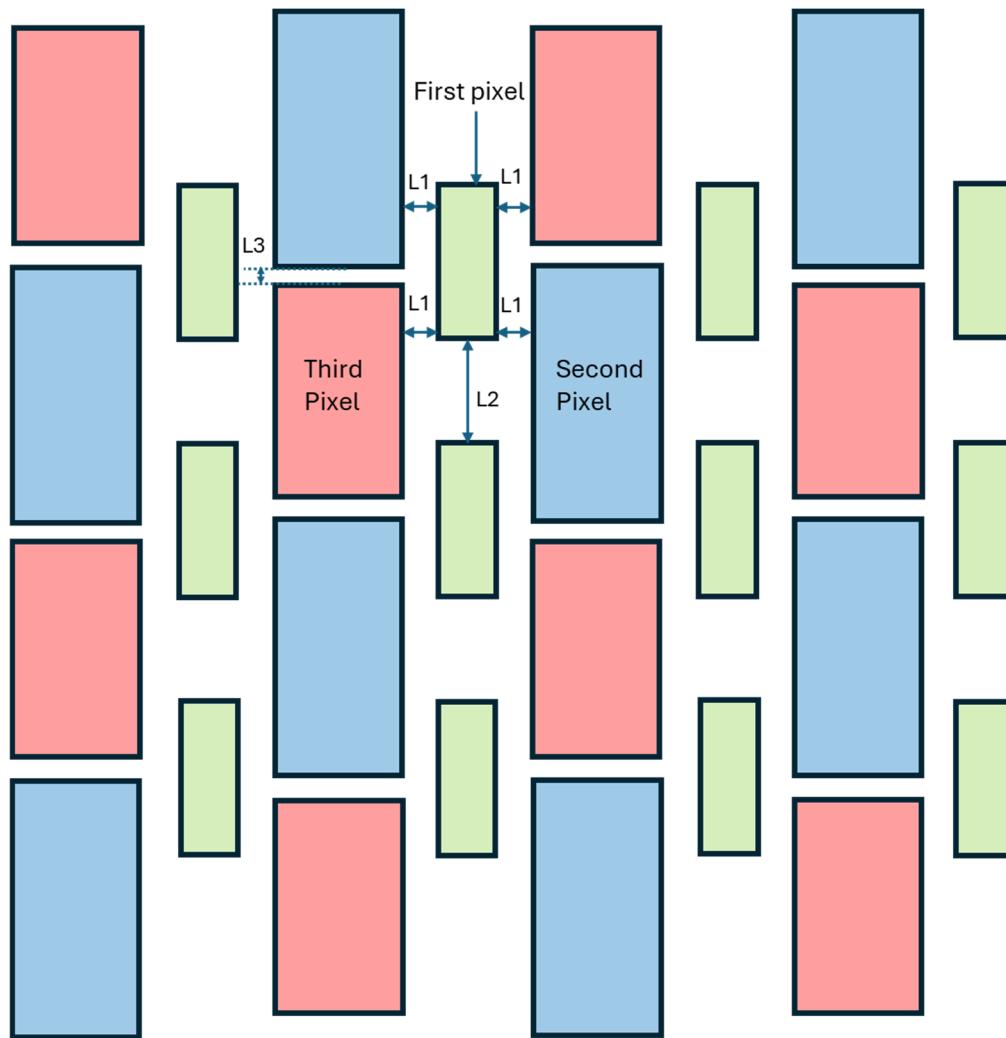
As shown below, a shortest distance between the first (green) pixel and the second (blue) pixel as well as a shortest distance between the first (green) pixel and the third (red) pixel is a same first length. (EX1002, ¶139.)



i. Limitation 1[H]

wherein a shortest distance between the first pixels is a second length that is longer than the first length and a shortest distance between each of the second pixels and the third pixels,

As shown below, a shortest distance between the first pixels is a second length L2 that is longer than the first length L1 and a shortest distance between each of the second pixels and the third pixels L3. (EX1002, ¶140.)



j. Limitation 1[I]

wherein the second pixel and the third pixel have polygonal shapes, and,

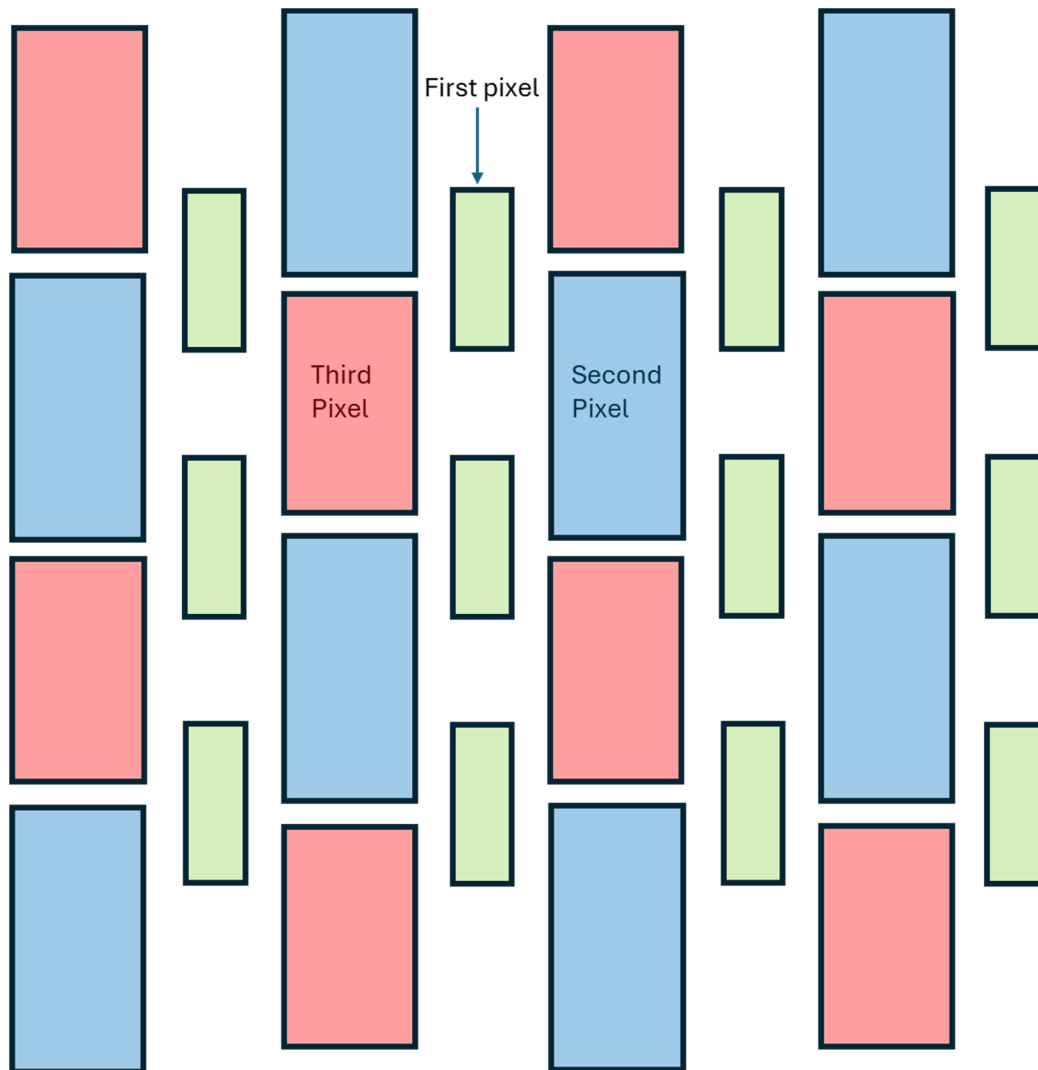
Credelle-379 discloses “the subpixels appear to have a substantially rectangular appearance. ... a multitude of other regular or irregular shapes for the

subpixels are possible and are desirable if manufacturable.” (EX1005, 4:50-56; EX1002, ¶141.) As defined in the ’616 patent, a polygonal shape can include “a triangle, a rectangle, a pentagon, a hexagon, a heptagon, and the like.” (EX1001, 10:10-13; EX1002, ¶141.)

k. Limitation 1[J]

wherein the second pixel has a larger area than that of the third pixel.

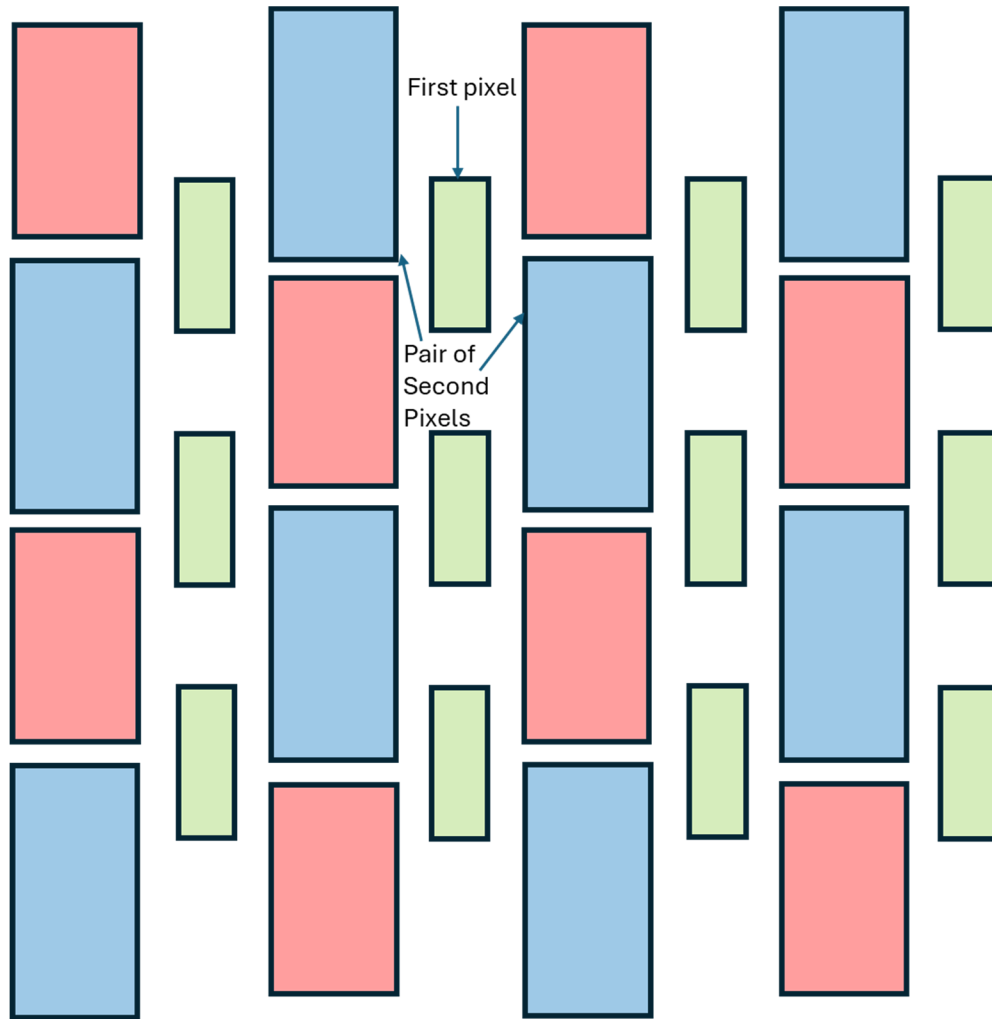
As explained above, using the relative sizing taught by Hong, a POSITA would have modified Credelle-379 FIG. 1C as shown below, with the blue pixel having the largest area, the red pixel having an intermediate area, and the green pixel having the smallest area. (EX1002, ¶142.)



3. Claim 2

The pixel arrangement structure of claim 1, wherein the second pixel comprises a pair of second pixels, and the second pixels are separated from each other by the first pixel.

As shown below, a pair of blue sub-pixels (e.g., corresponding to the claimed “pair of second pixels”) are separated by a green sub-pixel (e.g., the first pixel). (EX1002, ¶143.)

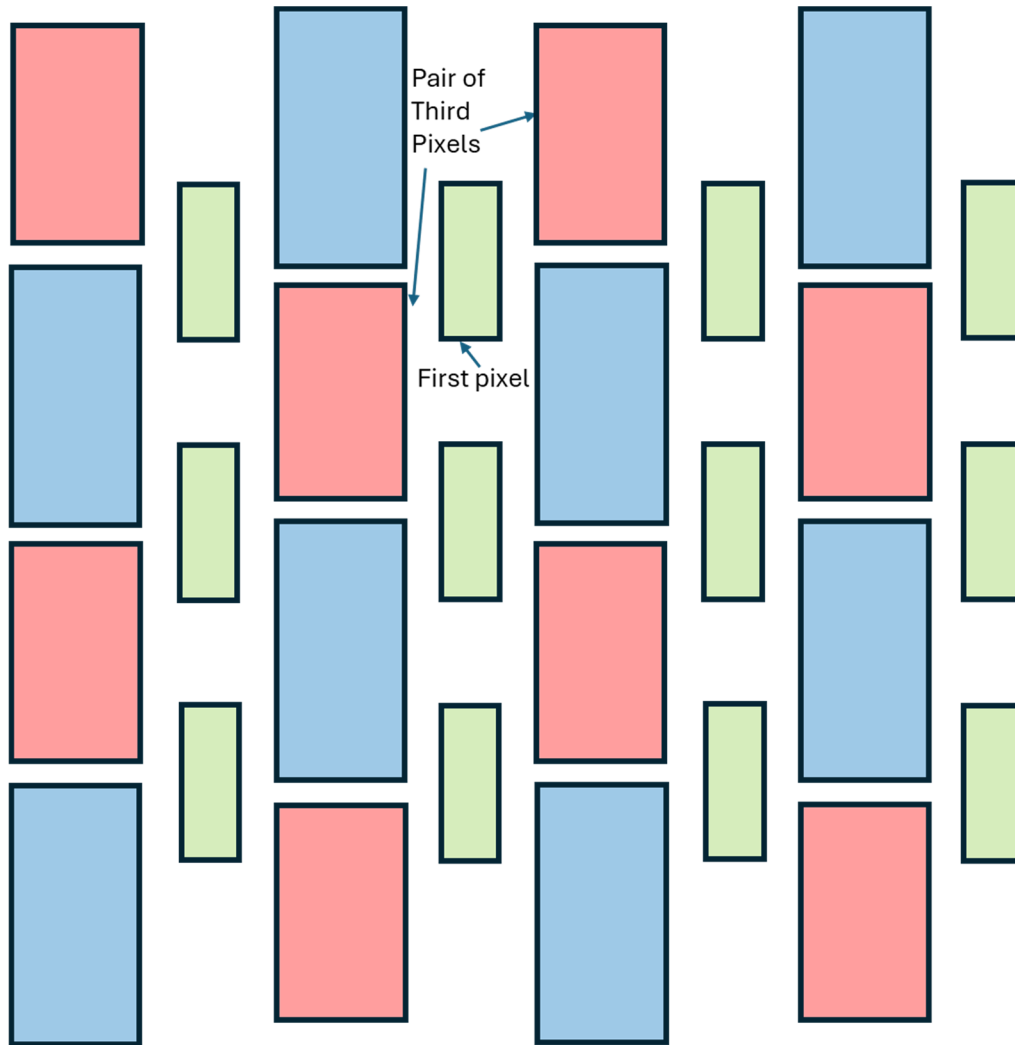


4. Claim 3

The pixel arrangement structure of claim 1, wherein the third pixel comprises a pair of third pixels, and the third pixels are separated from each other by the first pixel.

As shown below, a pair of red sub-pixels (e.g., corresponding to the claimed “pair of third pixels”), are separated by a green sub-pixel (e.g., the first pixel).

(EX1002, ¶144.)

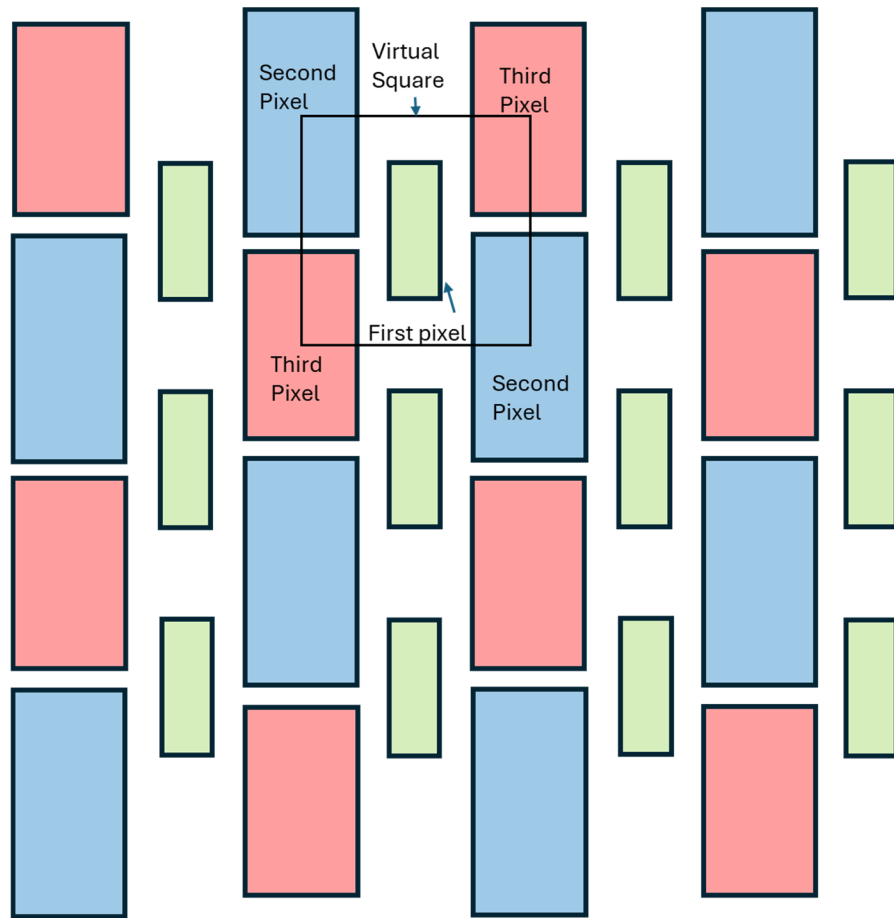


5. Claim 4

The pixel arrangement structure of claim 1, wherein the second pixel comprises a pair of second pixels, the third pixel comprises a pair of third pixels, and the second pixels and the third pixels enclose the first pixel in the virtual square.

The pair of blue sub-pixels (e.g., a pair of second pixels) and the pair of red sub-pixels (e.g., a pair of third pixels) enclose a green sub-pixel (e.g., the first

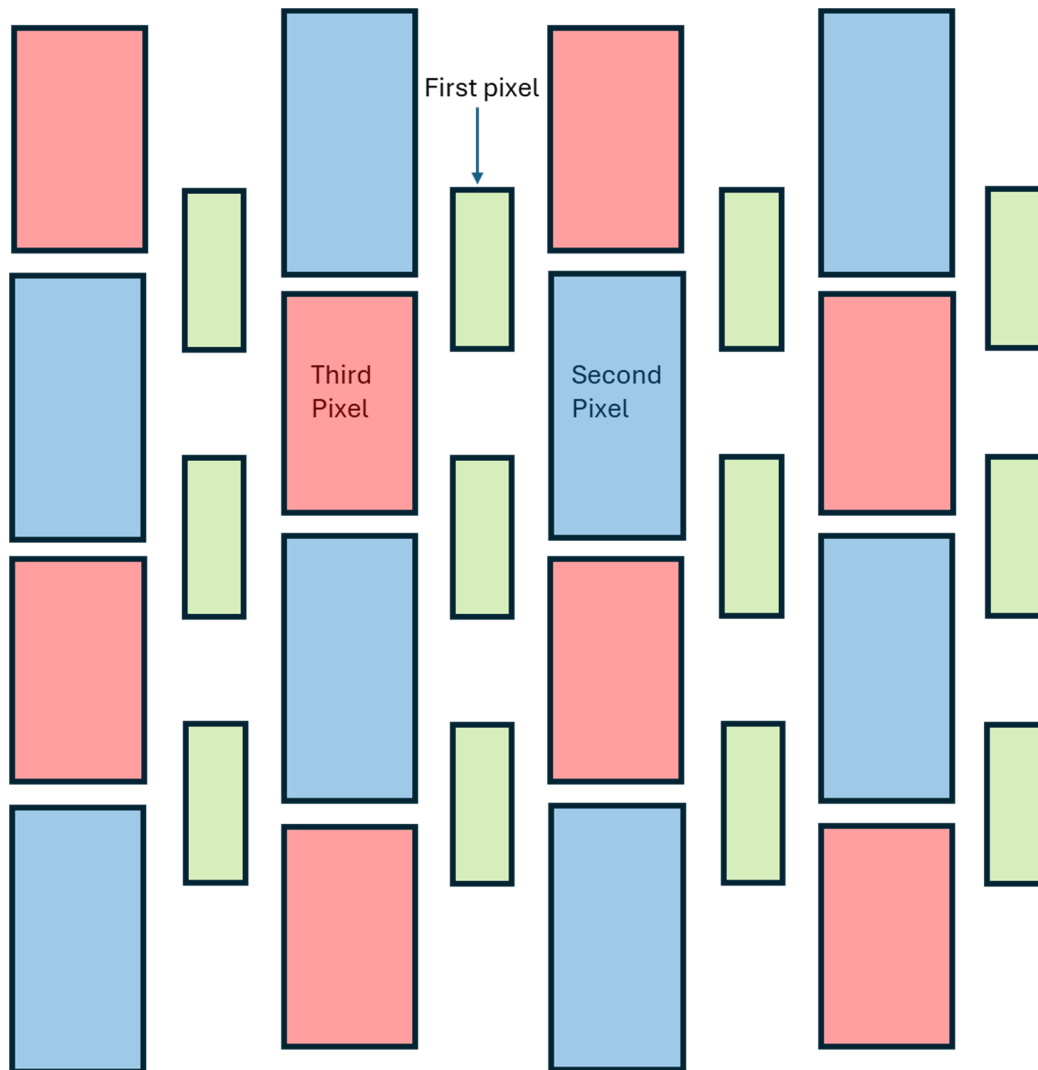
pixel) in a virtual square, as shown below. (EX1002, ¶145.)



6. Claim 5

The pixel arrangement structure of claim 4, wherein each of the second pixels and the third pixels is larger in area than the first pixel.

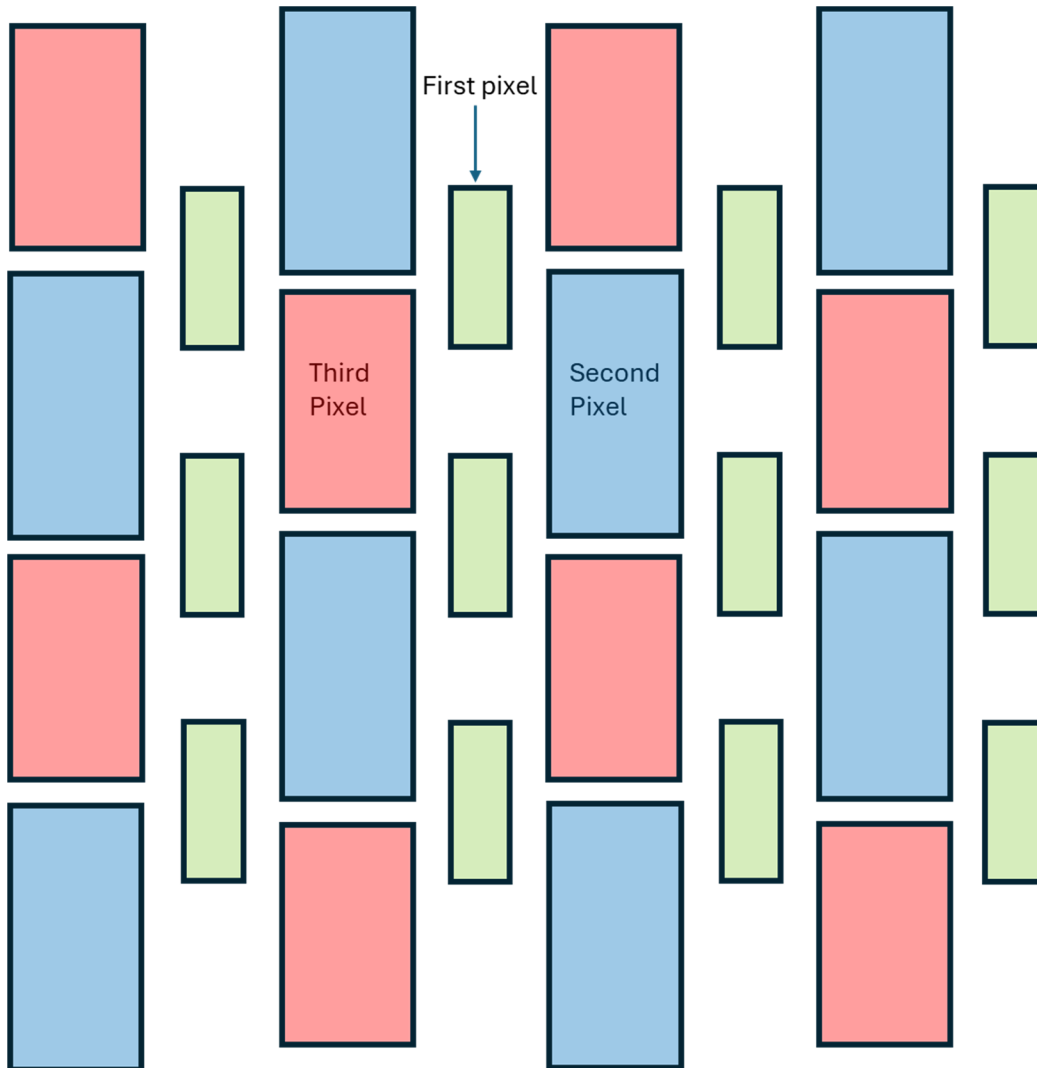
As explained above, using the relative sizing taught by Hong, a POSITA would have modified Credelle-379 FIG. 1C as shown below, with the blue pixel having the largest area, the red pixel having an intermediate area, and the green pixel having the smallest area. (EX1002, ¶146.)



7. Claim 10

The pixel arrangement structure of claim 1, wherein the first pixel, the second pixel, and the third pixel are configured to emit different color light.

Credelle-379 discloses that, “[f]or example, these four emitters 106 may be set to be ... green in color. For example, the other sub-pixel emitters may be set to be red 104 and blue 102.” (EX1005, 3:67-4:3.) As shown below, the first pixel is green, the second pixel is blue, and the third pixel is red. (EX1002, ¶147.)

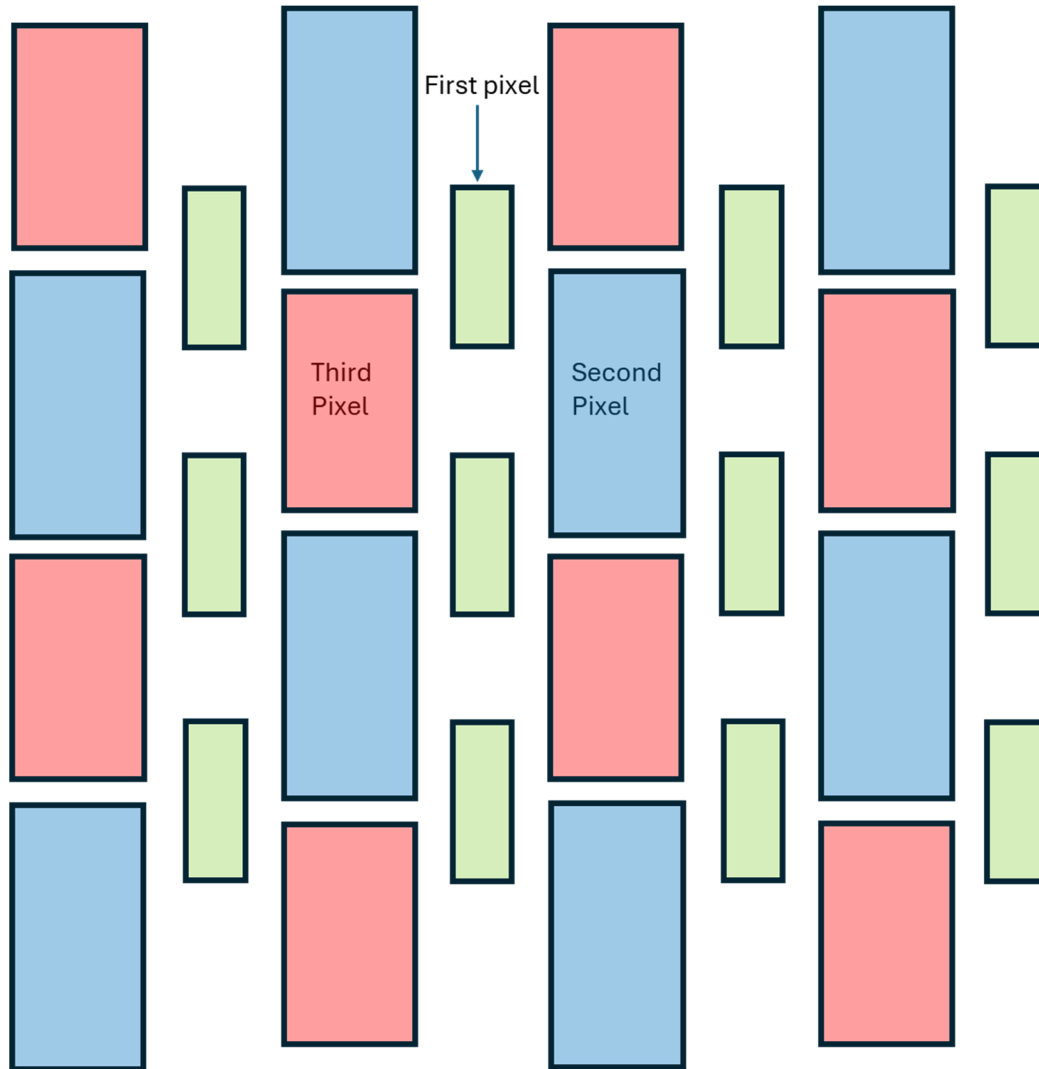


8. Claim 11

The pixel arrangement structure of claim 1, wherein the first pixel is configured to emit green light, one of the second pixel and the third pixel is configured to emit blue light, and another of the second pixel and the third pixel is configured to emit red light.

Credelle-379 discloses, “these four emitters 106 may be set to ... green in color. For example, the other sub-pixel emitters may be set to be red 104 and blue

102.” (EX1005, 3:67-4: 3; EX1002, ¶148.) As shown below, the first pixel is green, the second pixel is blue, and the third pixel is red. (EX1002, ¶148.)



9. Claim 13

a. Preamble

A pixel arrangement structure of an organic light emitting diode (OLED) display, comprising:

Credelle-379 meets the preamble as set forth for claim 1, preamble.

(EX1002, ¶149.)

b. 13[A]

a plurality of individually addressable pixels for displaying images, the individually addressable pixels being minimum addressable units of the OLED display and comprising:

Credelle-379 meets this element as set forth for limitation 1[A]. (EX1002, ¶150.)

c. 13[B]

a first pixel having a center coinciding with a center of a virtual square;

Credelle-379 in view of Hong meets this element as set forth for limitation 1[B]. (EX1002, ¶151.)

d. 13[C]

another first pixel having a center coinciding with a center of another virtual square, the virtual squares sharing a common side having endpoints at a common first vertex and a common second vertex of the virtual squares, with neighboring vertices in each of the virtual squares corresponding to pixels configured to emit different color light;

Credelle-379 in view of Hong meets this element as set forth for limitation 1[C]. (EX1002, ¶152.)

e. 13[D]

a second pixel separated from the first pixels and having a center at the first vertex;

Credelle-379 in view of Hong meets this element as set forth for limitation 1[D]. (EX1002, ¶153.)

f. 13[E]

a third pixel separated from the first pixels and the second pixel, and having a center at the second vertex,

Credelle-379 in view of Hong meets this element as set forth for limitation 1[F]. (EX1002, ¶154.)

g. 13[F]

the second pixel and the third pixel have polygonal shapes,

Credelle-379 in view of Hong meets this element as set forth for limitation 1[I]. (EX1002, ¶155.)

h. 13[G]

a shortest distance between the first pixel and the second pixel as well as a shortest distance between the first pixel and the third pixel is a same first length, and

Credelle-379 in view of Hong meets this element as set forth for limitation 1[G]. (EX1002, ¶156.)

i. 13[H]

a shortest distance between the first pixels is a second length that is longer than the first length and a shortest distance between each of the second pixels and the third pixels.

Credelle-379 in view of Hong meets this element as set forth for limitation 1[H]. (EX1002, ¶157.)

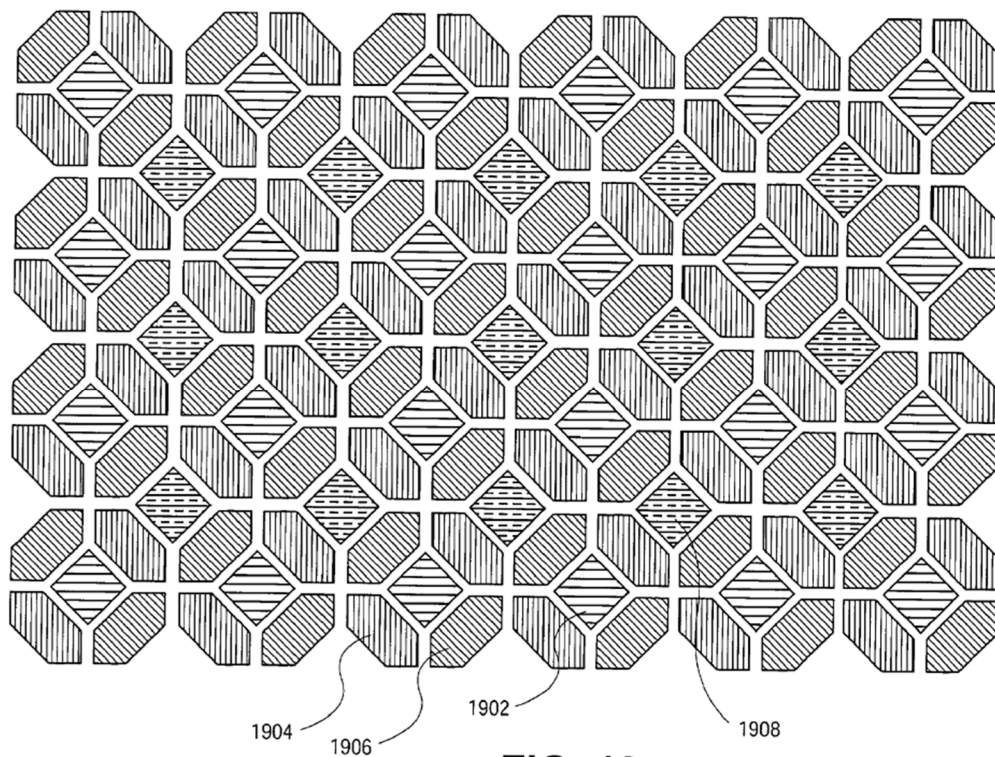
C. Ground 3: Credelle-379, Hong, And Elliott-724 Render Obvious Claims 6-9 and 12

Elliott-724 was filed on September 13, 2002, and published on March 18, 2004. (EX1006.) Elliott-724 qualifies as prior art to the '616 patent under at least §§ 102(a), (b), and (e). Elliott-724 is a parent application of Credelle-379. Elliott-724 was not considered during prosecution of the '616 patent.

1. Summary of Elliott-724

Elliott-724 discloses “novel embodiments of three and four color subpixel arrangements” and that “Organic Light Emitting Diode (OLED) displays,” will also be improved using this teaching. (EX1006, [0041], [0075].) In one embodiment, as shown in FIG. 19, some sub-pixels are made hexagonal. (*Id.*, FIG. 19.)

Elliott-724 is analogous art to the '616 patent at least because Elliott-724 is directed to the same problem (pixel arrangements) in the same field of endeavor (OLED displays) as the '616 patent. (EX1006, [0041], [0075]; EX1002, ¶159.)

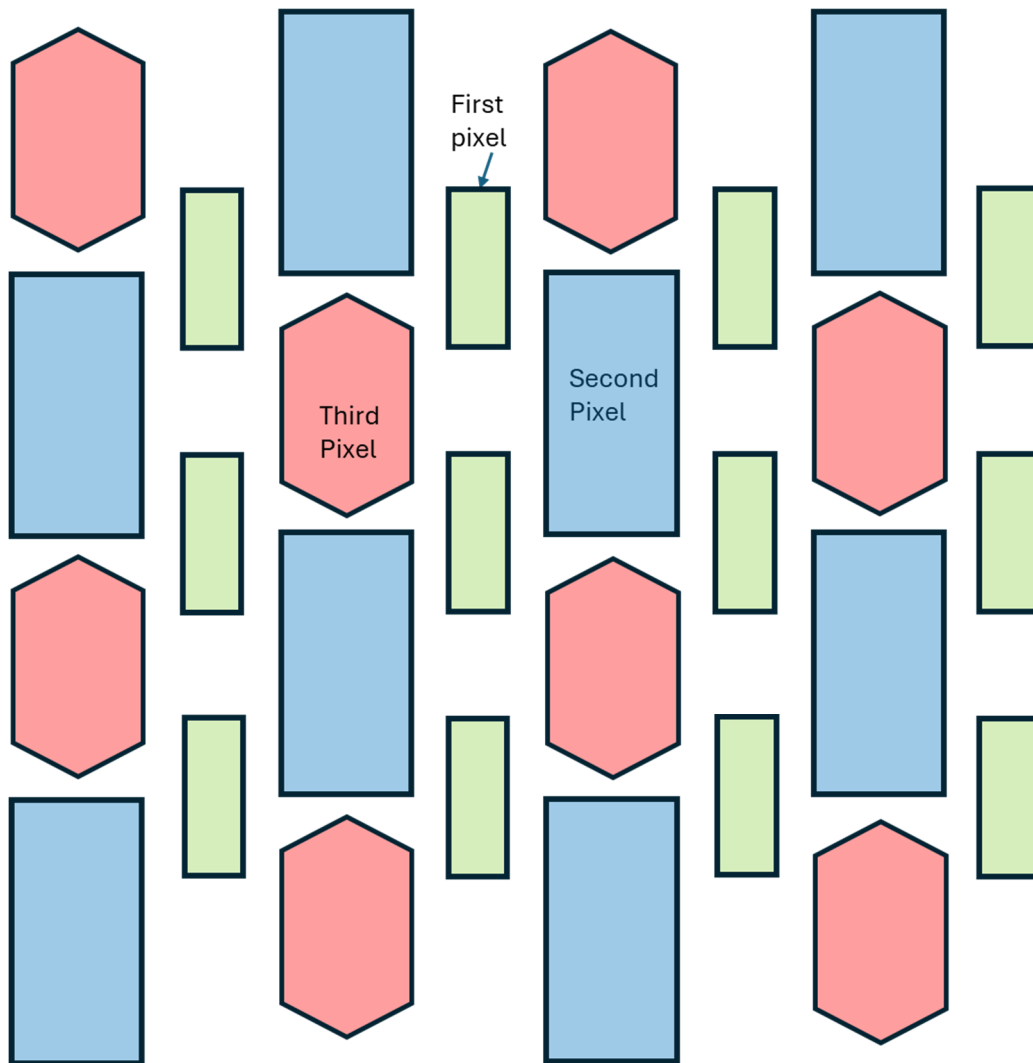
**FIG. 19**

2. Claim 6

The pixel arrangement structure of claim 5, wherein one of the second pixel and the third pixel has a hexagonal shape and another of the second pixel and the third pixel has a quadrilateral shape.

Credelle-379 discloses “[i]t should be appreciated that other shapes to the subpixels are also possible and are contemplated ... a multitude of other regular or irregular shapes for the subpixels are possible and are desirable if manufacturable.” (EX1005, 4:50-56.) Further, Elliott-724, which is the parent application of Credelle-379, teaches in FIG. 19 that sub-pixels can be made hexagonal. (EX1006, FIG. 19.)

Accordingly, Credelle-379 in view of Hong, when further considering that Elliott-724 teaches hexagonal sub-pixels are manufacturable, teaches that sub-pixels can be made hexagonal. A POSITA would have been motivated to substitute the rectangular red sub-pixels with hexagonal sub-pixels, such that the third pixel has a hexagonal shape, and the second pixel has a quadrilateral shape, as shown below. (EX1002, ¶161.)



Motivation to Combine Credelle-379 with Elliott-724

As discussed above, a POSITA would have found it obvious to use the relative areas taught in Hong to adjust the pixel arrangement of Credelle-379. (EX1002, ¶162.) Further, a POSITA would have found it obvious to combine the hexagonal sub-pixels of Elliott-724 with Credelle-379 in view of Hong. (*Id.*) Like Credelle-379 and Hong, Elliott-724 is analogous art because it is in the same field as the '616 patent. *Wyers*, 616 F.3d at 1238-39. (*See also* EX1002, ¶162.) Like the '616 patent, Elliott-724 is directed to “subpixel arrangements” that can be used in “Organic Light Emitting Diode (OLED) displays.” (EX1006, [0041], [0075].)

Credelle-379 itself discloses “[i]t should be appreciated that other shapes to the subpixels are also possible and are contemplated ... a multitude of other regular or irregular shapes for the subpixels are possible and are desirable if manufacturable.” (EX1005, 4:51-56.) And, given that Elliott-724 is the parent application of Credelle-379 and is incorporated by reference, a POSITA would have been motivated to use the hexagonal pixel shapes taught by Elliott-724 for the sub-pixels of Credelle-379. (EX1005, 1:13-21; EX1002, ¶163.) Further, it would have been obvious to try making the red pixels hexagonal, while maintaining the shapes of the green and blue pixels. (EX1002, ¶163.) That is because doing so would have been one of a finite number of identified, predictable solutions with a reasonable expectation of success—specifically, eight possibilities based on whether each of the red, green, and blue pixels is modified to have a hexagonal

shape. (EX1002, ¶163.)

Making this combination would have been a simple substitution of one pixel shape for another with predictable results given the two references describe the same, underlying OLED technology. (EX1002, ¶164.) Indeed, a POSITA would have viewed Elliott-724 as disclosing just one more way to shape Credelle-379's sub-pixels. (*Id.*)

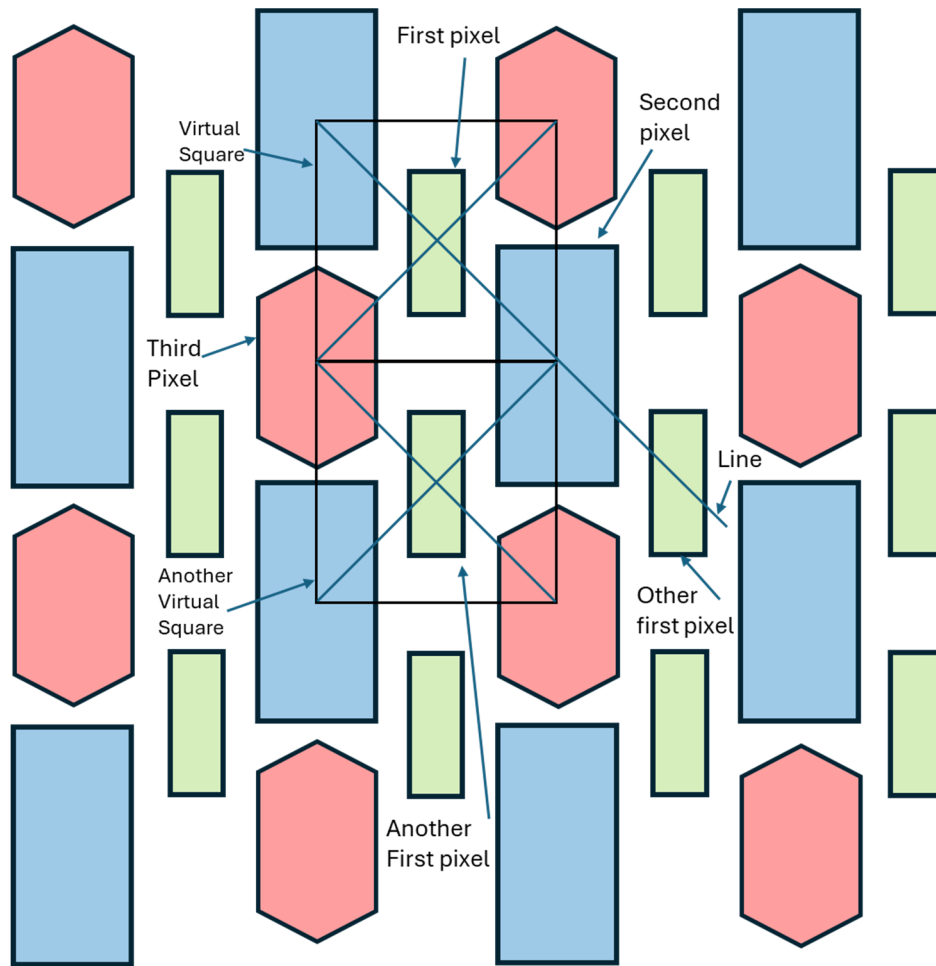
Moreover, a POSITA would have reasonably expected the combination to succeed. (EX1002, ¶165.) All references relate to OLED display technology. (*Id.*) Further, Elliott-724 is the parent application of Credelle-379 and is incorporated by reference. (EX1005, 1:13-21.) Credelle-379 discloses “[i]t should be appreciated that other shapes to the subpixels are also possible and are contemplated ... a multitude of other regular or irregular shapes for the subpixels are possible and are desirable if manufacturable,” thereby contemplating the hexagonal pixel shapes shown in Elliott-724. (EX1005, 4:51-56.) Given these disclosures and the knowledge of a POSITA, the POSITA would have reasonably expected the combination to succeed. (EX1002, ¶165.)

Such a modification still maintains the aspects of Credelle-379 in view of Hong that teach claims 1 and 5. (EX1002, ¶166.) As shown above, the second and third pixels have polygonal shapes, the second pixel has a larger area than that of the third pixel, and each of the second pixels and the third pixels is larger in area

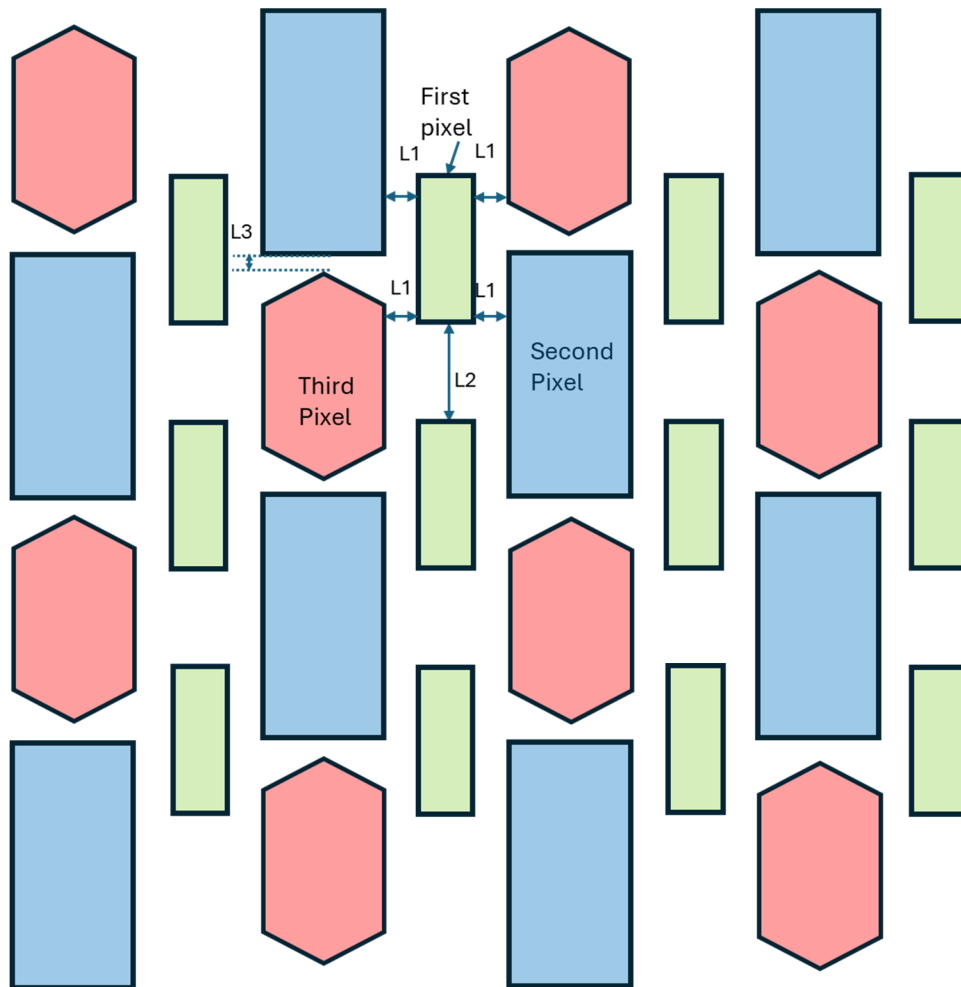
than the first pixel. (*Id.*)

Additionally, as shown below, the first (green) pixel has a center coinciding with a center of a virtual square, another first (green) pixel has a center coinciding with a center of another virtual square, the virtual squares sharing a common side having endpoints at a common first vertex and a common second vertex of the virtual squares, with neighboring vertices in each of the virtual squares corresponding to pixels configured to emit different color light (*e.g.*, red and blue), a second (blue) pixel is separated from the first pixels and having a center at the first vertex; an other (green) first pixel is on a line defined by the center of the virtual square and the first vertex, the first pixel, the second pixel, and the other first pixel being consecutive pixels on the line; and a third (red) pixel is separated from the first pixels and the second pixel, and has a center at the second vertex.

(EX1002, ¶167.)



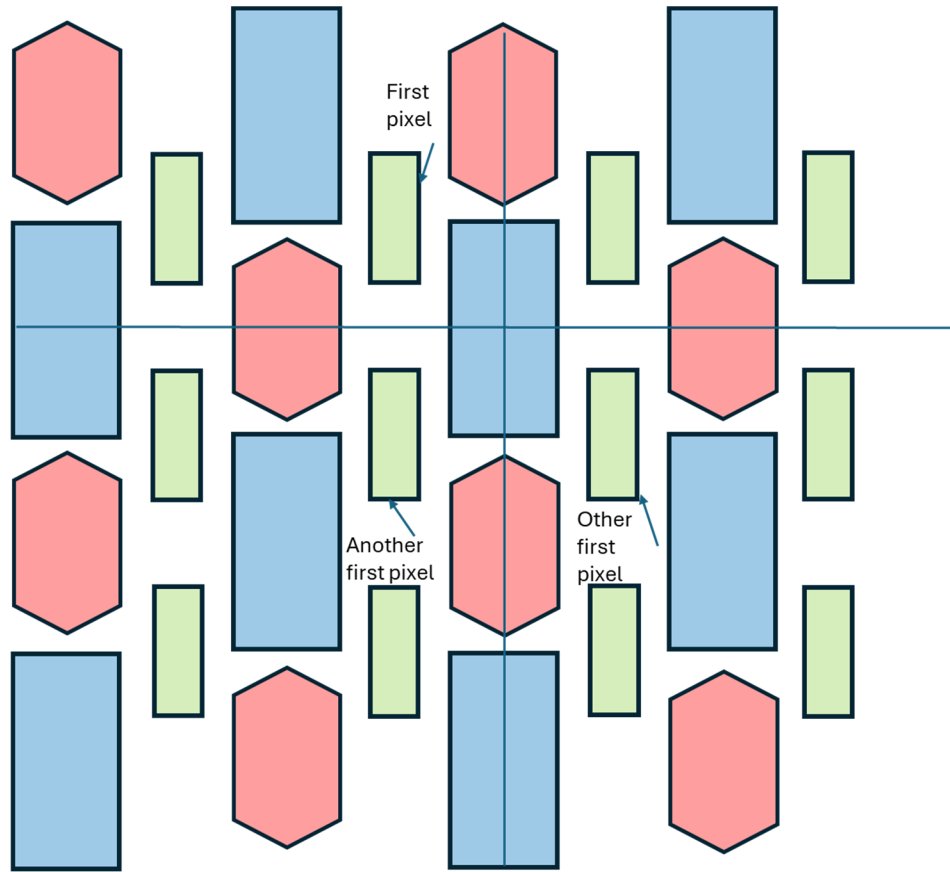
Additionally, as shown below, a shortest distance between the first pixel and the second pixel as well as a shortest distance between the first pixel and the third pixel is a same first length L_1 and a shortest distance between the first pixels is a second length L_2 that is longer than the first length L_1 and a shortest distance L_3 between each of the second pixels and the third pixels. (EX1002, ¶168.)



3. Claim 7

The pixel arrangement structure of claim 6, wherein the first pixels are symmetrical to each other.

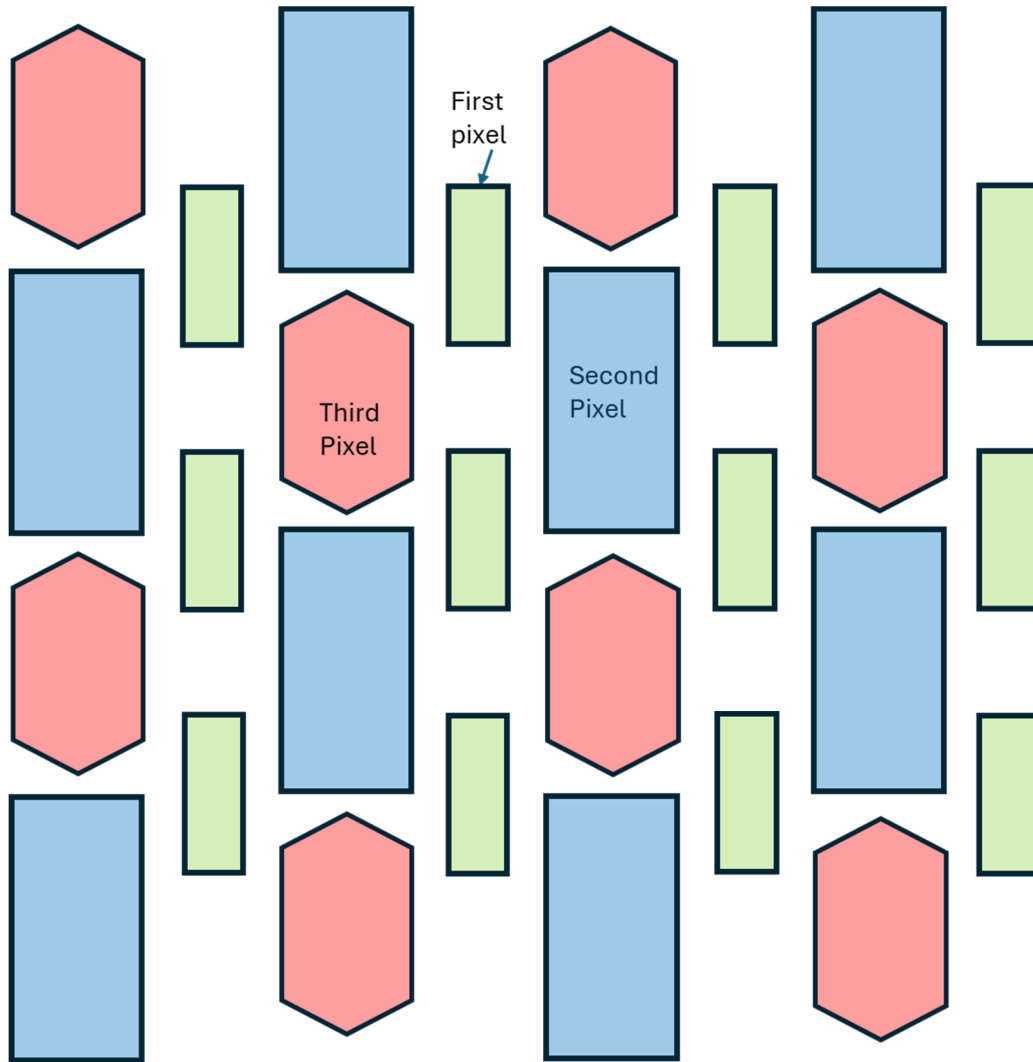
As shown below, the first pixel is symmetrical to the another first pixel across the horizontal line and the another first pixel is symmetrical to the other first pixel across the vertical line. (EX1002, ¶169.)



4. Claim 8

The pixel arrangement structure of claim 6, wherein each of the second pixels is larger in area than each of the third pixels.

As explained above, using the relative sizing taught by Hong, a POSITA would have modified Credelle-379 FIG. 1C as shown below, with the blue pixel having the largest area, the red pixel having an intermediate area, and the green pixel having the smallest area. (EX1002, ¶170.)



5. Claim 9

The pixel arrangement structure of claim 5, wherein at least one of the second pixel and the third pixel has a hexagonal shape.

Credelle-379 in view of Hong and Elliott-724 meets this element as set forth for claim 6. (EX1002, ¶171.)

6. Claim 12

The pixel arrangement structure of claim 1, wherein the second pixel has a different polygonal shape from the third pixel.

Credelle-379 in view of Hong and Elliott-724 meets this element as set forth for claim 6. (EX1002, ¶172.)

V. REMAINING ISSUES

Petitioner is not fully addressing discretionary issues in the Petition per USPTO guidance. (See *FAQs for Interim Processes for PTAB Workload Management*, USPTO, <https://www.uspto.gov/patents/ptab/faqs/interim-processes-workload-management> (last visited September 23, 2025).) As noted above, Cok and the published application (EX1017) of Credelle-379 were considered by the Examiner.⁵ (EX1003, 43, 516, 563, 567, 569.)

During the original examination, only dependent claims 9 and 10 were rejected as obvious over Elliott-383 (EX1010) in view of Chao (EX1011), and further in view of Cok. (EX1003, 516, 563.) The Examiner specifically relied on FIG. 5 of Cok for teaching “each of the second pixels (the green light emitting element 14) is larger in area than each of the third pixels (the red light emitting element 12),” which the Patent Owner did not challenge during prosecution. (*Id.*,

⁵ Hong and Elliott-724 were not considered during prosecution of the ’616 patent.

516.) But FIG. 5 of Cok is not relied upon in any Ground of this Petition.

Petitioner relies on materially different teachings of Cok, including its equations and other figures which teach RGBG pixel arrangements, such as those in the '616 patent.

With respect to the publication of the application (EX1017) that later issued as Credelle-379, it was cited in an IDS, but only after the second Notice of Allowance. (EX1003, 42, 59, 70.) It was not relied upon by the Examiner for any rejection.

Further, the Board previously determined there was a reasonable likelihood that similar claims of three family members were unpatentable in three separate proceedings. (EX1021, EX1023, EX1025.) Such findings were found to “counsel against discretionary denial.” *Tesla, Inc v. Intellectual Ventures II LLC*, IPR2025-00217, Paper 10 at 2 (June 13, 2025). In two of these proceedings, the Board found similar claims to be unpatentable with respect to U.S. Patent No. 7,091,986 to Phan (“Phan-986,” EX1028). (EX1021, 50-51; EX1023, 23.)

Finally, a schedule has not yet been issued and no trial date has been set in the corresponding district court litigation. A Final Written Decision is expected to issue around March 2027, whereas the trial date for the district court case (which has not been set) will likely be after. As discussed above, the prior art teaches every element of the challenged claims, and the claims are unpatentable. Thus, the

merits of the Petition weigh strongly in favor of institution.

VI. NOTICES AND STATEMENTS

Pursuant to 37 C.F.R. § 42.8(b)(1), BOE Technology Group Co., Ltd., is the real party-in-interest for Petitioner.

Pursuant to 37 C.F.R. § 42.8(b)(2), Petitioner identifies the following related litigation matter: the '616 patent is asserted in *Samsung Display Co. Ltd. v. BOE Technology Group Co., Ltd. et al.*, No. 2-25-cv-00430 (T.E.D.). Petitioner and Patent Owner are also involved in two additional related litigation matters in the same court, *i.e.*, No. 2-25-cv-00412 and -00426.

The '616 patent is related to U.S. Patent No. 9,818,803 (EX1020), its parent, and U.S. Patent Nos. 10,854,683 (EX1022) and 11,594,578 (EX1024). (EX1019.) These three patents were subject to three respective IPRs, *i.e.*, IPR2023-00987, IPR2023-00988, and IPR2023-01075, resulting in three final written decisions. (EX1021, EX1023, and EX1025.) In addition, the '803 and '578 patents were the subject of an International Trade Commission proceeding (Inv. No. 337-TA-1351).

Finally, Petitioner is contemporaneously seeking *inter partes* review of U.S. Patent No. 11,626,066, a child of the '616 patent. The proceeding is IPR2025-01545.

Pursuant to 37 C.F.R. § 42.8(b)(3), Petitioner identifies the following counsel (and a power of attorney accompanies this Petition).

Lead Counsel	First Backup Counsel
Mehran Arjomand Registration No. 48,231 MORRISON & FOERSTER LLP 707 Wilshire Boulevard, Suite 6000 Los Angeles, CA 90017-3543 Email: MArjomand@mofo.com Tel: (213) 892-5200 Fax: (213) 892-5454	Alex S. Yap Registration No. 60,609 MORRISON & FOERSTER LLP 707 Wilshire Boulevard, Suite 6000 Los Angeles, CA 90017-3543 Email: AYap@mofo.com Tel: (213) 892-5200 Fax: (213) 892-5454

Pursuant to 37 C.F.R. § 42.8(b)(4), service information for lead and back-up counsel is provided above. Petitioner consents to electronic service by email to BOE-Samsung-IPR@mofo.com.

Pursuant to 37 C.F.R. § 42.104(a), Petitioner certifies that the '616 patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds identified in this Petition.

The USPTO is authorized to charge any required fees, including the fee as set forth in 37 C.F.R. § 42.15(a), and any excess claim fees, to Deposit Account No. **03-1952**, referencing Docket No. **37294-00000.03**.

VII. CONCLUSION

Petitioner respectfully requests the Board initiate *inter partes* review of the challenged claims and ultimately cancel them.

Dated: September 23, 2025

Respectfully submitted,

By /Mehran Arjomand/
Mehran Arjomand, Reg. No. 48,231
MORRISON & FOERSTER LLP
707 Wilshire Boulevard, Suite 6000
Los Angeles, CA 90017-3543
Email: MArjomand@mofo.com
Tel: (213) 892-5200

Attorney for Petitioner

Certification of Word Count (37 C.F.R. § 42.24)

I hereby certify that this Petition for *Inter Partes* Review has 12,757 words (as counted by the “Word Count” feature of the Microsoft Word™ word-processing system), exclusive of “a table of contents, a table of authorities, mandatory notices under § 42.8, a certificate of service or word count, or appendix of exhibits or claim listing.”

Dated: September 23, 2025

By /Mehran Arjomand/
Mehran Arjomand

Certificate of Service (37 C.F.R. § 42.6(e)(4) and 42.205(a))

I hereby certify that the attached Petition for *Inter Partes* Review and supporting materials were served as of the below date by Priority Mail Express® on the Patent Owner at the correspondence address indicated for U.S. Patent No. 10,832,616.

Lewis Roca Rothgerber Christie LLP
PO BOX 29001
Glendale, CA

A copy of the attached Petition for *Inter Partes* Review and supporting materials were also served via e-mail on the following litigation counsel:

aa@rothfirm.com
charles.sanders@lw.com
kevin.wheeler@lw.com
alex.grabowski@lw.com
cassandra.baloga@lw.com
brian.kim@lw.com
jake.vannette@lw.com
au@rothfirm.com
ca@rothfirm.com
efindlay@findlaycraft.com
shene@findlaycraft.com
taustin@cov.com
jfrisch@cov.com
jychang@cov.com
shong@cov.com
jlerner@cov.com
rhaslam@cov.com
bbieluch@cov.com
dwcho@cov.com
kylee@cov.com

Dated: September 23, 2025

/Mehran Arjomand/

Mehran Arjomand