UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BOE Technology Group Co., LTD.
Petitioner

v.

Optronic Sciences LLC
Patent Owner

Inter Partes Review No.: IPR2024-01133

PETITION FOR INTER PARTES REVIEW OF U.S. PATENT 9,263,509 UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. §§ 42.1-100, ET SEQ

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1004	U.S. Patent Publication No. 2004/0079945 ("Weaver")
1005	U.S. Patent Publication No. 2012/0162053 ("Lee053")
1006	U.S. Patent Publication No. 2014/0183502 ("Song")
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1011	U.S. Patent Publication No. 2009/0015149 ("Lee149")
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CHART OF CLAIMS
[1pre] A pixel structure, comprising:
[1a] a data line and a scan line;
[1b] at least one active device electrically connected with the data line and the scan line, and each active device comprising a gate, a channel layer, a source, and a drain;
[1c] a first auxiliary electrode electrically insulated from the active device; and
[1d] a light emitting device disposed above the first auxiliary electrode, wherein the light emitting device comprises:
[1e] a first electrode layer electrically connected with the first auxiliary electrode;
[1f] a light emitting layer disposed on the first electrode layer; and
[1g] a second electrode layer disposed on the light emitting layer, wherein the second electrode layer is electrically connected with the active device.
[2] The pixel structure according to claim 1, further comprising a first insulating layer covering the active device and the first auxiliary electrode, and the first electrode layer of the light emitting device being disposed on the first insulating layer, wherein the first insulating layer has a first contact window opening that exposes the first auxiliary electrode, and the first electrode layer is electrically connected with the first auxiliary electrode via the first contact window opening.
[3] The pixel structure according to claim 2, further comprising a second insulating layer covering the first insulating layer and the first electrode layer of the light emitting device, and the second electrode layer of the light emitting device being disposed on the second insulating layer, wherein the second insulating layer has an opening that exposes the first electrode layer, and the light emitting layer of the light emitting device is disposed in the opening.
[4] The pixel structure according to claim 3, wherein the first insulating layer and the second insulating layer further comprise a second contact window opening that exposes a portion of the active device, and the second electrode layer of the light emitting device is electrically connected with the active device via the second contact window opening.
[5] The pixel structure according to claim 1, wherein the first auxiliary electrode is a single electrode layer.
[6pre] The pixel structure according to claim 1, wherein the first auxiliary electrode comprises:
[6a] a bottom electrode layer; and

[6b] a top electrode layer electrically connected with the bottom electrode layer, wherein the first electrode layer of the light emitting device is electrically connected with the top electrode layer of the first auxiliary electrode.
[7] The pixel structure according to claim 6, wherein the bottom electrode layer and the gate of the active device belong to the same layer.
[8] The pixel structure according to claim 6, wherein the top electrode layer and the source and the drain of the active device belong to the same layer.
[9] The pixel structure according to claim 1, further comprising an isolating structure disposed around the second electrode layer of the light emitting device, wherein a gap exists between the second electrode layer and the isolating structure.
[10] The pixel structure according to claim 1, further comprising a second auxiliary electrode electrically insulated from the active device and disposed at a side of the light emitting device, wherein the second auxiliary electrode is electrically connected with the first electrode layer of the light emitting device.
[11] The pixel structure according to claim 10, wherein the second auxiliary electrode and the second electrode layer of the light emitting device belong to the same layer, and the second auxiliary electrode and the second electrode layer of the light emitting device are electrically insulated from each other.
[12] The pixel structure according to claim 1, wherein the light emitting device is a top-emission organic electroluminescent device.
[13] The pixel structure according to claim 1, wherein a vertical projection of the light emitting layer of the light emitting device at least partially overlaps the first auxiliary electrode.

I. INTRODUCTION

BOE Technology Group Co. LTD. ("Petitioner") requests *inter partes* review of claims 1-13 ("Challenged Claims") of U.S. Patent No. 9,263,509 ("509 patent," EX1001), owned by Optronic Sciences LLC ("PO").

This petition relies upon the declaration of R. Jacob Baker, Ph.D., P.E. (EX1003), and copies large portions of that declaration herein.

II. STATEMENT OF PRECISE RELIEF REQUESTED

In accordance with 35 U.S.C. § 311, Petitioner requests cancelation of claims 1-13 of the 509 patent in view of the following grounds:

Ground	Claims	Stat. Basis	Prior Art
1	1-5, 9, 12-13	35 U.S.C. § 102	Weaver
2	6-8	35 U.S.C. § 103	Weaver and Lee053
3	6-8	35 U.S.C. § 103	Weaver and Song
4	10-11	35 U.S.C. § 103	Weaver and Lee149
5	10-11	35 U.S.C. § 103	Weaver and Bae
6	1-5, 9, 12-13	35 U.S.C. § 103	Weaver in view of Gupta or Han
7	6-8	35 U.S.C. § 103	Weaver and Lee053, in view of Gupta or Han
8	6-8	35 U.S.C. § 103	Weaver and Song, in view of Gupta or Han
9	10-11	35 U.S.C. § 103	Weaver and Lee149, in view of Gupta or Han
10	10-11	35 U.S.C. § 103	Weaver and Bae, in view of Gupta or Han

III. THE 509 PATENT

A. Overview of the 509 Patent

The 509 patent is directed to a pixel structure for solving the purported problem of poor overall luminous uniformity that occurs in traditional electroluminescent devices. EX1001, 1:48-50. The 509 patent discloses a pixel structure 100 that includes a data line DL, a scan line SL, active device T1, active device T2, a capacitor CS, a power line PL, and a light emitting device 130. *Id.*, 2:65-3:1 and Fig. 1.

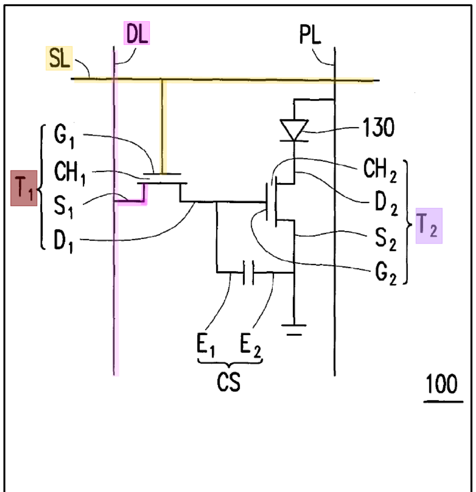

FIG. 1

The light emitting device 130 includes a first electrode layer 132, a light emitting layer 134, and a second electrode layer 136. *Id.*, 4:36-38. The purported novelty is the inclusion of a first auxiliary electrode 120 that is electrically connected with the first electrode layer 132, with the light emitting device 130 located above the first auxiliary electrode 120. *Id.*, 4:35-36, 47-49; Fig. 2.

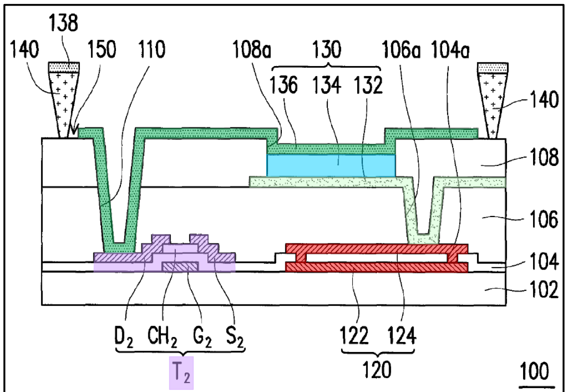

FIG. 2

The first auxiliary electrode 120 includes a bottom electrode layer 122 and a top electrode layer 124. *Id.*, 4:6-8; Fig. 2. In another embodiment, the first auxiliary electrode 120 includes only a bottom electrode layer 222. *Id.*, 6:29-34; Fig. 3.

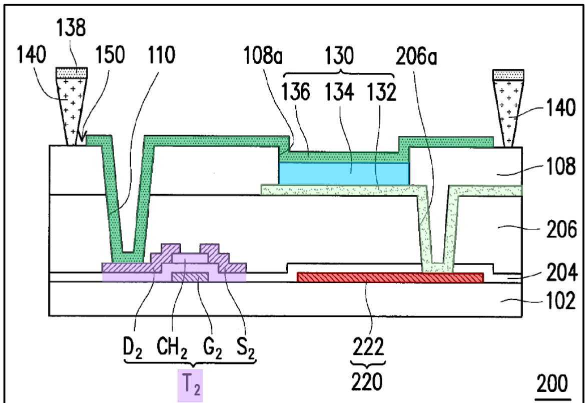

FIG. 3

In yet another embodiment, the pixel structure additionally includes a second auxiliary electrode 460 that is located at a side of the light emitting device 130 and also is electrically connected to the first electrode layer 132. *Id.*, 7:1-5; Fig. 5.

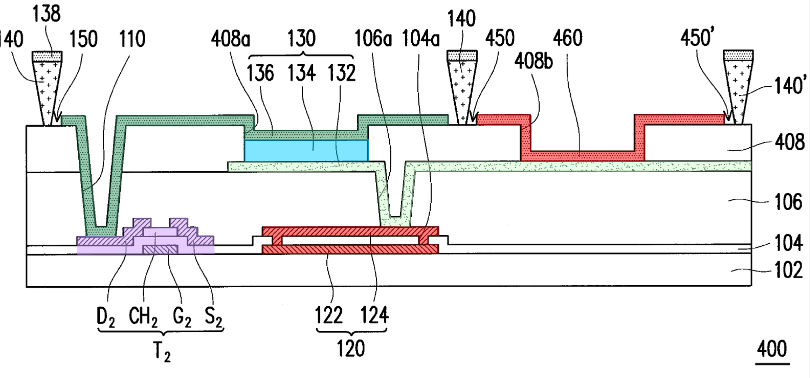

FIG. 5

B. Person of Ordinary Skill in the Art

A person of ordinary skill in the art ("POSITA") at the time of the alleged invention of the 509 patent (September 12, 2013) would have had a Bachelors' degree in electrical engineering or a comparable field of study, plus approximately one or more years of professional experience with electronic and optoelectronic system design. Additional graduate education could substitute for professional experience, and significant experience in the field could substitute for formal education. EX1003, ¶46.

C. Claim Construction Under 37 C.F.R. § 42.104(b)(3)

The Challenged Claims are interpreted using the same claim construction standard that is used to construe the claim in a civil action in federal district court. 37 C.F.R. § 42.100(b).

Petitioner does not contend that its proposed constructions are complete constructions of these limitations or the claims for any other purpose, including for issues that may arise in the related litigation.

Any claim terms not listed below should be construed according to their plain and ordinary meaning to a POSITA at the time of the 509 patent.

1. "auxiliary electrode" (claims 1-2, 5-6, 10-11, 13)

"Auxiliary electrode" should be construed either broadly as "supplemental electrode" or narrowly as "supplemental electrode to reduce the total resistance of the pixel structure." EX1003, ¶¶61-65.

The broad construction is applied in Grounds 1-5 and the narrow construction is applied in Grounds 1-10.

The claims do not explicitly state what the "auxiliary electrode" is auxiliary to, i.e., the claims do not explicitly recite what function or characteristic existed without the auxiliary electrode that has been supplemented with the auxiliary electrode. If the absence of this recitation in the claim sufficiently begs the question such that a POSITA would have turned to the specification to understand the nature of the claimed "auxiliary electrode," or if other statements in the specification sufficiently limit the term, then a narrow construction is appropriate. The prosecution history provides no guidance on this issue.

In support of the broad construction, the plain meaning of "auxiliary" is "supplemental" and is not limited to any particular type of supplemental functionality. EX1013, p. 51 ("supplementary" or "supplemental" included in each of the definitions of "auxiliary anode," "auxiliary channel," "auxiliary circuit," "auxiliary contacts," "auxiliary device," "auxiliary equipment," "auxiliary function," "auxiliary power," "auxiliary relay"). In the Summary of the Invention section, the 509 patent includes the following sentence:

> Based on the above, in the pixel structure of the invention, the first electrode layer of the light emitting device is electrically connected with the auxiliary electrode.

EX1001, 2:15-17. The Description of the Embodiments section contains similar statements. *Id.*, 4:47-49, 5:63-6:4, 6:53-58; 7:1-5 and 43-45. These statements are consistent with the broad construction that encompasses any supplemental electrode for any purpose. EX1003, ¶63.

In support of the narrow construction, the 509 patent follows the above sentence in the Summary of the Invention section with the following:

> Therefore, the design of the invention that coordinates the first electrode layer of the light emitting device with the auxiliary electrode decreases the resistance of the first electrode layer though parallel connection, <u>so as to significantly reduce the total resistance of the pixel structure</u>, thereby improving the overall luminous uniformity of the display panel.

EX1001, 2:15-23. The Description of the Embodiments section contains similar statements. *Id.*, 5:63-6:8; 7:45-56. To the extent a POSITA reads the claim and finds "auxiliary" ambiguous, such that the POSITA would turn to the specification to understand what makes the claimed auxiliary electrode "auxiliary," these statements would resolve that ambiguity and would limit the claim. Additionally, these statements refer to "the invention" and can limit the term for that reason as well. However, it should be noted that each of the two statements in the Description of the Embodiments section cited above is followed by the explicit disclaimer that "the invention is not limited thereto." *Id.*, 6:8-9; 7:56-57.

Petitioner does not include "decreases the resistance of the first electrode layer" or "decreases the resistance of the first electrode layer through parallel connection" in the proposed narrow construction because a POSITA would have known that adding an auxiliary electrode cannot literally perform that function. The first electrode layer has a resistance determined by its physical properties (material, dimensions, etc.), which cannot be changed by adding an electrode (even if connected in parallel). A POSITA would have understood that adding an electrode connected in parallel with the first electrode would decrease the resistance of the combined parallel circuit by allowing current to flow in parallel through the first electrode and the added electrode, but would not reduce the resistance of the first electrode itself. Thus, a POSITA would have interpreted this passage in the specification as imprecisely referring to the concept of reducing overall resistance, not the impossibility of reducing the resistance of the unaltered first electrode itself. A construction that literally requires that the auxiliary electrode reduce the resistance of the first electrode itself is not disclosed or enabled by the 509 patent. EX1003, ¶65.

2. **"disposed at a side of"** (claim 10)

This phrase in the context of the claim means the auxiliary electrode "overlaps in the horizontal direction" with the light emitting device (LED). EX1003, ¶¶66-68. This phrase should not be interpreted to include a negative limitation that precludes the auxiliary electrode from also vertically overlapping with some part of the LED. This is a comprising claim, so the auxiliary electrode could do both. Id., ¶66.

Any construction that precludes any amount of overlap in the vertical direction, or requires complete overlap in the horizontal direction, should be rejected because it would exclude all disclosed embodiments. In the only two embodiments of the 509 patent that include the second auxiliary electrode 460 "at a side" of the light emitting device 130 (which is defined as first electrode layer 132, light emitting layer 134 and second electrode layer 136), there is partial vertical overlap of the second auxiliary electrode 460 and the first electrode layer 132 of the light emitting device 130 (i.e., a portion of the second auxiliary electrode 460 is formed on a portion of the first electrode layer 132). EX1001, Figs. 5 and 6.

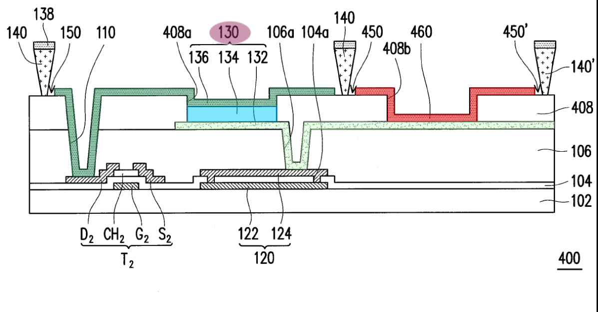

FIG. 5

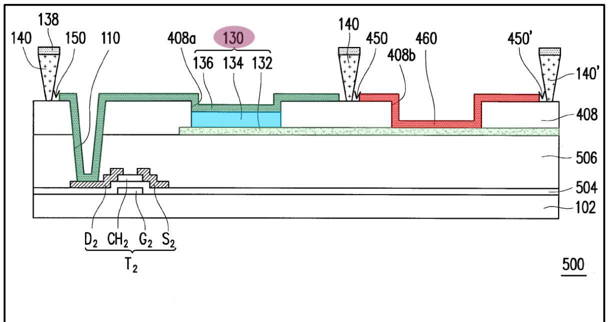

FIG. 6

Further, there is also no complete overlap of the second auxiliary electrode 460 and the LED in the horizontal direction, because there is no overlap of the second auxiliary electrode 460 and the first electrode layer 132 in the horizontal direction. *Id.*

Yet, second auxiliary electrode 460 in Figs. 5 and 6 is disclosed as being "located at a side of the light emitting device 130." *Id.*, 7:1-5; 8:4-8. Therefore, an electrode disposed "at a side of the light emitting device" as used in the 509 patent does not preclude partial vertical overlap of the electrode and at least one of the layers of the light emitting device, nor does it require complete horizontal overlap of the electrode and all of the layers of the light emitting device. If an electrode disposed "at a side of" precluded any vertical overlap of the electrode with any of the three layers that define the light emitting device 130, or required complete horizontal overlap therebetween, then claim 1 would not read on any of the disclosed embodiments. EX1003, ¶68.

IV. OVERVIEW OF THE PRIOR ART REFERENCES

A. EX1004 – Weaver

U.S. Patent Publication No. 2004/0079945 ("Weaver"), published on 4/29/2004, is prior art under post-AIA 35 U.S.C. § 102(a)(1).

B. EX1005 – Lee053

U.S. Patent Publication No. 2012/0162053 ("Lee053"), published on 6/28/2012, is prior art under post-AIA 35 U.S.C. § 102(a)(1).

C. EX1006 – Song

U.S. Patent Publication No. 2014/0183502 ("Song"), filed on 12/26/2013, published on 7/3/2014, claims priority to Korean Application 10-2013-0000181, filed on 1/2/2013 and published as 10-2014-0088369 (EX1007 – "Song KR"). A certified translation of Song KR is provided as EX1008. Song KR includes an enabling disclosure of all the relevant features disclosed in Song relied upon herein. EX1003, ¶72. Therefore, Song has an effective filing date of 1/2/2013, and is prior art under post-AIA 35 U.S.C. § 102(a)(2).

D. EX1009 – Gupta

U.S. Patent No. 9,088,003 ("Gupta"), issued on 7/21/2015, is prior art under post-AIA 35 U.S.C. § 102(a)(2).

E. EX1010 – Han

U.S. Patent Publication No. 2011/0248309 ("Han"), issued on 10/13/2011, is prior art under post-AIA 35 U.S.C. § 102(a)(1).

F. EX1011 – Lee149

U.S. Patent Publication No. 2009/0015149 ("Lee149"), published on 1/15/2009, is prior art under post-AIA 35 U.S.C. § 102(a)(1).

G. EX1012 – Bae

U.S. Patent Publication No. 2006/0119259 ("Bae"), published on 06/08/2006, is prior art under post-AIA 35 U.S.C. § 102(a)(1).

V. GROUND 1: CLAIMS 1-5, 9, 12-13 ARE ANTICIPATED BY WEAVER

A. Claim 1

1. [1pre]

To the extent that the preamble is limiting, Weaver discloses "a pixel structure (Weaver's circuit/array 300)."[1] EX1003, ¶¶78-79.

Weaver discloses circuit 300 that includes OLEDs and transistors in an array configuration that may be used in devices such as displays, and a process flow for forming "a pixel" that includes the OLEDs and transistors. EX1004, [0021], [0022], [0032], Figs. 3-8.

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[1] The discussion for each claim limitation herein begins with a quote of the claim language in which parentheticals have been added to include exemplary arguments and evidence. However, Petitioner relies on all arguments and evidence provided with respect to a limitation (and any cross-referenced sections).

2. [1a]

Weaver discloses "a data line (data line 304) and a scan line (select line 306)." EX1003, ¶¶80-82.

Weaver discloses that each circuit of Fig. 3 is connected to a data line 304 and a select line 306. EX1004, Fig. 3, [0021], *see also*, Fig. 2, [0019] (data line 204 and select line 206). EX1003, ¶81.

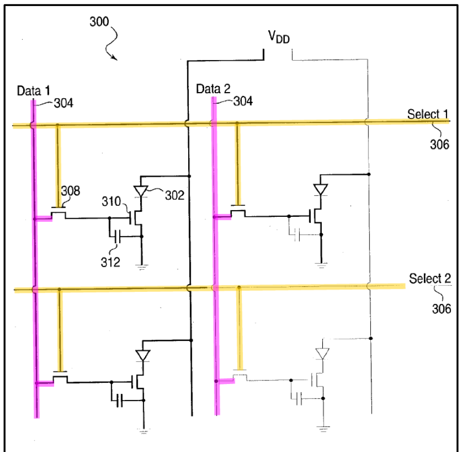


Fig. 3

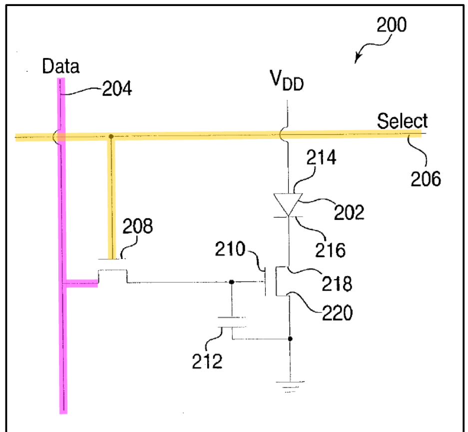


Fig. 2

A voltage applied to the select line 306 will turn on transistor 308. *Id.*, Fig. 3, [0017]. In comparing Fig. 1 of the 509 patent and Fig. 2 of Weaver, the line configurations of the circuit designs are essentially identical in both configuration and function. EX1003, ¶82.

3. [1b]

Weaver discloses "at least one active device (transistor 208/308 and transistor 210/310/410) electrically connected with the data line (204/304) and the scan line (206/306), and each active device comprising a gate (gate 408), a channel layer (a-Si layer 414), a source (source 220/405), and a drain (drain 218/407)."

EX1003, ¶¶83-88.

Weaver discloses that each of the circuits in Fig. 3 is a circuit such as that shown in Fig. 2. EX1004, [0021].

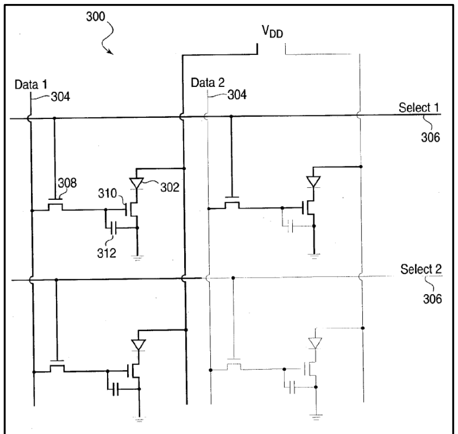


Fig. 3

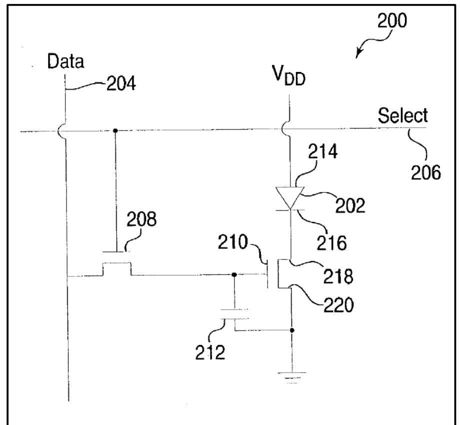


Fig. 2

Weaver also discloses that the OLED 400 and transistor 410 in Fig. 4 may be the elements of an array such as shown in Fig. 3. *Id.*, [0022].

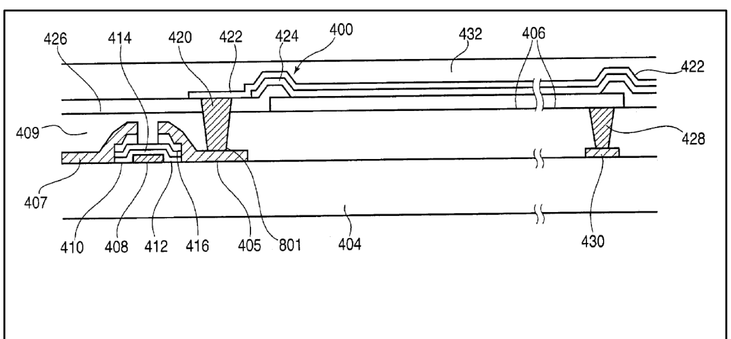


Fig. 4

Therefore, transistor 210 in Fig. 2, transistor 310 in Fig. 3 and transistor 410 in Fig. 4 refer to the same transistor. Similarly, transistor 208 in Fig. 2 and transistor 308 in Fig. 3 refer to the same transistor. Further, OLED 202 in Fig. 2, OLED 302 in

Fig. 3 and OLED 400 in Fig. 4 refer to the same OLED. Finally, data lines 204 and 304 refer to the same data line and select lines 206 and 306 refer to the same select line. EX1003, ¶84.

Weaver discloses at least one active device (transistor 208/308 and transistor 210/310/410) that are electrically connected with a data line 204/304 and a scan (select) line 206/306. EX1004, [0019], [0021], Figs. 2-4. It should be noted that Weaver discloses a pixel structure circuit (with transistors 208/308 and 210/310/410) that is identical to the only disclosed pixel structure circuit embodiment in the 509 patent (with transistors T1 and T2). Compare Fig. 1 of the 509 patent (EX1001, Fig. 1) and Fig. 2 of Weaver (EX1004, Fig. 2):

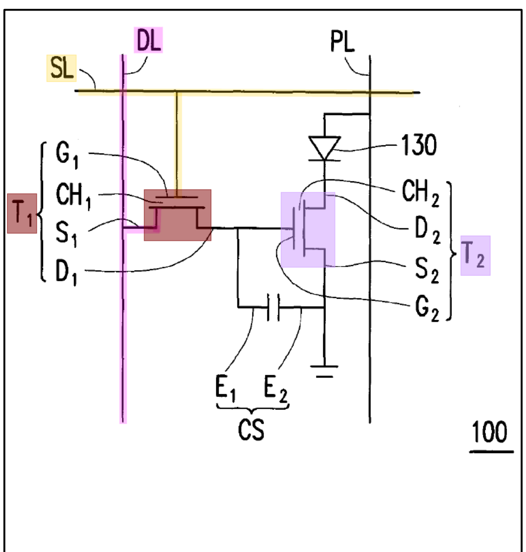


FIG. 1

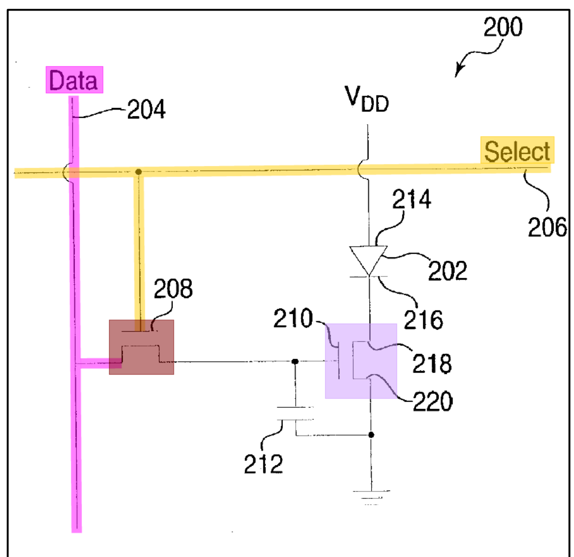


Fig. 2

The active device (transistor 210/310/410) includes a gate 408, an a-Si layer 414, a source 220, 405, and a drain 218, 407. *Id.*, [0019], [0024], Fig. 2-4.

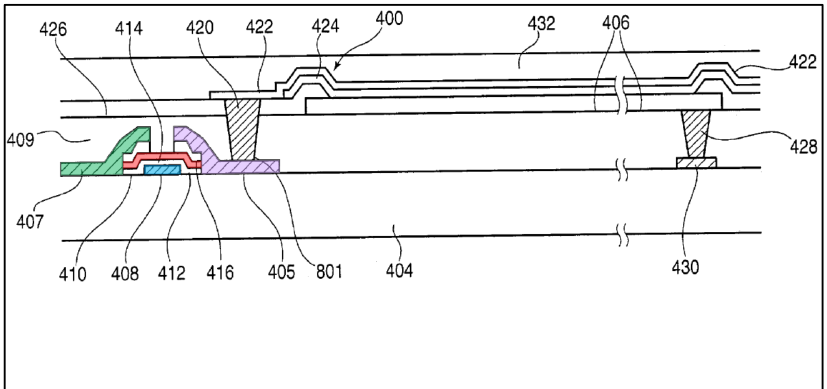


Fig. 4

A POSITA would have understood that the a-Si layer 414 forms a channel layer for transistor 410. EX1003, ¶86. Transistors are active devices. EX1001, 3:33-59.

Weaver acknowledges that transistor 210/310/410 (having a gate, a channel layer, a source and a drain) is also referred to as a thin film transistor. EX1004 [0008], [0019]. Weaver discloses that in the embodiment of Fig. 2 (which shows two transistors 208 and 210), "n-type thin film transistors are also used, which may be n-type thin film transistors." *Id.*, [0018]. Given this disclosure regarding plural "transistors" with respect to Fig. 2, a POSITA would have understood that transistor 208/308 is also a thin film transistor (i.e., one that has a gate, a channel layer, a source and a drain). EX1003, ¶87.

Further, Weaver discloses that Figs. 5-8 illustrate a processing flow for forming a pixel that includes OLED 400, transistor 410, and a switching transistor 502. EX1004, [0032]. A POSITA would have understood that transistor 502 corresponds to the transistor 208/308, because the pixel of Weaver only includes two transistors. Weaver further discloses that "the active regions 505 and 506 are deposited, which may be formed from the three layer SiNx layer, an intrinsic a-Si layer, and a N+a-Si layer as described above." Here, Weaver is teaching that the same channel layer (a-Si layer 414) used for transistor 410 is used for transistor 208/308. EX1003, ¶88. Therefore, a POSITA would have understood that each active device (transistor 208/308 and transistor 210/310/410) of the "at least one active device" of Weaver comprises a gate, a channel layer, a source and a drain. *Id*.

4. [1c]

Weaver discloses "a first auxiliary electrode (bus line 430) electrically insulated from the active device (transistor 410); and." EX1003, ¶¶89-94.

Claim 1 does not previously recite "an active device" and therefore "the active device" lacks antecedent basis. Rather, claim 1 previously recites "at least one active device." Therefore, a POSITA would have understood that reciting "the active device" (singular) in claim 1 or in claims dependent thereon refers to one of the "at least one active device" of claim 1 if there is more than one. *Id.* This interpretation is consistent with the 509 specification. EX1001, 2:66-67 ("at least one active device T1 and T2"), 3:7 ("the active device T1"), 3:8-9 ("[t]he active device T2").

Weaver discloses bus line 430 is electrically insulated from transistor 410 by passivation layer 409. EX1004, [0026], Fig. 4.

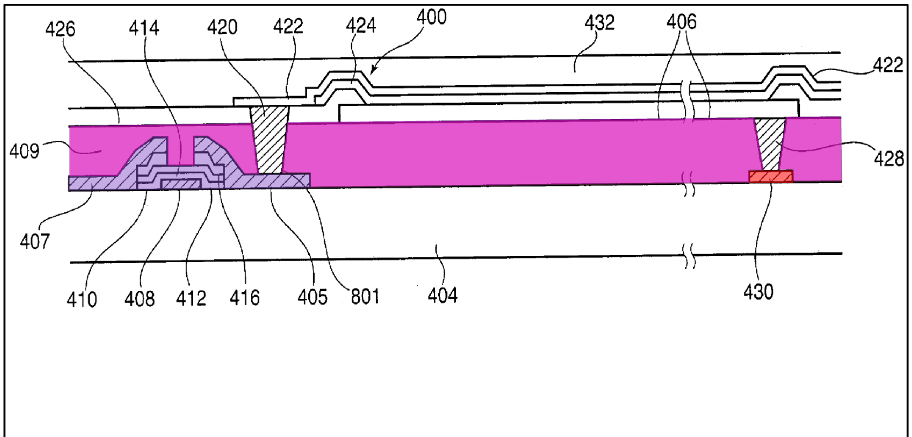


Fig. 4

Organic layer 424 is disposed between the anode 406 (connected to bus line 430) and the cathode 422 (connected to the transistor 410). The organic layer 424 also serves to electrically insulate the bus line 430 from the transistor 410 for the same reason that light emitting layer 130 of the 509 patent (disposed between first electrode layer 132 which is connected to auxiliary electrode 220, and second electrode layer 136 which is connected to active device T2) serves to electrically insulate the first auxiliary electrode 220 from the active device T2. *See* Fig. 3 of 509 patent. Otherwise, claim 1 would not read on any of the 509 disclosed embodiments.

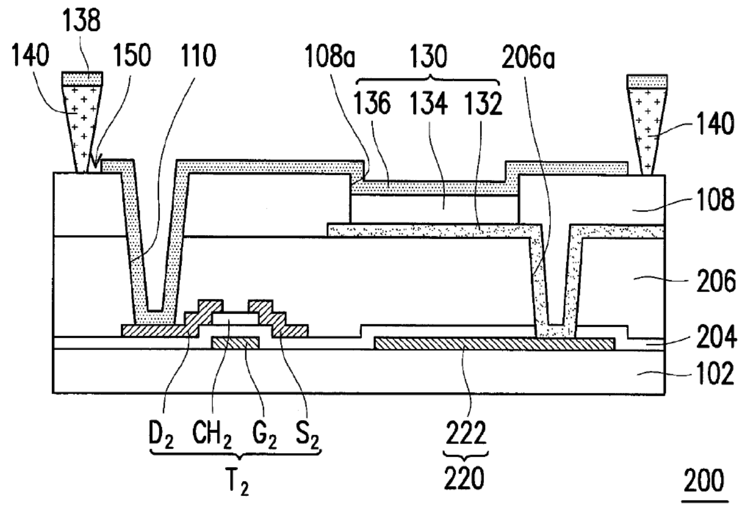


FIG. 3

The 509 patent teaches that this arrangement provides the claimed electrically insulated configuration. EX1001, 4:5-6.

Weaver discloses that bus line 430 is an electrode that is supplemental to other electrodes in the structure. EX1004, [0026], Fig. 4; EX1003, ¶92.

Weaver also discloses that in forming the pixel, a source/drain level metal is deposited and patterned to form, among other things, bus line 430. EX1004, [0034], Fig. 6. Via holes 428 are formed in the passivation layer to bus line 430. *Id.*

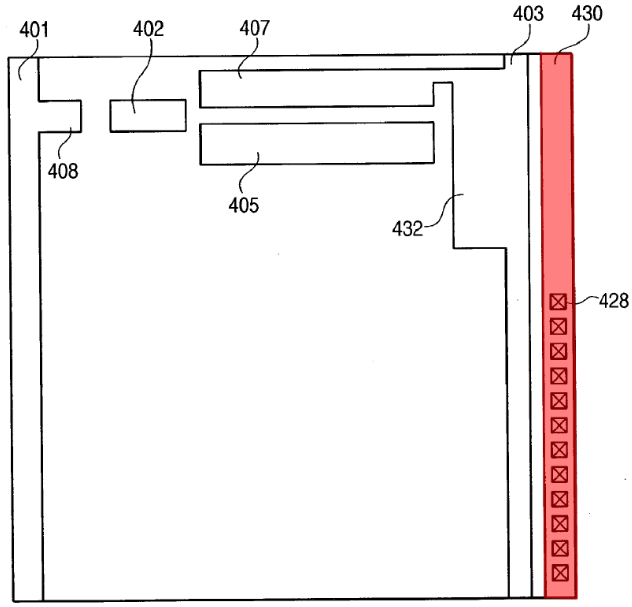


Fig. 6

An ITO layer is deposited and patterned to form anode 406, where "Anode 406 is formed so as to cover vias 428 as shown in FIG. 6 to contact ITO bus line 430. *Id.*, [0036], Fig. 7. A POSITA would have understood that the plural electrical connections provided by vias 428 between anode 406 and bus line 430 means that the anode 406 and bus line 430 are connected in parallel, which means that bus line 430 is a supplemental electrode that reduces the total resistance of the pixel structure. EX1003, ¶94.

5. [1d]

Weaver discloses "a light emitting device (OLED 202, 302, 400) disposed above the first auxiliary electrode (bus line 430), wherein the light emitting device comprises." EX1003, ¶¶95-96.

Weaver discloses that OLED stands for organic light emitting device. EX1004, [0014]. OLED 400 includes three layers (cathode 422, organic layer 424, anode 406), which are disposed above bus line 430. *Id.*, [0026], Fig. 4.

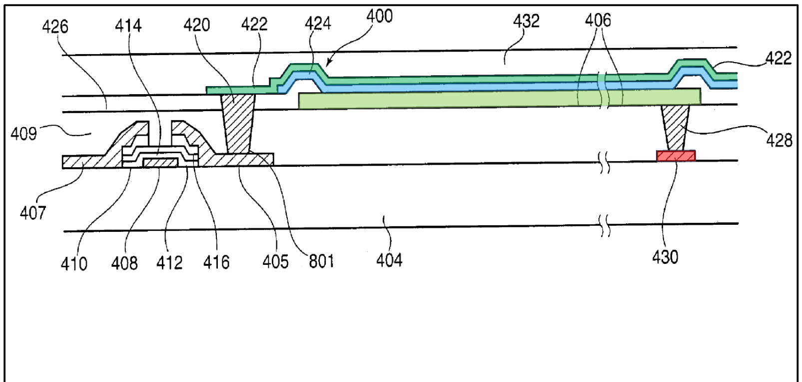


Fig. 4

OLED 400 is considered "above" the bus line 430 because a portion (but not all) of OLED 400 vertically overlaps with bus line 430, in the same way that a portion (but not all) of light emitting device 130 vertically overlaps with first auxiliary electrode 120 for the embodiments of the 509 patent. EX1001, Figs. 2-5. EX1003, ¶96.

6. [1e]

Weaver discloses "a first electrode layer (anode 406) electrically connected with the first auxiliary electrode (bus line 430)." EX1003, ¶¶97-98.

Weaver discloses that OLED 400 includes anode 406, which is electrically connected to bus line 430 by via 428. EX1004, [0026] ("Via 428 connects the anode 406 of OLED 400 to bus line 430."), Fig. 4.

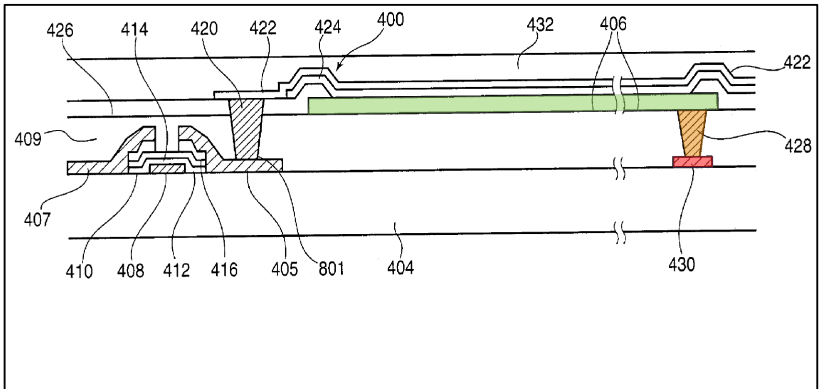


Fig. 4

7. [1f]

Weaver discloses "a light emitting layer (organic layer 424) disposed on the first electrode layer (anode 406)." EX1003, ¶¶99-100.

Weaver discloses that OLED 400 includes organic layer 424, which is disposed on anode 406. EX1004, [0026], Fig. 4.

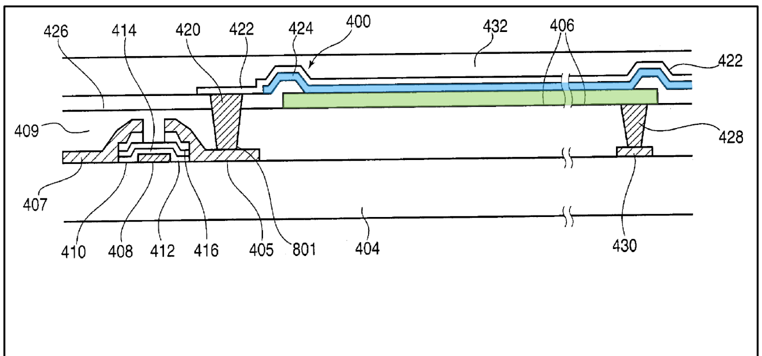


Fig. 4

Organic layer 424 emits light when sufficient current is passed between the anode 406 and cathode 422. *Id.*, [0027].

8. [1g]

Weaver discloses "a second electrode layer (cathode 422) disposed on the light emitting layer (organic layer 424), wherein the second electrode layer is electrically connected with the active device (transistor 410)." EX1003, ¶¶101-103.

A POSITA would have understood that reciting "the active device" (singular) in claim 1 or in claims dependent thereon refers to one of the "at least one active device" of claim 1 if there is more than one. *Id.* §V.A.4

Weaver discloses that OLED 400 includes cathode 422, which is disposed on the organic layer 424. EX1004, [0026], Fig. 4.

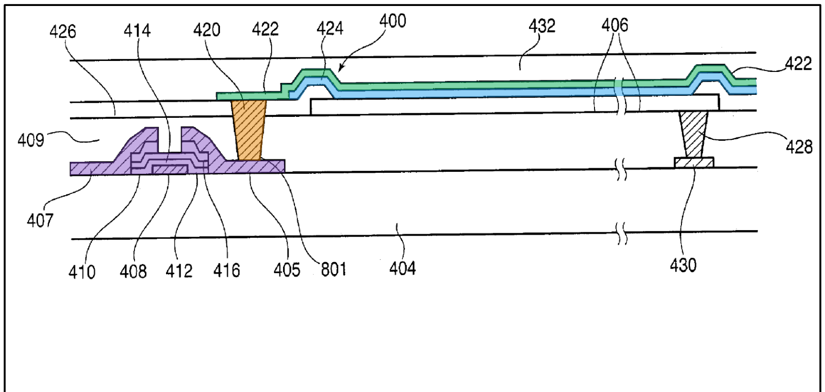


Fig. 4

Cathode 422 is electrically connected to the source region 405 of transistor 410 by a metal plug filling via 420. *Id.*, [0025], Fig. 4.

B. Claim 2

Weaver discloses "the pixel structure according to claim 1 (*see* claim 1), further comprising a first insulating layer (passivation layer 409) covering the active device (transistor 410) and the first auxiliary electrode (bus line 430), and the first electrode layer (anode 406) of the light emitting device (OLED 400) being disposed on the first insulating layer (passivation layer 409), wherein the first insulating layer (passivation layer 409) has a first contact window opening (via hole 428) that exposes the first auxiliary electrode (bus line 430), and the first electrode layer (anode 406) is electrically connected with the first auxiliary electrode (bus line 430) via the first contact window opening (by a metal plug formed in via hole 428)." EX1003, ¶¶104-106.

A POSITA would have understood that reciting "the active device" (singular) in claim 1 or in claims dependent thereon refers to one of the "at least one active device" of claim 1 if there is more than one. *Id.* §V.A.4.

Fig. 4 of Weaver shows passivation layer 409 covering transistor 410 and bus line 430, where anode 406 is disposed on passivation layer 409.

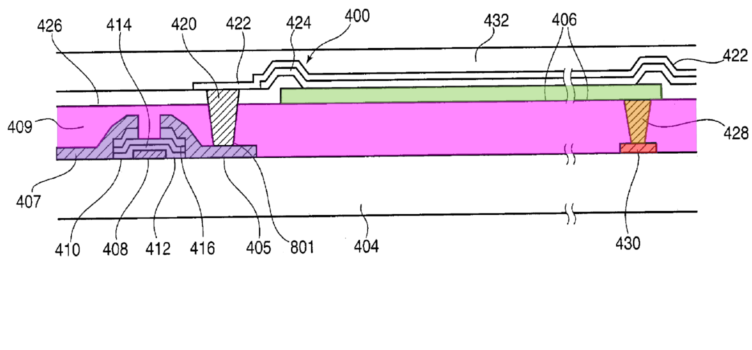


Fig. 4

Weaver discloses that via holes 428 are formed in the passivation layer to the bus line 430, and metal plugs are formed therein (to electrically connect bus line 430 to anode 406). EX1004, [0035], Fig. 4.

C. Claim 3

Weaver discloses "the pixel structure according to claim 2 (*see* claim 2), further comprising a second insulating layer (dielectric layer 426) covering the first insulating layer (passivation layer 409) and the first electrode layer (anode 406) of the light emitting device (OLED 400), and the second electrode layer (cathode 422) of the light emitting device being disposed on the second insulating layer (dielectric layer 426), wherein the second insulating layer (dielectric layer 426) has an opening that exposes the first electrode layer (anode 406), and the light emitting layer (organic layer 424) of the light emitting device is disposed in the opening." EX1003, ¶¶107-108.

Weaver discloses that dielectric layer 426 may define boundaries of the OLED, and is formed on and covers passivation layer 409. EX1004, [0026], Fig. 4. Cathode layer 422 is disposed on dielectric layer 426 in the vicinity of via 420. *Id.*, Fig. 4. Dielectric layer 426 has an opening indicated by the red arrows added to annotated Fig. 4 below that exposes the anode 406, where organic layer 424 is disposed in the opening. EX1003, ¶108.

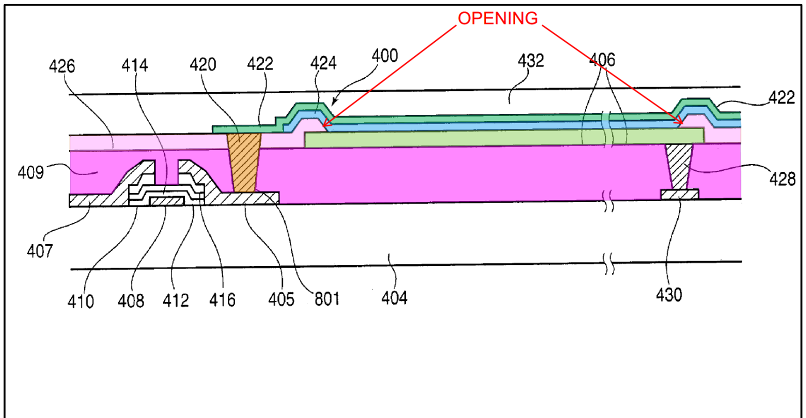


Fig. 4

D. Claim 4

Weaver discloses "the pixel structure according to claim 3 (*see* claim 3), wherein the first insulating layer (passivation layer 409) and the second insulating layer (dielectric layer 426) further comprise a second contact window opening (via hole 420) that exposes a portion of the active device (source 405 of transistor 410), and the second electrode layer (cathode 422) of the light emitting device is electrically connected with the active device (transistor 410) via the second contact window opening (by the metal plug in via 420)." EX1003, ¶¶109-111.

A POSITA would have understood that reciting "the active device" (singular) in claim 1 or in claims dependent thereon refers to one of the "at least one active device" of claim 1 if there is more than one. *Id.* §V.A.4.

Weaver discloses that transistor 410 is connected to the OLED 400 through via 420, which may be filled with a metal plug. EX1004, [0025]. Weaver shows that via 420 extends through both passivation layer 409 and dielectric layer 426 forming a contact window opening. *Id.*, Fig. 4.

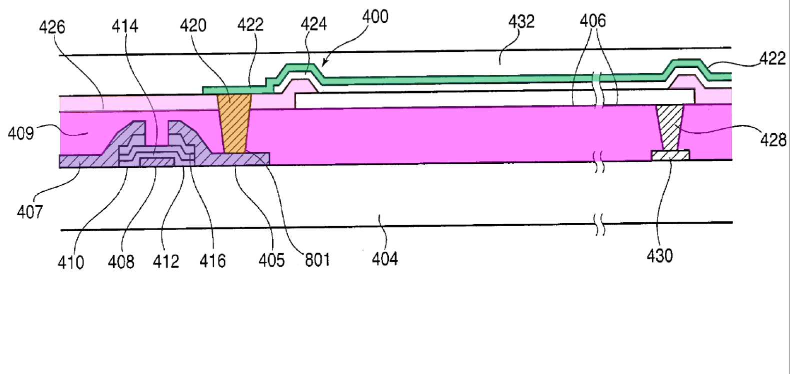


Fig. 4

Weaver discloses via 420 with metal plug therein connects the source region 405 of transistor 410 to the cathode 422 of OLED 400. *Id.*, [0025], Fig. 4.

E. Claim 5

Weaver discloses "the pixel structure according to claim 1 (*see* claim 1), wherein the first auxiliary electrode (bus line 430) is a single electrode layer." EX1003, ¶¶112-113.

Weaver discloses that bus line 430 is a single electrode layer. EX1004, [0026], [0036], Figs. 4 and 7.

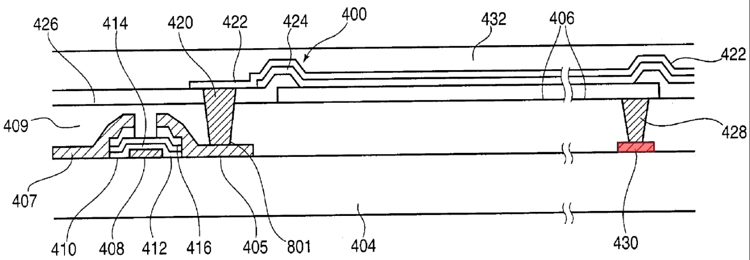


Fig. 4

F. Claim 9

Weaver discloses "the pixel structure according to claim 1 (*see* claim 1), further comprising an isolating structure (integrated shadow mask - ISM) disposed around the second electrode layer (cathode 422) of the light emitting device, wherein a gap exists between the second electrode layer and the isolating structure." EX1003, ¶¶114-116.

Weaver discloses that shadow masks can be formed around the OLED opening. EX1004, [0037]. An integrated shadow mask (ISM) is fabricated prior to OLED fabrication, after which the layers of OLED including cathodes 422 are formed. *Id.*, [0038]. The ISM's are isolating structures disposed around cathodes 422, with gaps indicated by the red arrows added to annotated Fig. 8 between the cathodes 422 and ISM's. *Id.*, Fig. 8; EX1003, ¶¶115-116.

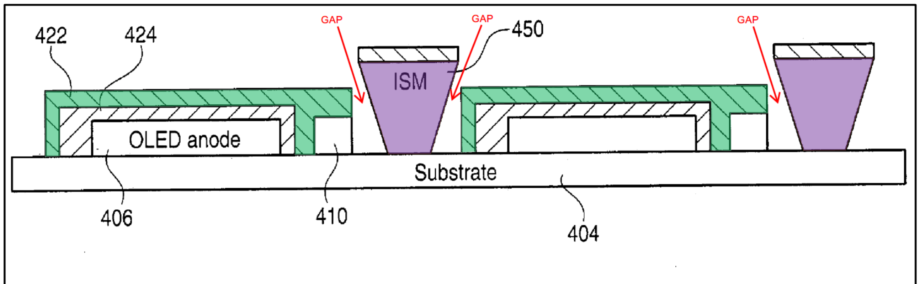


Fig. 8

G. Claim 12

Weaver discloses "the pixel structure according to claim 1 (*see* claim 1), wherein the light emitting device (OLED 202, 302, 400) is a top-emission organic electroluminescent device." EX1003, ¶¶117-118.

Weaver discloses that cathode 422 may be sufficiently transparent to create a top emitting device. EX1004, [0029]. Organic layer 424 may be any suitable organic material that emits light when sufficient current is passed between anode 406 and cathode 422, and can include phosphorescent materials for higher luminescent efficiencies. *Id.*, [0027]-[0028]; EX1003, ¶118.

H. Claim 13

Weaver discloses "the pixel structure according to claim 1 (*see* claim 1), wherein a vertical projection of the light emitting layer (organic layer 424) of the light emitting device (OLED 400) at least partially overlaps the first auxiliary electrode (bus line 430)." EX1003, ¶¶119-120.

Weaver discloses that the organic layer 424 has a vertical projection that at least partially overlaps with bus line 430. EX1004, Fig. 4; EX1003, ¶120.

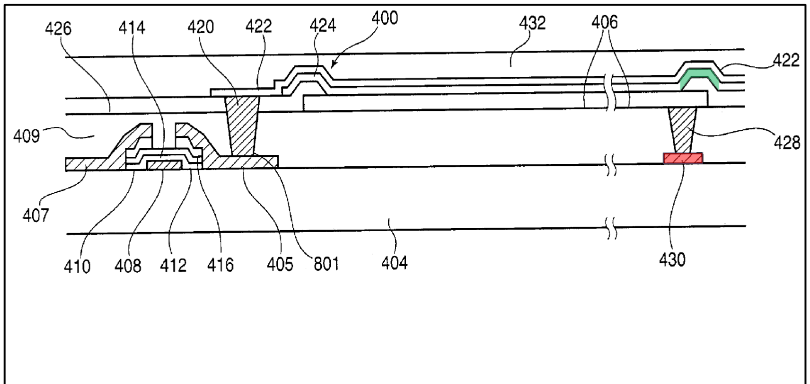


Fig. 4

VI. GROUND 2: CLAIMS 6-8 RENDERED OBVIOUS BY WEAVER AND LEE053

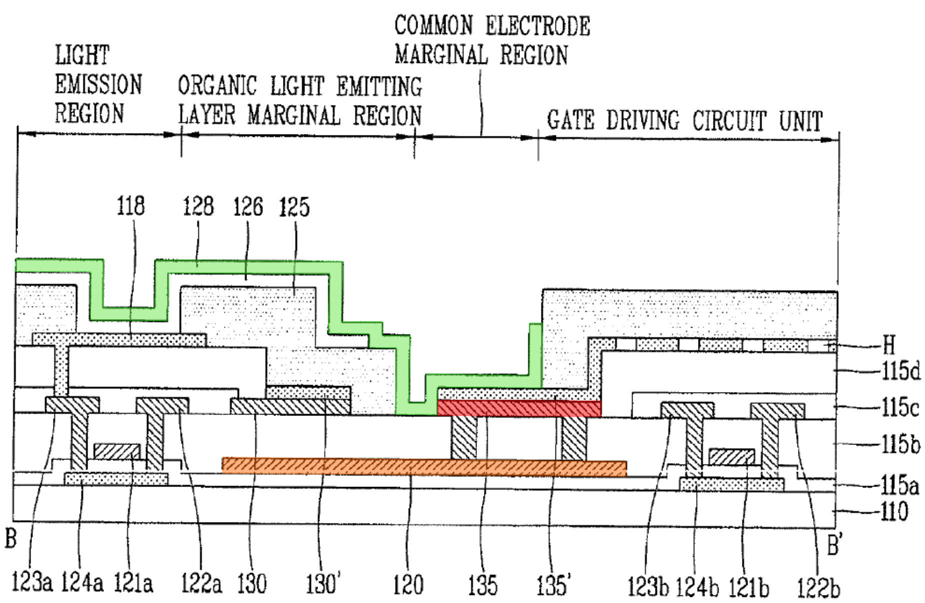
A. Claim 6

The Weaver-Lee053 combination renders obvious "the pixel structure (Weaver's pixel structure) according to claim 1 (*see* claim 1), wherein the first auxiliary electrode (Weaver's bus line 430) comprises: a bottom electrode layer (Weaver's bus line 430 modified to comprise Lee053's dummy wiring 120); and a top electrode layer (Weaver's bus line 430 corresponding to Lee053's second power wiring 135) electrically connected with the bottom electrode layer (Weaver's bus line 430 modified to include connection between Lee053's dual layers), wherein the first electrode layer (Weaver's anode 406) of the light emitting device (Weaver's OLED 400) is electrically connected with the top electrode layer of the first auxiliary electrode (by Weaver's metal plug in via 428)." EX1003, ¶¶122-131.

Weaver discloses a first auxiliary electrode (bus line 430) wherein the first electrode layer 406 of the light emitting device (OLED 400) is electrically connected to the first auxiliary electrode (bus line 430). *See* §§V.A.4, V.A.6; EX1003, ¶123.

Lee053 discloses dummy wiring 120, which is made of metal. EX1005, [0073], Fig. 7.

FIG. 7

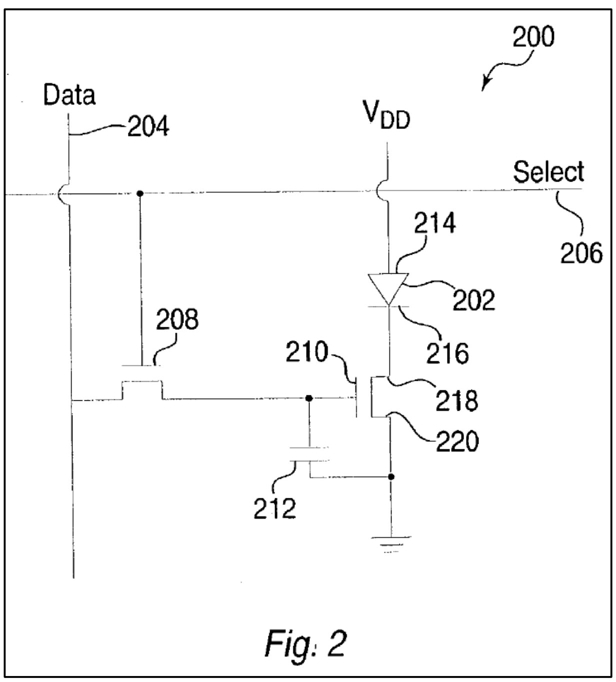


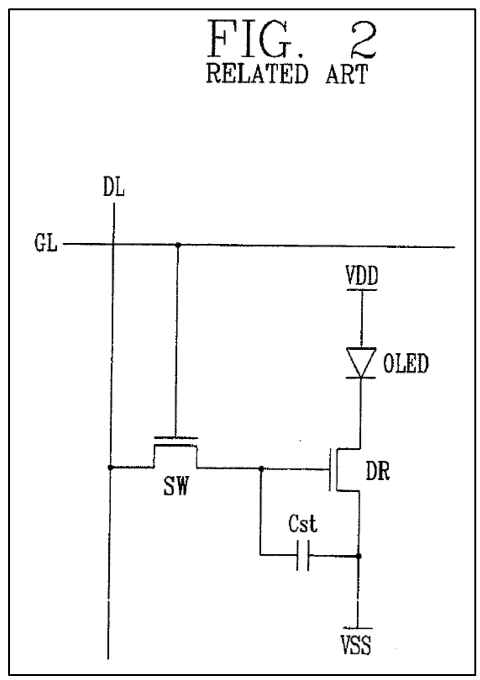
A light emitting device includes electrode 118 as an anode, an organic light emitting layer 126 on electrode 118, and electrode 128 as a cathode on the organic light emitting layer 126. EX1005, [0081], [0089], [0091], Fig. 7. Lee053 discloses a first auxiliary electrode having a top electrode layer (second power wiring 135) and a bottom electrode layer (dummy wiring 120), which is made of metal. *Id.*, [0073], Fig. 7. The second power wiring 135 is electrically connected to underlying dummy wiring 120 through a third contact hole. *Id.*, [0077], Fig. 7. Lee053 discloses that dummy wiring 120 and second power wiring 135 collectively are an electrode that is supplemental to other electrodes in the structure. *Id.*; EX1003, ¶124.

The top electrode layer (second power wiring 135) is electrically connected to the cathode (electrode 128) by second power wiring pattern 135'. EX1005, [0092], Fig. 7. Therefore, Lee053 discloses that it was known to electrically connect an auxiliary electrode to one of the electrode layers of a light emitting device, where that auxiliary electrode includes a top electrode layer (second power wiring 135) and a bottom electrode layer (dummy wiring 120) electrically connected together. EX1003, ¶125. Lee053 discloses that providing the dummy wiring 120 at a lower side of, and connected to, the second power wiring 135, reduces wiring resistance, and also allows for the widths of the wirings to be reduced while having the same wiring resistance. EX1005, [0093], [0085].

It would have been obvious to a POSITA to combine the teachings of Weaver and Lee053 to reconfigure the bus line 430 of Weaver with a bottom electrode layer (akin to Lee053's dummy wiring 120) that is electrically connected with a top electrode layer (akin to Lee053's second power wiring 135), wherein the first electrode layer (anode 406) of the light emitting device 400 of Weaver is electrically connected with the top electrode layer. EX1003, ¶126.

Weaver and Lee053 are analogous prior art to the 509 patent, as each relates to organic light emitting devices with an organic light emitting layer disposed between an anode electrode layer and a cathode electrode layer, as well as the surrounding layers and circuits to operate the light emitting devices. *Id.*, ¶127. Both references disclose the same OLED circuit design (compare Fig. 2 of Weaver and Fig. 2 of Lee053).





A POSITA would have understood the problem involved, namely that higher resistance between the power or ground line to the light emitting device would consume more power and require higher operating voltages, and can require larger wiring widths in order to achieve a desired performance. *Id.*, ¶128; EX1005,

[0085], [0093]. To overcome this problem, Lee053 discloses the solution of providing the auxiliary electrode, (electrically connected to one of the LED electrodes) configured as two electrode layers (top electrode layer and bottom electrode layer) that are electrically connected together. EX1003, ¶128. Doing so reduces resistance, and can allow for reduced wiring widths as disclosed in Lee053. A POSITA would have been motivated to implement the solution of Lee053 in the Weaver device to lower the resistance between anode 406 and the voltage source VDD, and/or allow for reduced wiring widths that enables scaling down the size of the circuit. *Id.*, ¶128.

The modification to Weaver could be implemented, for example, by adding an additional electrode layer electrically connected to the bus line 430, whereby the additional electrode layer is the bottom electrode layer, and the bus line 430 is the top electrode layer. *Id.*, ¶129.

Modified Fig. 4 of Weaver below shows an example of such a straightforward implementation, with the additional electrode layer added as part of the same layer of conductive material used to form gate 408, the additional insulation layer is added as part of the insulation layer 412 (i.e., as part of the SiNx layer described in [0024] and shown as layer 412 of the transistor 410 in Fig. 4), and bus line 430 formed as part of the same layer of conductive material used to form source/drain regions 405/407 on top of insulation layer 412, where the additional electrode layer and the bus line 430 are electrically connected, and the bus line 430 and anode 406 are electrically connected. EX1003, ¶130.

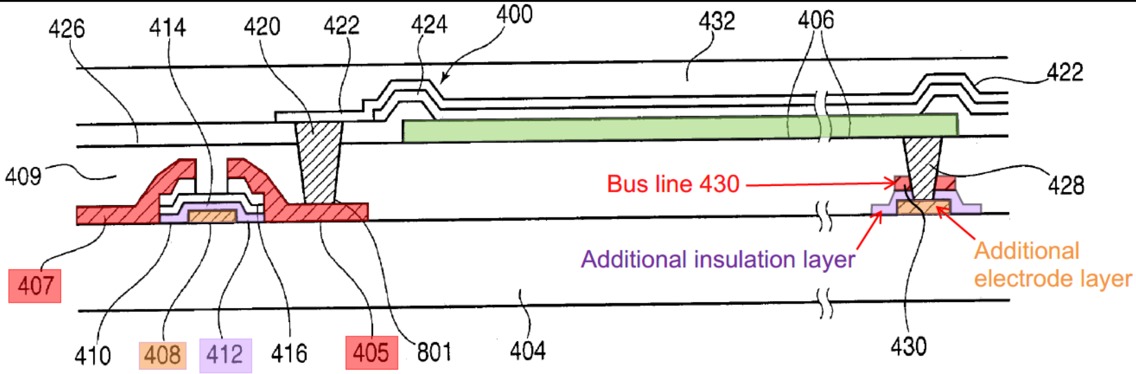


Fig. 4
(MODIFIED)

This implementation would provide for an efficient manufacturing process flow. *Id.*

A POSITA would have had a reasonable expectation of success in combining Weaver and Lee053, as both references disclose the various layers for connecting to and operating a light emitting device with an anode and a cathode, and the modification to Weaver to implement the solution taught in Lee053 involves modifications of only routine skill in the art. EX1003, ¶131. Moreover, because combining the teachings of Weaver and Lee053 would involve known methods, it would have yielded predictable results. *Id.*

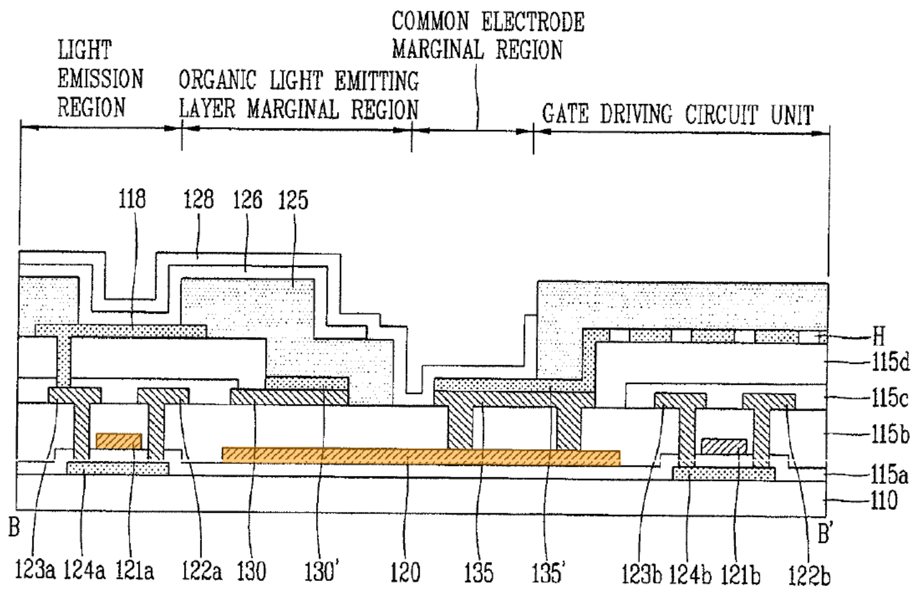
B. Claim 7

The Weaver-Lee053 combination renders obvious "the pixel structure according to claim 6 (*see* claim 6), wherein the bottom electrode layer (Weaver modified with the additional electrode layer) and the gate (Weaver's gate 408) of the active device belong to the same layer." EX1003, ¶¶132-138.

As set forth above for claim 6, it would have been obvious to a POSITA to combine the teachings of Weaver and Lee053 to reconfigure the bus line 430 of Weaver with a bottom electrode layer (akin to Lee053's dummy wiring 120) that is electrically connected with a top electrode layer (akin to Lee053's second power wiring 135), wherein the first electrode layer (anode 406) of the light emitting device 400 of Weaver is electrically connected with the top electrode layer. *See* §VI.A.

Lee053 discloses that OLED display devices are driven by thin film transistor (TFT) switching elements (i.e., active devices), including a TFT formed in the light emission region and electrically connected to the anode electrode 118. EX1005, [0008], [0069], Fig. 7. The TFT in the light emission region includes a first active layer 124a, a first gate electrode 121a, and first source and drain electrodes 122a and 123a. *Id.*, [0074], [0076], Fig. 7.

FIG. 7



Lee053 discloses that the first gate electrode 121a is included in "gate wiring." *Id.*, [0071]. Lee053 also discloses that the dummy wiring 120 is "made of the metal for a gate wiring." *Id.*, [0073]. The first gate electrode 121a and the dummy wiring 120 are both formed on layer 115a. *Id.*, Fig. 7. Therefore, Lee053 discloses or at least renders obvious that the dummy wiring 120 and the first gate electrode 121a of the TFT active device belong to the same layer. EX1003, ¶134.

In combining the teachings of Weaver and Lee053 as set forth above in §VI.A, it would have been obvious to a POSITA to add the additional electrode layer as part of the same layer of conductive material used to form gate 408, to add the additional insulation layer as part of the insulation layer 412, and to form bus line 430 as part of the same layer of conductive material used to form source/drain regions 405/407, as shown in the modified Fig. 4 of Weaver below. EX1003, ¶135.

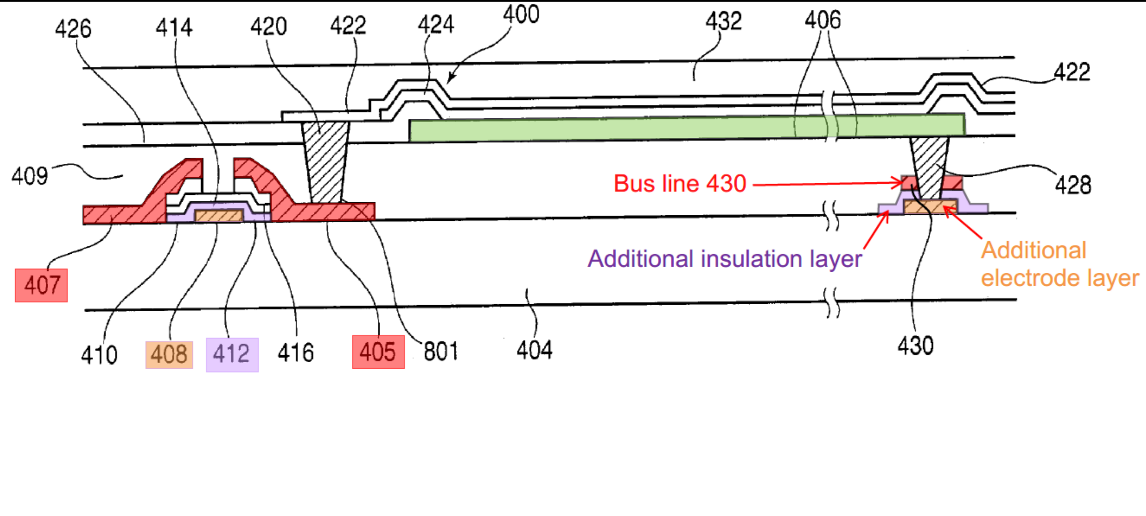


Fig. 4
(MODIFIED)

Weaver and Lee053 are analogous prior art to the 509 patent. *See* §VI.A.

A POSITA would have understood the problem involved, namely how to efficiently form the various layers of the device. To overcome this problem, Lee053 discloses or renders obvious the solution of using the same layer of conductive material to form both the dummy wiring 120 and the first gate electrode 121a of the same metal layer. EX1003, ¶137. Doing so simplifies semiconductor manufacturing steps to more efficiently form the device, reducing the number of the processing steps necessary to fabricate the device. A POSITA would have been motivated to implement the solution of Lee053 in the Weaver device to manufacture the device more efficiently. *Id.*

A POSITA would have had a reasonable expectation of success in combining Weaver and Lee053, as both references disclose the various layers for connecting to and operating an organic light emitting device with an anode and a cathode, and techniques for their manufacture. The modification to Weaver to implement the solution taught or rendered obvious in Lee053 involves modifications of only routine skill in the art. Specifically, both the additional electrode layer and the gate 408 are formed on substrate 404, so their formation using the same conductive layer would have involved routine skill in the art. *Id.*, ¶138. Because combining the teachings of Weaver and Lee053 would involve known methods, it would have yielded predictable results. *Id.*

C. Claim 8

The Weaver-Lee053 combination renders obvious "the pixel structure according to claim 6 (*see* claim 6), wherein the top electrode layer (Weaver's bus line 430 as modified by Lee053) and the source and the drain of the active device (Weaver's source region 405 and the drain region 407 of transistor 410) belong to the same layer." EX1003, ¶¶139-146.

As set forth above for claim 6, it would have been obvious to a POSITA to combine the teachings of Weaver and Lee053 to reconfigure the bus line 430 of Weaver with a bottom electrode layer (akin to Lee053's dummy wiring 120) that is electrically connected with a top electrode layer (akin to Lee053's second power wiring 135). *See* §VI.A.

Weaver discloses that bus line 430, and source region 405 and drain region 407 of transistor 410 are formed in the same layer. Specifically, Weaver discloses that in forming the device of Fig. 4, a source/drain level metal (e.g. Mo) is deposited and patterned to form data line 401, source/drain 408, contact 402, drain 405 and source 407, ground line 403, a top electrode 432 of the storage capacitor and ITO bus line 430.[2] EX1004, [0034], Fig. 6.

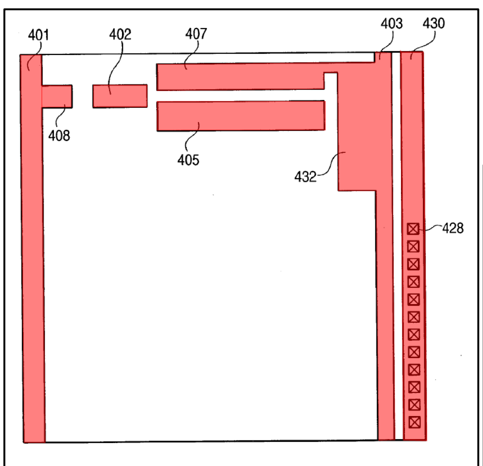


Fig. 6

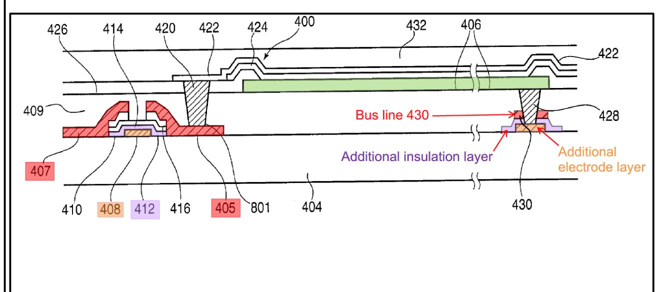


Fig. 4
(MODIFIED)

Lee053 discloses the TFT (active device) in the light emission region includes first source and drain electrodes 122a and 123a. EX1005, [0074], Fig. 7.

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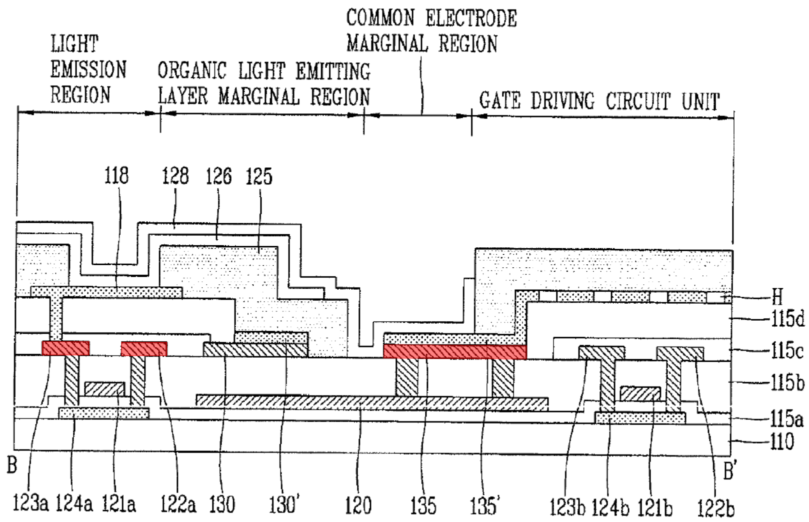
[2] A POSITA would have understood that reference to drain 405 and source 407 in ¶[0034] is referring to source region 405 and drain region 407 of Fig. 4. EX1003, ¶141.

FIG. 7



Lee053 further discloses that the first source and drain electrodes 122a and 123a are included as part of the "data wiring" that are formed on first passivation layer 115b. *Id.*, ¶0074, Fig. 7. Lee053 also discloses that second power wiring 135 is "made of metal for a data wiring," and is also formed on passivation layer 115b. *Id.*, ¶0077, Fig. 7. Therefore, Lee053 discloses or at least renders obvious forming first source and drain electrodes 122a and 123a and second power wiring 135 whereby they belong to the same conductive layer. EX1003, ¶142.

In combining the teachings of Weaver and Lee053 as set forth above in §VI.A, it would have been obvious to a POSITA to form the top electrode layer of the first auxiliary electrode (i.e. bus line 430), and the source region 405 and the drain region 407 of transistor 410 in Weaver, so they belong to the same layer. *Id.*, ¶143; EX1004, [0034], Fig.4, Fig. 6.

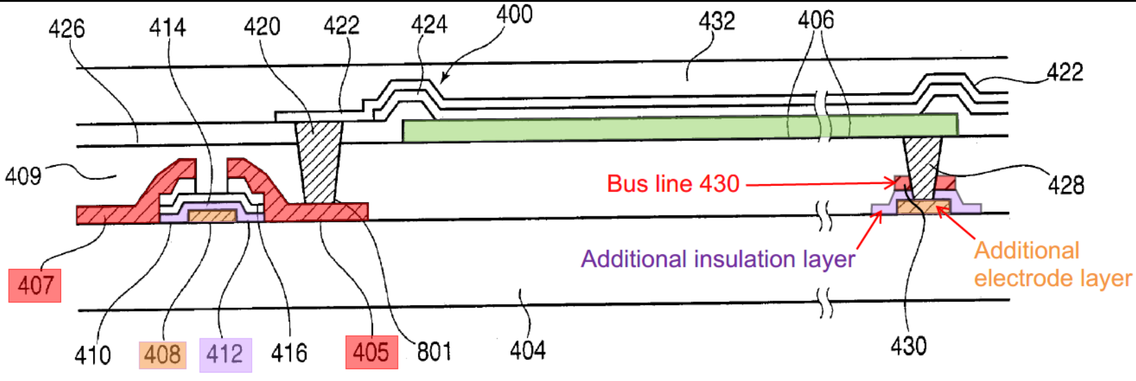


Fig. 4
(MODIFIED)

Weaver and Lee053 are analogous prior art to the 509 patent. *See* §VI.A.

A POSITA would have understood the problem involved, namely how to efficiently form the various layers of the device. To overcome this problem, Lee053 discloses or renders obvious the solution of forming first source and drain electrodes 122a and 123a and second power wiring 135 whereby they belong to the same metal layer, and Weaver discloses bus line 430, and source region 405 and drain region 407 of transistor 410 are formed in the same layer. EX1003, ¶145. Doing so simplifies semiconductor manufacturing steps to form the device, reducing the number of the processing steps necessary to fabricate the device. In combining the teachings of Weaver and Lee053 as set forth above in §VI.A, a POSITA would have been motivated to implement the solutions of Lee053 and Weaver to manufacture the device more efficiently. *Id.*

A POSITA would have had a reasonable expectation of success in combining Weaver and Lee053, as both references disclose the various layers for connecting to and operating a light emitting device with an anode and a cathode, and techniques for their manufacture. The modification to Weaver to implement the solution taught in Lee053 and Weaver involves modifications of only routine skill in the art. *Id.*, ¶146. Moreover, because combining the teachings of Weaver and Lee053 would involve known methods, it would have yielded predictable results. *Id.*

VII. GROUND 3: CLAIMS 6-8 RENDERED OBVIOUS BY WEAVER AND SONG

A. Claim 6

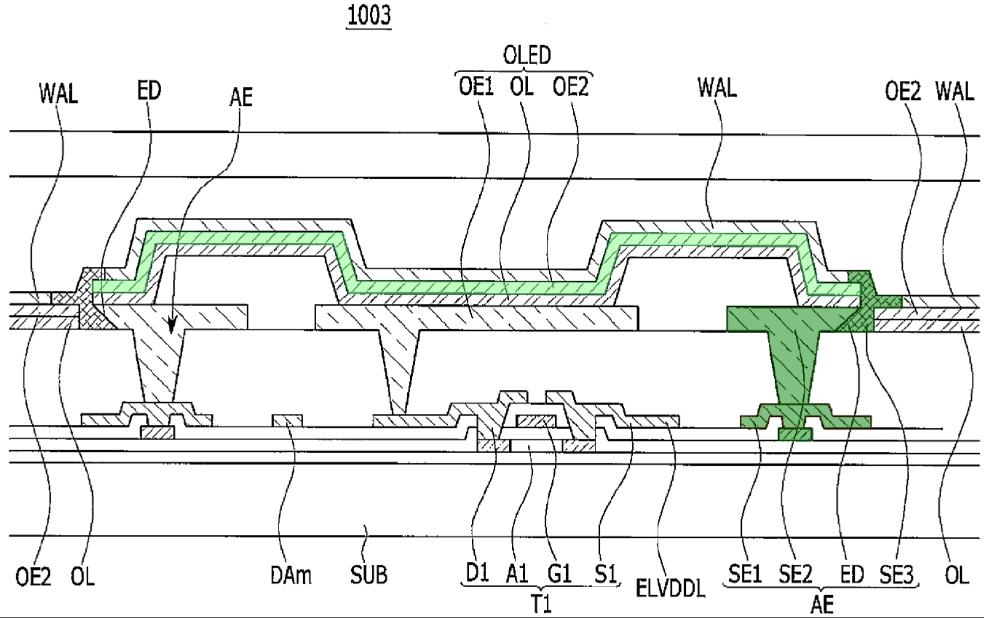
The Weaver-Song combination renders obvious "the pixel structure (Weaver's pixel structure) according to claim 1 (*see* claim 1), wherein the first auxiliary electrode (Weaver's bus line 430) comprises: a bottom electrode layer (Weaver's bus line 430 modified to comprise Song's bottom electrode layer of first auxiliary electrode portion SE1); and a top electrode layer (Weaver's bus line 430 corresponding to Song's top electrode layer of first auxiliary electrode portion SE1) electrically connected with the bottom electrode layer (Weaver's bus line 430 modified to include connection between Song's dual layers), wherein the first electrode layer (Weaver's anode 406) of the light emitting device (Weaver's

OLED 400) is electrically connected with the top electrode layer of the first auxiliary electrode (by Weaver's metal plug in via 428)." EX1003, ¶¶148-158.

Weaver discloses a first auxiliary electrode (bus line 430) wherein the first electrode layer 406 of the light emitting device (OLED 400) is electrically connected to the first auxiliary electrode (bus line 430). *See* §§V.A.4, V.A.6; EX1003, ¶149.

Song discloses an organic light emitting diode OLED that includes first electrode OE1 as an anode, an organic emission layer OL disposed on first electrode OE1, and second electrode OE2 as a cathode disposed on the organic emission layer OL. EX1006, [0069]; Fig. 5. Thin film transistor T1 (i.e., an active device) is electrically connected to the OLED and includes a first source electrode S1, a first drain electrode D1, a first active layer A1, and a first gate electrode G1. *Id.*, [0059]. Fig. 5. An auxiliary electrode AE of the OLED display includes a first auxiliary electrode portion SE1, a second auxiliary electrode portion SE2, and a third auxiliary electrode portion SE3 (which is electrically connected to the second electrode OE2). *Id.*, [0090], Fig. 5.

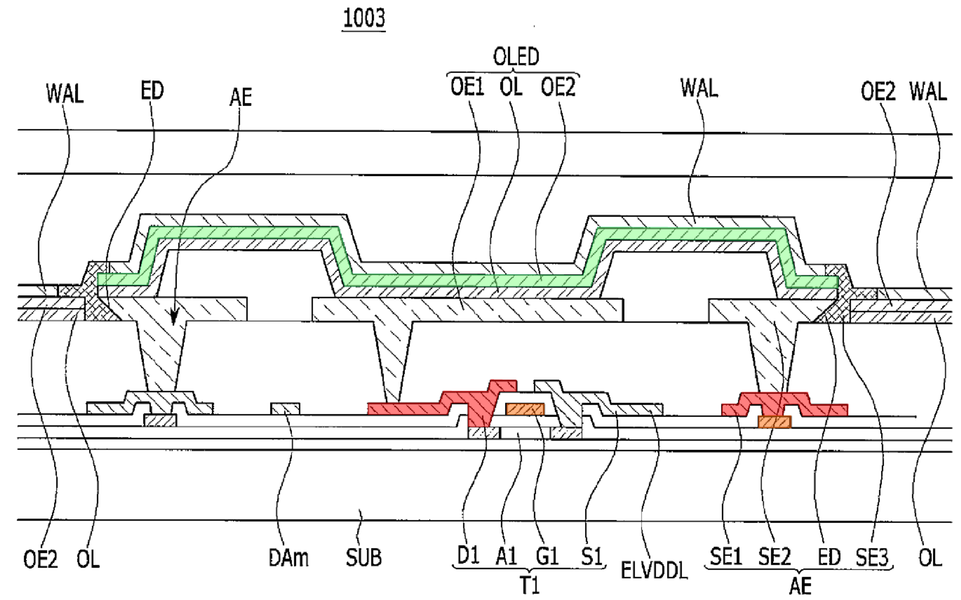
FIG. 5



The first auxiliary electrode portion SE1, the second auxiliary electrode portion SE2 and the third auxiliary electrode portion SE3 (of auxiliary electrode AE) wholly thickens second electrode OE2 to reduce sheet resistance and voltage drop. *Id.*, [0098].

Song discloses first auxiliary electrode portion SE1 is located (or disposed) in the same layer as that of a first gate electrode G1 and a first drain electrode D1 on substrate SUB. EX1006, [0090]-[0091], Fig. 5. However, Fig 5 shows that the first drain electrode D1 overlaps first gate electrode G1, and the first auxiliary electrode portion SE1 is formed of two sublayers (a top electrode layer and a bottom electrode layer). *Id.*

FIG. 5



Further, the first gate electrode G1 and the bottom electrode layer of the first auxiliary electrode portion SE1 are both formed on one of the insulation layers, and the first drain electrode D1 and the top electrode layer of the first auxiliary electrode portion SE1 are both formed on a different one of the insulation layers. *Id.* Therefore, a POSITA would have understood Song as disclosing that the first gate electrode G1 and the bottom electrode layer of the first auxiliary electrode portion SE1 are formed of one sublayer, and the first drain electrode D1 and the top electrode layer of the first auxiliary electrode portion SE1 are formed of a different sublayer. EX1003, ¶151. Song discloses that first auxiliary electrode portion SE1 is an electrode that is supplemental to other electrodes in the structure. *Id.*

The first auxiliary electrode portion SE1 is electrically connected to the cathode (second electrode OE2) by second auxiliary electrode portion SE2 and third auxiliary electrode portion SE3. EX1006, [0098], Fig. 5. Therefore, Song discloses that it was known to electrically connect an auxiliary electrode to one of the electrode layers of a light emitting device, where the that auxiliary electrode (first auxiliary electrode portion SE1) includes a top electrode layer (in the same layer as the first drain electrode D1) and a bottom electrode layer (in the same layer as the first gate electrode G1). EX1003, ¶152.

It would have been obvious to a POSITA to combine the teachings of Weaver and Song to reconfigure the bus line 430 of Weaver with a top electrode layer (akin to Song's top electrode layer of first auxiliary electrode portion SE1) that is electrically connected with a bottom electrode layer (akin to Song's bottom electrode layer of first auxiliary electrode portion SE1), wherein the first electrode layer (anode 406) of the light emitting device 400 of Weaver is electrically connected with the top electrode layer. EX1003, ¶153.

Weaver and Song are analogous prior art to the 509 patent, as each relates to organic light emitting devices with an organic light emitting layer disposed between an anode electrode layer and a cathode electrode layer, as well as the surrounding layers and circuits to operate the light emitting devices. *Id.*, ¶154.

A POSITA would have understood the problem involved, namely that higher sheet resistance between the power or ground line to the light emitting device would consume more power and require higher operating voltages because of the higher voltage drop of the OLED display. *Id.*, ¶155; EX1006, [0098]. To overcome this problem, Song discloses the solution of providing the auxiliary electrode, (electrically connected to one of the LED electrodes) configured as two electrode layers (top electrode layer and bottom electrode layer) that are electrically connected together. EX1003, ¶155. Doing so reduces resistance and voltage drop as disclosed in Song. *Id.* A POSITA would have been motivated to implement the solution of Song in the Weaver device to lower the resistance and voltage drop between anode 406 and the voltage source VDD of Weaver. *Id.*

The modification to Weaver could be implemented, for example, by adding an additional electrode layer electrically connected to the bus line 430, whereby the additional electrode layer is the bottom electrode layer, and the bus line 430 is the top electrode layer. *Id.*, ¶156.

Modified Fig. 4 of Weaver below shows an example of such a straightforward implementation, with the additional electrode layer added as part of the same layer of conductive material used to form gate 408, the additional insulation layer is added as part of the insulation layer 412 (i.e., as part of the SiNx layer described in [0024] and shown as layer 412 of the transistor 410 in Fig. 4), and bus line 430 formed as part of the same layer of conductive material used to form source/drain regions 405/407 on top of insulation layer 412, where the additional electrode layer and the bus line 430 are electrically connected, and the bus line 430 and anode 406 are electrically connected. EX1003, ¶157.

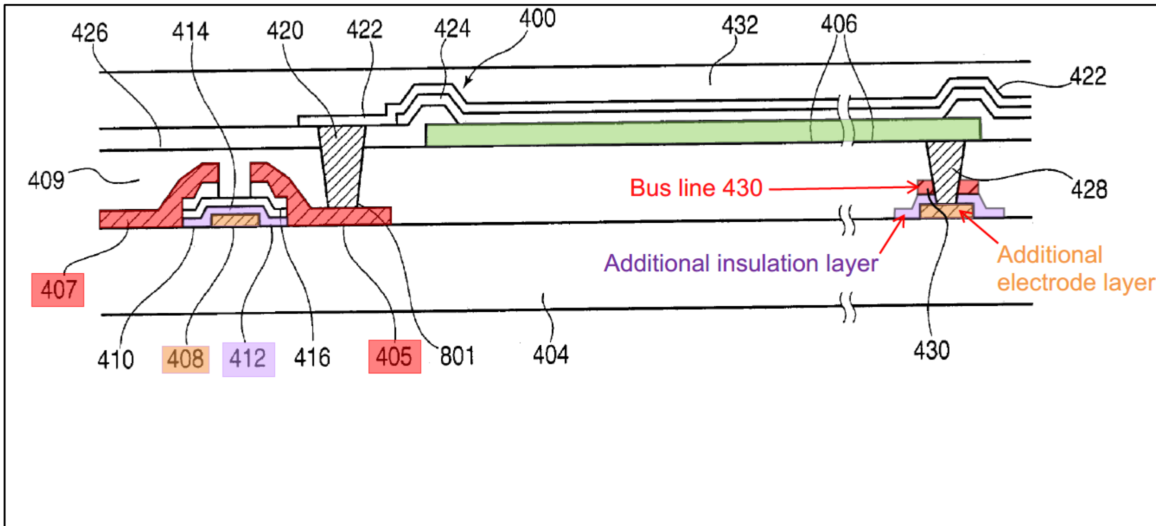


Fig. 4
(MODIFIED)

This implementation would provide for an efficient manufacturing process flow. *Id.*

A POSITA would have had a reasonable expectation of success in combining Weaver and Song, as both references disclose the various layers for connecting to and operating a light emitting device with an anode and a cathode, and the modification to Weaver to implement the solution taught in Song involves modifications of only routine skill in the art. *Id.*, ¶158. Moreover, because combining the teachings of Weaver and Song would involve known methods, it would have yielded predictable results. *Id.*

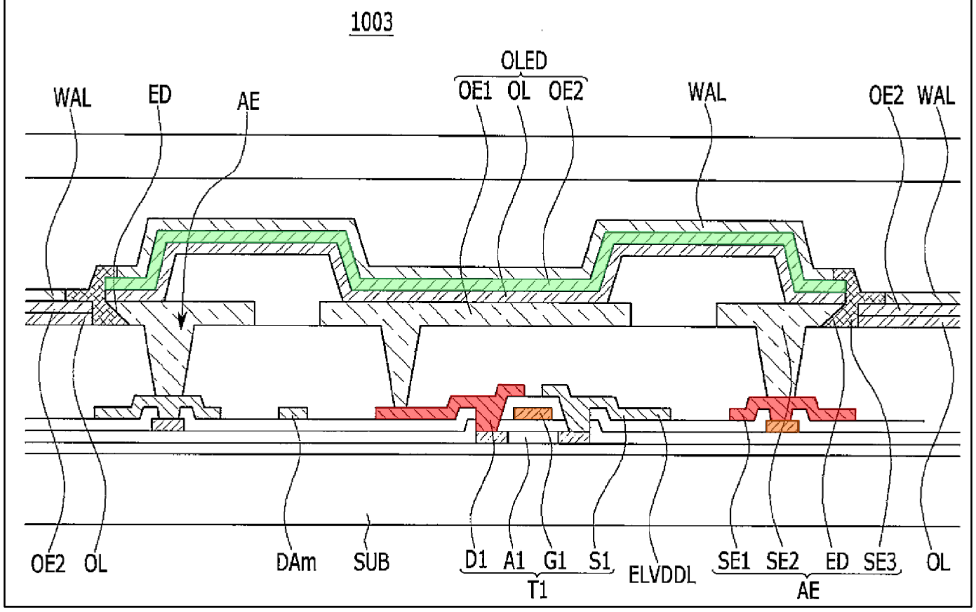
B. Claim 7

The Weaver-Song combination renders obvious "the pixel structure according to claim 6 (*see* claim 6), wherein the bottom electrode layer (modified Weaver's bus line 430) and the gate (Weaver's gate 408) of the active device belong to the same layer." EX1003, ¶¶159-165.

As set forth above for claim 6, it would have been obvious to a POSITA to combine the teachings of Weaver and Song to reconfigure the bus line 430 of Weaver with a bottom electrode layer (akin to Song's bottom electrode layer of first auxiliary electrode portion SE1) that is electrically connected with a top electrode layer (akin to Song's top electrode layer of first auxiliary electrode portion SE1), wherein the first electrode layer (anode 406) of the light emitting device 400 of Weaver is electrically connected with the top electrode layer. *See* §VII.A.

Song discloses that the first gate electrode G1 and the bottom electrode layer of the first auxiliary electrode portion SE1 are formed of the same sublayer. *See* §VII.A.

FIG. 5



In combining the teachings of Weaver and Song as set forth above in §VII.A, it would have been obvious to a POSITA to add the additional electrode layer as part of the same layer of conductive material used to form gate 408, to add the additional insulation layer as part of the insulation layer 412, and to form bus line 430 as part of the same layer of conductive material used to form source/drain regions 405/407, as shown in the modified Fig. 4 of Weaver below. EX1003, ¶162.

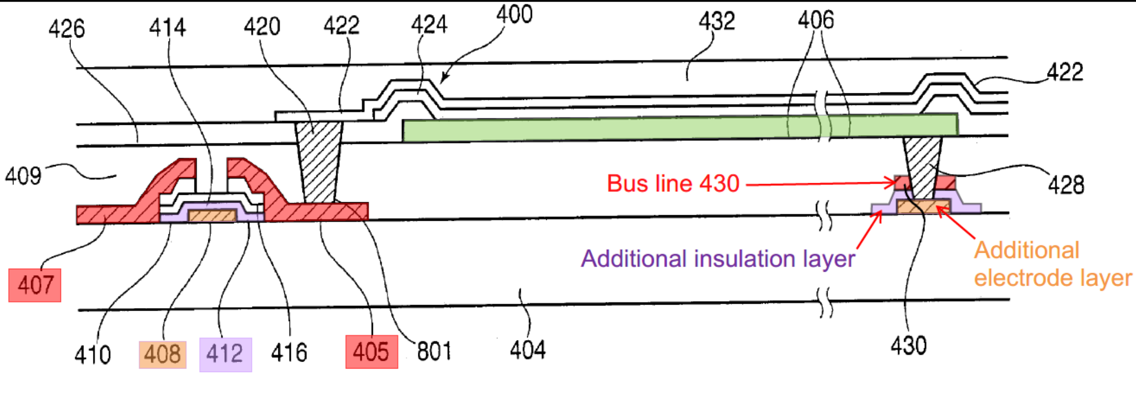


Fig. 4
(MODIFIED)

Weaver and Song are analogous prior art to the 509 patent. *See* §VII.A.

A POSITA would have understood the problem involved, namely how to efficiently form the various layers of the device. To overcome this problem, Song discloses the solution of using the same layer of conductive material to form both the first gate electrode G1 and the bottom electrode layer of the first auxiliary electrode portion SE1. EX1003, ¶164. Doing so simplifies semiconductor manufacturing steps to form the device, reducing the number the processing steps necessary to fabricate the device. A POSITA would have been motivated to implement the solution of Song in the Weaver device to manufacture the device more efficiently. *Id.*

A POSITA would have had a reasonable expectation of success in combining Weaver and Song, as both references disclose the various layers for connecting to and operating an organic light emitting device with an anode and a cathode, and techniques for their manufacture. *Id.*, ¶165. The modification to Weaver to implement the solution taught in Song involves modifications of only routine skill in the art. Specifically, both the additional electrode layer and the gate 408 are formed on substrate 404, so their formation using the same conductive layer would have involved routine skill in the art. *Id.*; EX1004, Fig. 4. Because combining the teachings of Weaver and Song would involve known methods, it would have yielded predictable results. EX1003, ¶165.

C. Claim 8

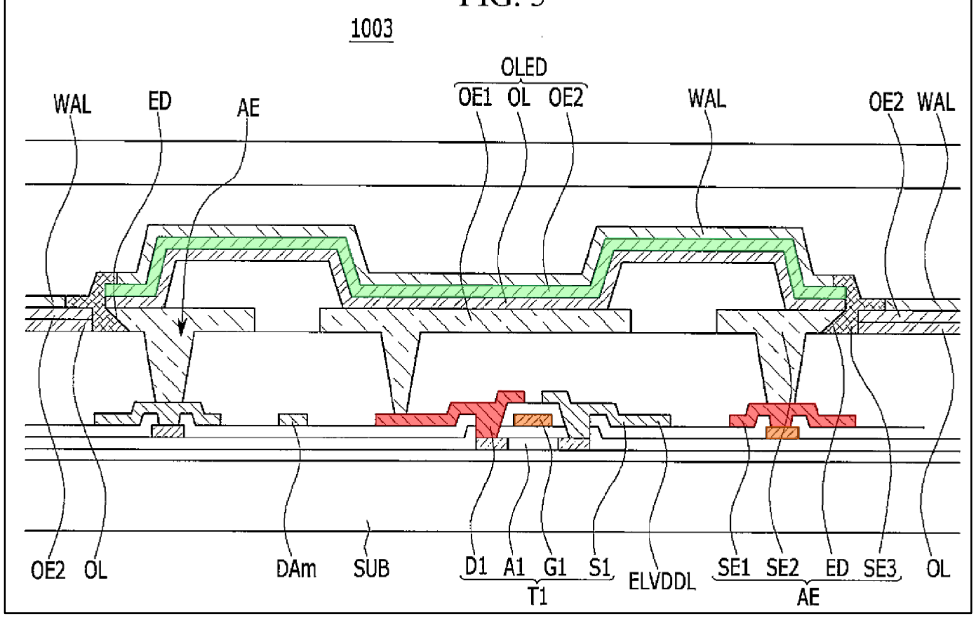
The Weaver-Song combination renders obvious "the pixel structure according to claim 6 (*see* claim 6), wherein the top electrode layer (Weaver's bus line 430 as modified by Song) and the source and drain of the active device (Weaver's source region 405 and the drain region 407 of transistor 410) belong to the same layer." EX1003, ¶¶166-173.

As set forth above for claim 6, it would have been obvious to a POSITA to combine the teachings of Weaver and Song to reconfigure the bus line 430 of Weaver with a bottom electrode layer (akin to Song's bottom electrode layer of first auxiliary electrode portion SE1) that is electrically connected with a top electrode layer (akin to Song's top electrode layer of first auxiliary electrode portion SE1), wherein the first electrode layer (anode 406) of the light emitting device 400 of Weaver is electrically connected with the top electrode layer. *See* §VII.A.

Weaver discloses that bus line 430, and source region 405 and drain region 407 of transistor 410 are formed in the same layer. *See* §VI.C.

Song discloses that the first drain electrode D1 and the top electrode layer of the first auxiliary electrode portion SE1 are formed of the same sublayer. *See* §VII.A.

FIG. 5



In combining the teachings of Weaver and Song as set forth above in §VII.A, it would have been obvious to a POSITA to form the top electrode layer of the first auxiliary electrode (i.e. bus line 430), and the source region 405 and the drain region 407 transistor 410 in Weaver, so they belong to the same layer. EX1003, ¶170; EX1004, [0034], Fig.4, Fig. 6.

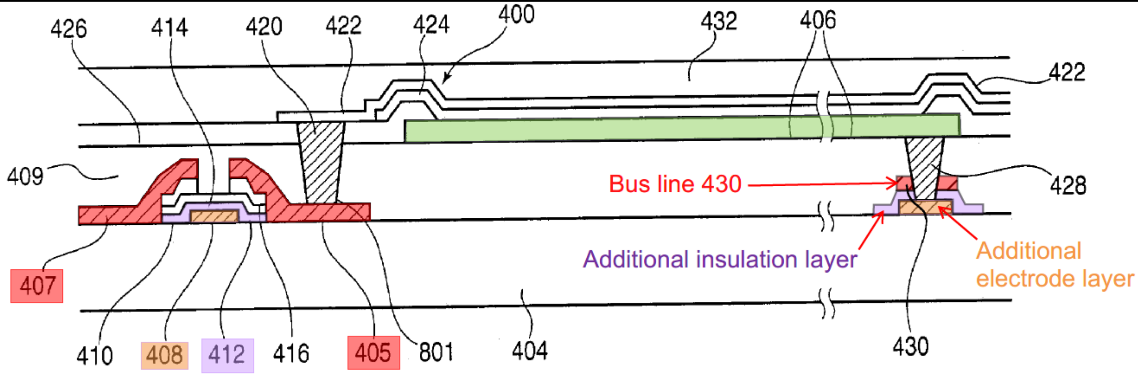


Fig. 4
(MODIFIED)

Weaver and Song are analogous prior art to the 509 patent. *See* §VII.A.

A POSITA would have understood the problem involved, namely how to efficiently form the various layers of the device. To overcome this problem, Song discloses the solution of forming the first drain electrode D1 and the top electrode layer of the first auxiliary electrode portion SE1 of the same layer. EX1003, ¶172. Doing so simplifies semiconductor manufacturing steps to form the device, reducing the number of the processing steps necessary to fabricate the device. In combining the teachings of Weaver and Song as set forth above in §VII.A, a POSITA would have been motivated to implement the solutions of Song and Weaver to manufacture the device more efficiently. EX1003, ¶172.

A POSITA would have had a reasonable expectation of success in combining Weaver and Song, as both references disclose the various layers for connecting to and operating a light emitting device with an anode and a cathode, and techniques for their manufacture. The modification to Weaver to implement the solution taught in Song and Weaver involves modifications of only routine skill in the art. *Id.*, ¶173. Moreover, because combining the teachings of Weaver and Song would involve known methods, it would have yielded predictable results. *Id.*

VIII. GROUND 4: CLAIMS 10-11 RENDERED OBVIOUS BY WEAVER AND LEE149

A. Claim 10

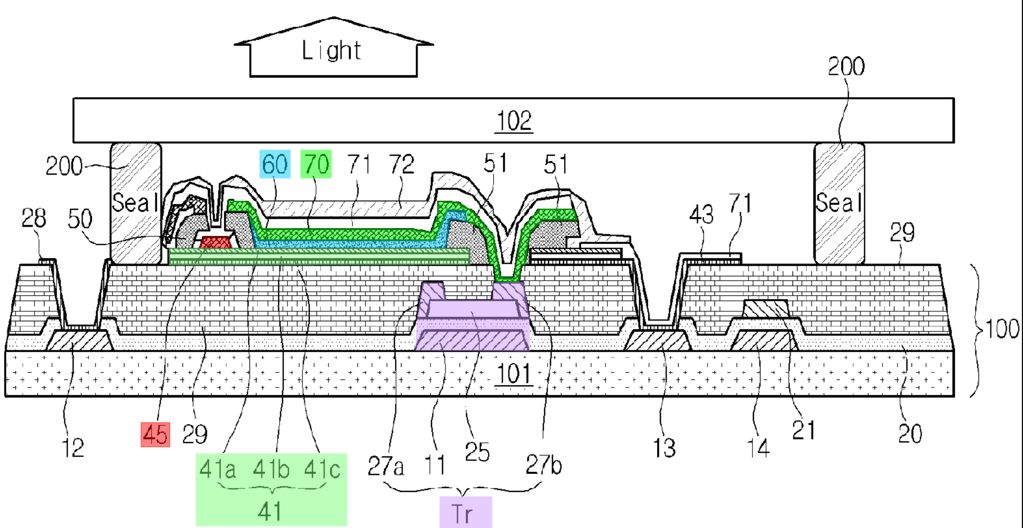
The Weaver-Lee149 combination renders obvious "the pixel structure (Weaver's pixel structure) according to claim 1 (*see* claim 1), further comprising a second auxiliary electrode (Weaver modified with Lee149's electrode pattern 45) electrically insulated from the active device (Weaver's transistor 410) and disposed at a side of the light emitting device (Weaver's OLED 400), wherein the second auxiliary electrode is electrically connected with the first electrode layer (Weaver's anode 406) of the light emitting device (Weaver's OLED 400)." EX1003, ¶¶175-184.

A POSITA would have understood that reciting "the active device" (singular) in claim 1 or in claims dependent thereon refers to one of the "at least one active device" of claim 1 if there is more than one. *Id.* *See* §V.A.4.

Lee149 discloses a light emitting diode that includes first electrode 41, organic electroluminescent layer 60, and second electrode 70. EX1011, [0027],

Fig. 1. Lee149 discloses "An electrode pattern 45 is formed on the first electrode 41 at a central region of the buffer layer 50." *Id.*, [0027].

FIG. 1



Lee149's electrode pattern 45 is electrically connected with the first electrode 41 given they are in physical contact. EX1003, ¶177. Lee149 explicitly teaches that "the electrode pattern 45 serves to lower the resistance of the first electrode 41." EX1011, [0038]. Therefore, Lee149 discloses that electrode pattern 45 is an electrode that is supplemental to other electrodes in the structure, and is a supplemental electrode that reduces the total resistance of the pixel structure." EX1003, ¶177.

Electrode pattern 45 is electrically insulated from TFT Tr by planarization layer 29. EX1011, Fig. 1. A POSITA would have understood that planarization layer 29 is made of insulating material, so that electrical features such as source electrode 27a, drain electrode 27b and first electrode 41 (which are all shown in

Fig. 1 in physical contact with planarization layer 29) are not electrically shorted together by planarization layer 29, which would render the device in operatable. EX1003, ¶178.

Lee149's electrode pattern 45 is disposed at a side (i.e., the left side) of the light emitting device (light emitting diode that includes first electrode 41, organic electroluminescent layer 60, second electrode 70). EX1011, Fig. 1. Specifically, electrode pattern 45 overlaps in the horizontal direction with the organic electroluminescent layer 60 and second electrode 70 of the light emitting diode which satisfies this term under the proper construction. The partial vertical overlap of electrode pattern 45 and first electrode 41 does not preclude a finding that Lee149 discloses the electrode pattern 45 is disposed "at a side" of the light emitting diode under the proper construction. EX1003, ¶179.

It would have been obvious to a POSITA to combine the teachings of Weaver and Lee149 to add a second auxiliary electrode to the side of the OLED 400 of Weaver (akin to Lee149's electrode pattern 45), wherein the first electrode layer (anode 406) of the light emitting device 400 of Weaver is electrically connected with the second auxiliary electrode. *Id.*, ¶180.

Weaver and Lee149 are analogous prior art to the 509 patent, as each relates to organic light emitting devices with an organic light emitting layer disposed between an anode electrode layer and a cathode electrode layer, as well as the surrounding layers and circuits to operate the light emitting devices. *Id.*, ¶181.

A POSITA would have understood the problem involved, namely that higher sheet resistance between the power or ground line to the light emitting device would consume more power and require higher operating voltages because of the higher voltage drop of the OLED display. *Id.*, ¶182. To overcome this problem, Lee149 discloses the solution of providing the second auxiliary electrode (electrode pattern 45) disposed at a side of the light emitting device and electrically connected to the light emitting device's first electrode layer (first electrode 41). Lee149 explicitly teaches that "the electrode pattern 45 serves to lower the resistance of the first electrode 41." EX1011, [0038]. The first electrode layer 41a and third electrode layer 41c are formed of a transparent material such as ITO, IZO, or ITZO. *Id.*, [0025], [0038]. A POSITA would have been motivated to implement the solution of Lee149 in the Weaver device to lower the resistance and voltage drop between anode 406 and the VDD line of Weaver. This is consistent with the teachings of Weaver, which discloses concerns about non-uniformities caused by voltage drops across the OLED, and using highly conductive material (indium tin oxide – ITO) for the anode 406 and the bus line 430. EX1004, [0017], [0030], [0034], [0036]; EX1003, ¶182.

The modification to Weaver could be implemented, for example, by forming a contact window with an undercut (similar to that of Lee's buffer layer 50) over the anode 406 before forming the cathode 422, so that when the conductive layer for cathode 422 is formed, it would result in a first portion of the conductive layer as the cathode 422 of OLED 400 and a separate second portion of the conductive layer in the contact window as the second auxiliary electrode at a side of the OLED 400. EX1003, ¶183.

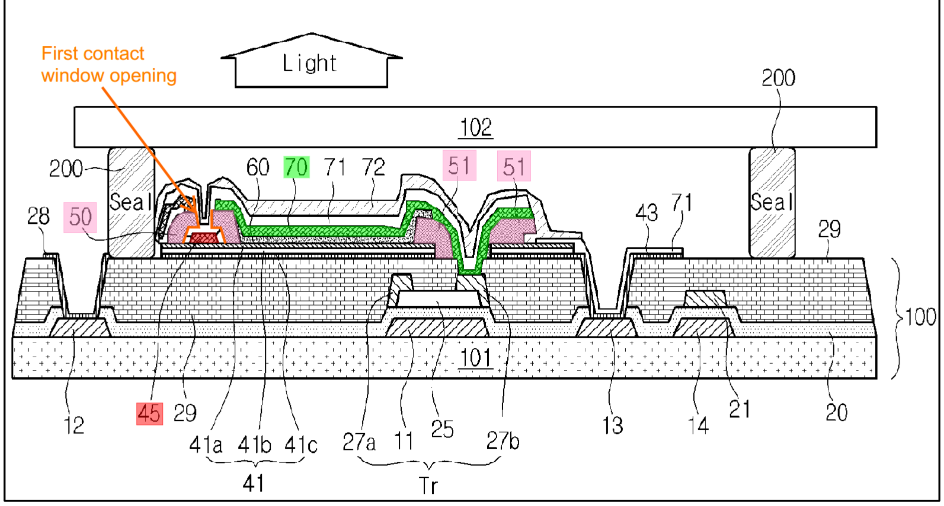
A POSITA would have had a reasonable expectation of success in combining Weaver and Lee149, as both references disclose the various layers for connecting to and operating a light emitting device with an anode and a cathode, and the modification to Weaver to implement the solution taught in Lee149 involves modifications of only routine skill in the art. *Id.*, ¶184. Moreover, because combining the teachings of Weaver and Lee149 would involve known methods, it would have yielded predictable results. *Id.*

B. Claim 11

The Weaver-Lee149 combination renders obvious "the pixel structure (Weaver's pixel structure) according to claim 10 (*see* claim 10), wherein the second auxiliary electrode (Weaver modified with Lee149's electrode pattern 45) and the second electrode layer (Weaver's cathode 422) of the light emitting device (Weaver's OLED 400) belong to the same layer, and the second auxiliary electrode and the second electrode layer of the light emitting device are electrically insulated from each other." EX1003, ¶¶185-192.

Fig. 1 of Lee149 shows that the electrode pattern 45 is electrically insulated from the second electrode 70 by buffer layer 50.

FIG. 1



Lee149 further discloses:

> "When the buffer layer 50 is formed as described above, the organic electroluminescent layer 60 is formed at the sub-pixel region and subsequently a metal layer is formed on the dielectric substrate 101 to form the second electrode 70 on the organic electroluminescent layer 60. The metal layer is separated from the undercut region to form the second electrode 70 in the sub-pixel unit. At this point, the electrode pattern 45 is formed on the first electrode 41 at the undercut region of the buffer layer 50." EX1011, [0038].

A POSITA would have understood that Lee149 is disclosing that the metal layer deposited to form second electrode 70 is also deposited through the first contact window opening of buffer layer 50, which has the undercut region. The undercut region of first contact window opening is what serves to separate the second electrode 70 from the electrode pattern 45. Therefore, a POSITA would have understood that the second electrode 70 and the electrode pattern 45 belong to the same metal layer. EX1003, ¶187.

A POSITA would have understood forming different features in or at a same layer simplifies manufacturing, making it more efficient. *Id.*, ¶188. In combining the teachings of Weaver and Lee149 as set forth above in §VIII.A for claim 10 (i.e., including a second auxiliary electrode to the side of OLED 400 and connected to the anode 406 of Weaver), it would have been obvious to a POSITA to form such a second auxiliary electrode (to the side of OLED 400) of a same layer as the cathode 422 (of OLED 400) in order to simplify manufacturing, as taught by Lee149. EX1003, ¶188. Further, because the second auxiliary electrode would be electrically connected with the first electrode layer of the light emitting device (*see* §VIII.A for claim 10), it would have also been obvious to have the second auxiliary electrode and the second electrode layer of the light emitting device be electrically insulated from each other (otherwise the electrode layers of the light emitting device would be shorted together and non-operational). EX1003, ¶188.

Weaver and Lee149 are analogous prior art to the 059 patent. *See* §VIII.A.

A POSITA would have understood the problem involved, namely how to efficiently form the various features of the OLED device in a semiconductor process flow. EX1003, ¶190. To overcome this problem, Lee149 discloses the solution of forming the second electrode layer of the light emitting device (second electrode 70) and the second auxiliary electrode (electrode pattern 45) so that they belong to the same metal layer. A POSITA would have been motivated to implement the solution of Lee149 in the Weaver device to more efficiently form the OLED device. *Id.*

The modification to Weaver could be implemented, for example, by forming a contact window with an undercut (similar to that of Lee's buffer layer 50) over the anode 406 before forming the cathode 422, so that when the conductive layer for cathode 422 is formed, it would result in a first portion of the conductive layer as the cathode 422 of OLED 400 and a separate second portion of the conductive layer in the contact window as the second auxiliary electrode at a side of the OLED 400. *Id.*, ¶191.

A POSITA would have had a reasonable expectation of success in combining Weaver and Lee149, as both references disclose the various layers for connecting to and operating a light emitting device with an anode and a cathode, and the modification to Weaver to implement the solution taught in Lee149 involves modifications of only routine skill in the art. *Id.,* ¶192. Moreover, because combining the teachings of Weaver and Lee149 would involve known methods, it would have yielded predictable results. *Id.*

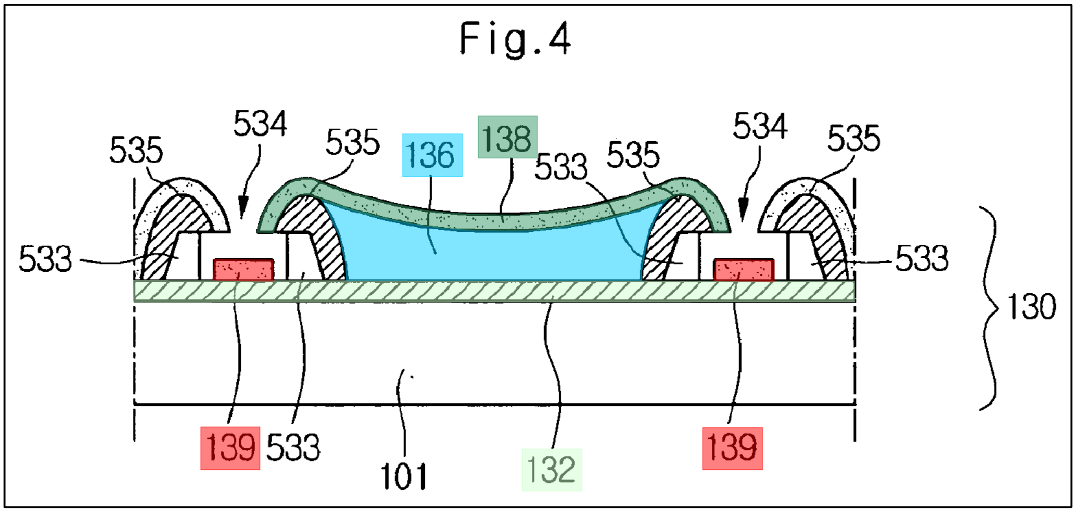
IX. GROUND 5: CLAIMS 10-11 RENDERED OBVIOUS BY WEAVER AND BAE

A. Claim 10

The Weaver-Bae combination renders obvious "the pixel structure (Weaver's pixel structure) according to claim 1 (*see* claim 1), further comprising a second auxiliary electrode (Weaver modified with Bae's auxiliary electrodes 139) electrically insulated from the active device (Weaver's transistor 410) and disposed at a side of the light emitting device (Weaver's OLED 400), wherein the second auxiliary electrode is electrically connected with the first electrode layer (Weaver's anode 406) of the light emitting device (Weaver's OLED 400)." EX1003, ¶¶194-203.

A POSITA would have understood that reciting "the active device" (singular) in claim 1 or in claims dependent thereon refers to one of the "at least one active device" of claim 1 if there is more than one. *Id.* *See* §V.A.4.

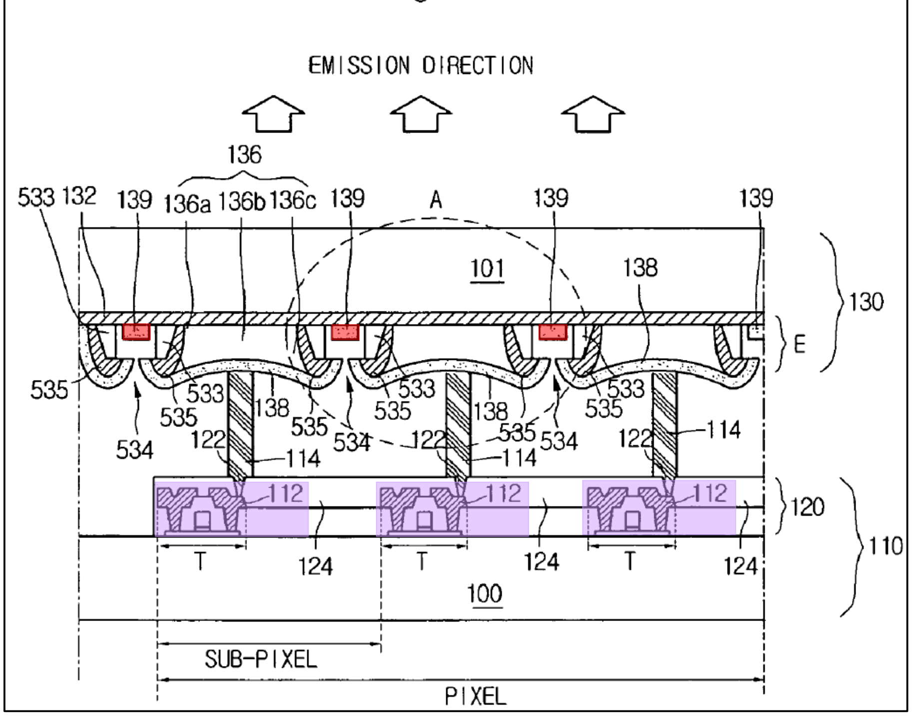
Bae discloses an organic electro-luminance diode E that includes a first electrode 132, an organic electro-luminescent layer 136, and a second electrode 138. EX1012, [0041]-[0043], Fig. 4. Bae discloses auxiliary electrodes 139 arranged around the sub-pixels in a grid shape, and in contact with the first electrode 132 to commonly apply a voltage to the sub-pixels, and "serves to lower the resistance of the first electrode 132." *Id.*, [0037], [0059].



Bae discloses that auxiliary electrodes 139 is an electrode that is supplemental to other electrodes in the structure, and is a supplemental electrode that reduces the total resistance of the pixel structure." EX1003, ¶196.

Auxiliary electrodes 139 is electrically insulated from TFT T by at least passivation layer 124. EX1012, [0048], Fig. 3.

Fig.3



A POSITA would have understood that passivation layer 124 is made of insulating material, so that electrical features of TFT T are not electrically shorted together which would render the device in operatable. EX1003, ¶197.

Bae's auxiliary electrode 139 is disposed at a side of the light emitting device (first electrode 132, organic electro-luminescent layer 136, and second electrode 138). EX1012, Fig. 4. Specifically, auxiliary electrode 139 overlaps in the horizontal direction with organic electro-luminescent layer 136 of the organic electro-luminance diode E which satisfies the term under the proper construction. The partial vertical overlap of auxiliary electrode 139 with first electrode 132 and second electrode 138 does not preclude a finding that Bae discloses the auxiliary electrode 139 is disposed "at a side" of the light emitting device under the proper construction. EX1003, ¶198.

It would have been obvious to a POSITA to combine the teachings of Weaver and Bae to add a second auxiliary electrode to the side of the OLED 400 of Weaver (akin to Bae's auxiliary electrode 139), wherein the first electrode layer (anode 406) of the light emitting device 400 of Weaver is electrically connected with the second auxiliary electrode. *Id.*, ¶199.

Weaver and Bae are analogous prior art to the 509 patent, as each relates to organic light emitting devices with an organic light emitting layer disposed between an anode electrode layer and a cathode electrode layer, as well as the surrounding layers and circuits to operate the light emitting devices. *Id.*, ¶200.

A POSITA would have understood the problem involved, namely that higher resistance between the power or ground line to the light emitting device would consume more power and require higher operating voltages because of the higher voltage drop of the OLED display. *Id.*, ¶201. To overcome this problem, Bae discloses the solution of providing the second auxiliary electrode (auxiliary electrode 139) disposed at a side of the light emitting device and electrically connected to the light emitting device's first electrode layer (first electrode 132). Bae explicitly teaches that the "auxiliary electrodes 139 contact the first electrode 132 to commonly apply a voltage to the sub-pixels" and the "auxiliary electrode

139 reduces the resistance of the first electrode 132." EX1012, [0037], [0059]. A POSITA would have been motivated to implement the solution of Bae in the Weaver device to lower the resistance and voltage drop between anode 406 and the VDD line of Weaver. This is consistent with the teachings of Weaver, which discloses concerns about non-uniformities caused by voltage drops across the OLED, and using highly conductive material (indium tin oxide – ITO) for the anode 406 and the bus line 430. EX1004, [0017], [0030], [0034], [0036]; EX1003, ¶201.

The modification to Weaver could be implemented, for example, by forming a contact window with an undercut (similar to that of Bae's buffer layer 535) over the anode 406 before forming the cathode 422, so that when the conductive layer for cathode 422 is formed, it would result in a first portion of the conductive layer as the cathode 422 of OLED 400 and a separate second portion of the conductive layer in the contact window as the second auxiliary electrode at a side of the OLED 400. EX1003, ¶202.

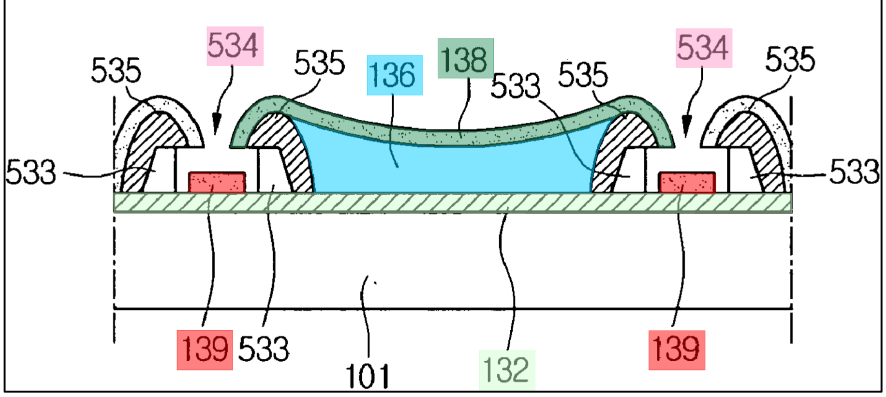
A POSITA would have had a reasonable expectation of success in combining Weaver and Bae, as both references disclose the various layers for connecting to and operating a light emitting device with an anode and a cathode, and the modification to Weaver to implement the solution taught in Bae involves modifications of only routine skill in the art. *Id.*, ¶203. Moreover, because combining the teachings of Weaver and Bae would involve known methods, it would have yielded predictable results. *Id.*

B. Claim 11

The Weaver-Bae combination renders obvious "the pixel structure (Weaver's pixel structure) according to claim 10 (*see* claim 10), wherein the second auxiliary electrode (Weaver modified with Bae's auxiliary electrode 139) and the second electrode layer (Weaver's cathode 422) of the light emitting device (Weaver's OLED 400) belong to the same layer, and the second auxiliary electrode and the second electrode layer of the light emitting device are electrically insulated from each other." EX1003, ¶¶204-212.

Fig. 4 of Bae shows that auxiliary electrode 139 is electrically insulated from the second electrode 138 by space 534.

Fig.4



Bae further discloses that the "auxiliary electrodes 139, which are formed of the same material as the second electrode 138, is formed on the first electrode." *Id.*, [0039]. Bae explains:

> "Also, the auxiliary electrode 139 is formed on the first electrode 132 in the space 534 formed by the undercut structure. The auxiliary electrode 139 is formed during the process of forming the second electrode 138. The auxiliary electrode 139 reduces the resistance of the first electrode 132. Specifically, at least one surface of the first buffer 533 is formed inwardly from the second buffer 535 with a gap greater than 0.1 um."

A POSITA would have understood that Bae is disclosing that the material deposited to form second electrode 138 is also deposited through the space 534 in second buffer 535 which has the undercut region. The undercut region and space 534 of second buffer 535 is what serves to separate the second electrode 138 from the auxiliary electrode 139. Therefore, a POSITA would have understood that the second electrode 138 and the auxiliary electrode 139 belong to the same metal layer. EX1003, ¶207.

A POSITA would have understood forming different features in or at a same layer simplifies manufacturing, making it more efficient. *Id.*, ¶208. In combining the teachings of Weaver and Bae as set forth above in §IX.A for claim 10 (i.e., including a second auxiliary electrode to the side of OLED 400 and connected to the anode 406 of Weaver), it would have been obvious to a POSITA to form such a second auxiliary electrode (to the side of OLED 400) of a same layer as the cathode 422 (of OLED 400) in order to simplify manufacturing, as taught by Bae. EX1003, ¶208. Further, because the second auxiliary electrode would be electrically connected with the first electrode layer of the light emitting device (*see* §IX.A), it would have also been obvious to have the second auxiliary electrode and the second electrode layer of the light emitting device be electrically insulated from each other (otherwise the electrode layers of the light emitting device would be shorted together and non-operational). *Id*.

Weaver and Bae are analogous prior art to the 059 patent. *See* §IX.A.

A POSITA would have understood the problem involved, namely how to efficiently form the various features of the OLED device in a semiconductor process flow. EX1003, ¶210. To overcome this problem, Bae discloses the solution of forming the second electrode layer of the light emitting device (second electrode 138) and the second auxiliary electrode (auxiliary electrode 139) so that they belong to the same metal layer. A POSITA would have been motivated to implement the solution of Bae in the Weaver device to more efficiently form the OLED device. *Id.*

The modification to Weaver could be implemented, for example, by forming a contact window with an undercut (similar to the undercut of Bae's second buffer 535) over the anode 406 before forming the cathode 422, so that when the conductive layer for cathode 422 is formed, it would result in a first portion of the conductive layer as the cathode 422 of OLED 400 and a separate second portion of the conductive layer in the contact window as the second auxiliary electrode at a side of the OLED 400. *Id.*, ¶211.

A POSITA would have had a reasonable expectation of success in combining Weaver and Bae, as both references disclose the various layers for connecting to and operating a light emitting device with an anode and a cathode, and the modification to Weaver to implement the solution taught in Bae involves modifications of only routine skill in the art. *Id.*, ¶212. Moreover, because combining the teachings of Weaver and Bae would involve known methods, it would have yielded predictable results. *Id.*

X. GROUND 6: CLAIMS 1-5, 9, 12-13 RENDERED OBVIOUS BY WEAVER IN VIEW OF GUPTA OR HAN

A. Claim 1

1. [1pre]

See §V.A.1.

2. [1a]

See §V.A.2.

3. [1b]

See §V.A.3.

4. [1c]

See §V.A.4.

Should the PO argue, or the Board conclude, that Weaver does not disclose an auxiliary electrode under the narrow construction ("supplemental electrode to reduce the total resistance of the pixel structure"), Weaver in combination with Gupta or Han renders obvious "a first auxiliary electrode (Weaver's bus line 430 modified with a parallel connection with anode 406) electrically insulated from the active device (Weaver's transistor 410)." EX1003, ¶¶218-228.

Gupta discloses that an organic light emitting diode (OLED) "generally includes an anode, one or more organic layers, and a cathode." EX1009, 1:25-27. Gupta identifies the need to reduce the sheet resistance of the common OLED electrode (a transparent conductive material like indium-tin-oxide ITO) in top emission OLEDs such that less power may be required from a power supply to operate the OLEDs. *Id.*, 1:44-61. Specifically, for inverted top emission OLEDs, "An additional voltage is required from the VDD due to the high sheet resistance 234B on the anode 230 which is the common electrode 232 in the inverted OLED." *Id.*, 8:6-8.

Gupta discloses a solution for an OLED sub-pixel 236 as shown in Fig. 2C, where the anode 230 (having an anode sheet resistance 234B) is connected to power supply VDD 202, and "a resistor 238 is added to be in parallel with the anode sheet resistance 234B to reduce the total resistance between anode 230 and VDD 202." *Id.*, 8:3-14, Fig. 2C.

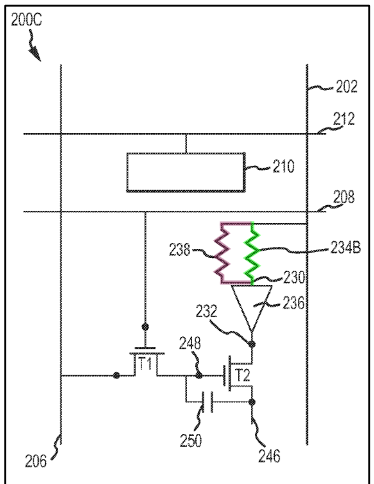
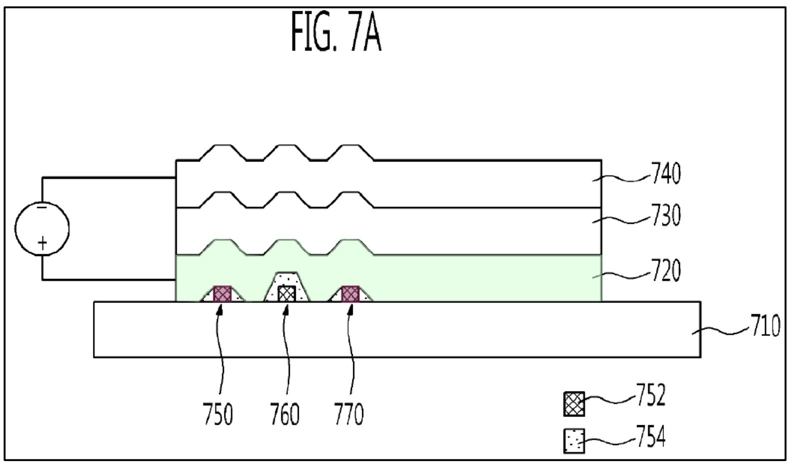


FIG.2C

The resistor 238 may be formed of a conductive mesh or strip. *Id.*, 7:42-43. For AMOLED displays having such a conductive mesh or strip coupled to the common electrode (i.e., the anode 230) to reduce its sheet resistance, the "reduced sheet resistance of the common electrode helps save power consumption in operating the AMOLED displays." *Id.*, 4:55-60. Resistor 238 is a supplemental electrode that reduces the total resistance of the pixel structure that includes OLED sub-pixel 236 by providing an additional electrode (and additional current path) connected in parallel with the anode 230 and its sheet resistance 234B to the power supply VDD

202. EX1003, ¶221. Gupta discloses this solution can be implemented in both inverted OLEDs and standard (non-inverted) OLEDs. EX1009, 5:8-9, Figs. 2A and 2B.

Han discloses that an organic light emitting diode (OLED) can include an organic emission layer (EML) between an anode and a cathode, where the organic EML emits light when power is applied between the anode and the cathode. EX1010, [0008]. Specifically, organic EML (emission layer) 730 is interposed between an anode 720 and a cathode 740. *Id.*, [0030]-[0031], Fig. 7A.



One problem with OLED's is that IR-drop that may occur due to resistance of components such as the anode and the cathode. *Id.*, [0009]. Han discloses a solution that includes the addition of "first and third subsidiary electrodes 750 and 770, which may be bonded to the anode 720 and function to reduce a resistance component of the anode 720." *Id.*, [0032]. Han further discloses that "each of the first and third subsidiary electrodes 750 and 770 may be electrically connected in parallel to the anode 720 in the emission region and function to reduce the influence of IR-drop due to a driving current." *Id.*, [0033]. First and third subsidiary electrodes 750 and 770 are supplemental electrodes that reduce the total resistance of the pixel structure that includes the OLED by providing additional electrodes (and additional current paths) connected in parallel with the anode 720. EX1003, ¶222.

It would have been obvious to a POSITA to combine the teachings of Weaver and either Gupta or Han so that bus line 430 of Weaver is connected in parallel with anode 406 to voltage supply line VDD in order to reduce the overall resistance of the pixel structure that includes OLED 400. *Id.*, ¶223.

Gupta, Han and Weaver are analogous prior art to the 509 patent, as each relates to organic light emitting devices with an organic light emitting layer disposed between an anode electrode layer and a cathode electrode layer, as well as the surrounding layers and circuits to operate the light emitting devices. *Id.*, ¶224.

A POSITA would have understood the problem involved, namely that higher resistance between the power or ground line to the light emitting device would increase the IR-drop and power consumption to operate the OLEDs. EX1009, 1:58-61; EX1010, [0009]; EX1003, ¶225.

To overcome this problem, Gupta and Han disclose the solution of connecting the auxiliary electrode and the anode in parallel so as to reduce the total resistance of the pixel structure that includes the OLED. EX1003, ¶226. A POSITA would have been motivated to implement the solution of Gupta or Han in the Weaver device to lower the resistance and voltage drop between anode 406 and the VDD line of Weaver. *Id.* This is consistent with the teachings of Weaver, which discloses concerns about non-uniformities caused by voltage drops across the OLED, and using highly conductive material (indium tin oxide – ITO) for the anode 406 and the bus line 430. EX1004, [0017], [0030], [0034], [0036].

The modification to Weaver could be implemented, for example, by connecting the bus line 430 and anode 406 of OLED 302/400 in parallel to the VDD line of Weaver. EX1003, ¶227; EX1004, Figs. 3 and 4.

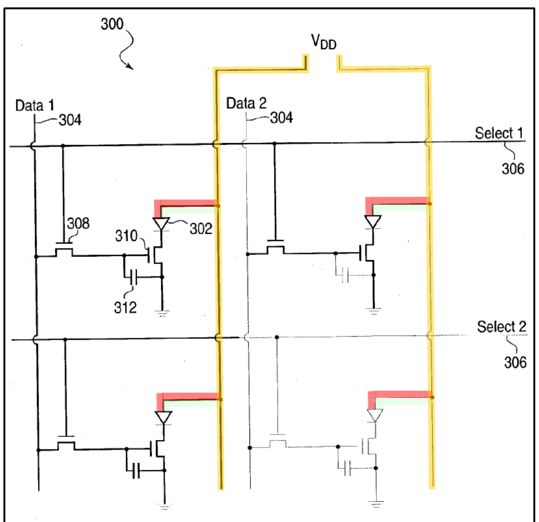


Fig. 3

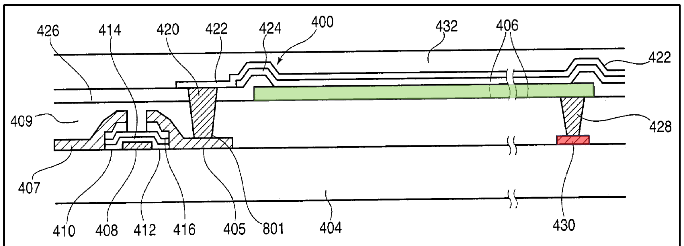


Fig. 4

Alternately, bus line 430 could be connected in parallel to just a portion of the anode 406, which would still result in bus line 430 serving as a supplemental electrode to reduce the total resistance of the pixel structure. EX1003, ¶227.

A POSITA would have had a reasonable expectation of success in combining Weaver with Gupta or Han, as all these references disclose the various electrodes and connections for operating an organic light emitting device with an anode and a cathode and an organic light emitting layer, and the modification to Weaver to implement the solution taught in Gupta or Han involves modifications of only routine skill in the art. *Id.*, ¶228. Moreover, because combining the teachings of Weaver and Gupta or Han would involve known methods, it would have yielded predictable results. *Id.*

5. [1d]

See §V.A.5 and §X.A.4.

6. [1e]

See §V.A.6 and §X.A.4.

7. [1f]

See §V.A.7 and §X.A.4.

8. [1g]

See §V.A.8 and §X.A.4.

B. Claim 2

See §V.B and §X.A.4.

C. Claim 3

See §V.C and §X.A.4.

D. Claim 4

See §V.D and §X.A.4.

E. Claim 5

See §V.E and §X.A.4.

F. Claim 9

See §V.F and §X.A.4.

G. Claim 12

See §V.G and §X.A.4.

H. Claim 13

See §V.H and §X.A.4.

XI. GROUND 7: CLAIMS 6-8 RENDERED OBVIOUS BY WEAVER AND LEE053, IN VIEW OF GUPTA OR HAN

A. Claim 6

See §VI.A and §X.A.4.

B. Claim 7

See §VI.B and §X.A.4.

C. Claim 8

See §VI.C and §X.A.4.

XII. GROUND 8: CLAIMS 6-8 RENDERED OBVIOUS BY WEAVER AND SONG, IN VIEW OF GUPTA OR HAN

A. Claim 6

See §VII.A and §X.A.4.

B. Claim 7

See §VII.B and §X.A.4.

C. Claim 8

See §VII.C and §X.A.4.

XIII. GROUND 9: CLAIMS 10-11 RENDERED OBVIOUS BY WEAVER AND LEE149, IN VIEW OF GUPTA OR HAN

A. Claim 10

See §VIII.A and §X.A.4.

Should the PO argue, or the Board conclude, that Weaver and Lee149 do not disclose the second auxiliary electrode under the narrow construction ("supplemental electrode to reduce the total resistance of the pixel structure"), then all of the reasons set forth in §X.A.4 for why it would have been obvious to connect Weaver's bus line 430 in parallel with anode 406 to voltage supply line VDD in order to reduce the overall resistance of the pixel structure that includes

OLED 400 equally applies to second auxiliary electrode added to the side of the OLED 400 in view of Lee149 as set forth in §VIII.A (i.e., it would have been obvious to connect the second auxiliary electrode added to Weaver in parallel with anode 406 to voltage supply line VDD in order to reduce the overall resistance of the pixel structure). EX1003, ¶250. This is especially so given that Lee149 discloses its "the electrode pattern 45 serves to lower the resistance of the first electrode 41." EX1011, [0038].

B. Claim 11

See §VIII.B and §X.A.4.

XIV. GROUND 10: CLAIMS 10-11 RENDERED OBVIOUS BY WEAVER AND BAE, IN VIEW OF GUPTA OR HAN

A. Claim 10

See §IX.A and §X.A.4.

Should the PO argue, or the Board conclude, that Weaver and Bae do not disclose the second auxiliary electrode under the narrow construction ("supplemental electrode to reduce the total resistance of the pixel structure"), then all of the reasons set forth in §X.A.4 for why it would have been obvious to connect Weaver's bus line 430 in parallel with anode 406 to voltage supply line VDD in order to reduce the overall resistance of the pixel structure that includes OLED 400 equally applies to second auxiliary electrode added to the side of the OLED 400 in view of Bae as set forth in §IX.A (i.e., it would have been obvious to connect the second auxiliary electrode added to Weaver in parallel with anode 406 to voltage supply line VDD in order to reduce the overall resistance of the pixel structure). EX1003, ¶254. This is especially so given that Bae discloses its "auxiliary electrode 139 serves to lower the resistance of the first electrode 132." EX1012, [0059].

B. Claim 11

See §IX.B and §X.A.4.

XV. DISCRETIONARY DENIAL IS NOT WARRANTED

A. 35 U.S.C. § 314(a) Analysis

The *Fintiv* factors (enumerated below) weigh against discretionary denial. IPR2020-00019, Paper 11, 5-6 (PTAB Mar. 20, 2020) (precedential).

1. Stay

This factor is neutral because no party has requested a stay. *Sand Revolution II, LLC. v. Continental Intermodal Group-Trucking LLC*, IPR2019-01393, Paper 24 at 7 (PTAB June 16, 2020).

2. Trial Date

No trial date has been set yet in the Litigation. Thus, this factor weighs against a discretionary denial.

3. Parallel Proceeding

Petitioner has not yet answered the Complaint. Accordingly, this factor weighs against a discretionary denial.

4. Issue Overlap

Petitioner challenges 13 claims. The Complaint in the Litigation explicitly asserts only 1. Accordingly, this IPR addresses significantly more invalidity issues than the Litigation and, therefore, this factor weighs against a discretionary denial.

5. Same Party

Because Petitioner and the PO are the parties in the Litigation, and because this Board is likely to reach the merits around the same time as the district court, this factor weighs slightly against discretionary denial. *See NVIDIA Corp. v. Invensas Corp.*, IPR2020-00603, Paper 11, at 23.

6. Other Considerations

Other considerations weigh strongly against a discretionary denial. The Challenged Claims are clearly invalid, Petitioners have not previously challenged any related patents based on the references relied upon in this petition, and the patent has never been challenged in a post-issuance proceeding. Thus, this factor weighs against a discretionary denial.

Even if the Board were to determine that *Fintiv* factors on balance weigh in favor of denial, institution should nonetheless be granted because this Petition satisfies the compelling merits standards. Interim Guidance at 4; *Vizio, Inc. v. Maxell, Ltd.*, IPR2022-01458, Paper 8, at 62.

B. 35 U.S.C. § 325(b) Analysis

Applying the two-part framework discussed in *Advanced Bionics, LLC v. Med-El Elektromedizinische Gerate GMBH*, IPR2019-01469, Pap. 6, *8-9, the Board should not exercise its §325(d) discretion to deny institution.

None of the challenges are substantially the same as those considered during prosecution. In the event that the challenges herein are found to be based on prior art that is the same as or cumulative to prior art considered by the examiner during prosecution, the examiner has made a clear error in allowing the claims over such prior art. This is at least because the challenges in this Petition satisfy the compelling merits standard, and allowing the claims over such prior art is therefore clear error.

XVI. COMPLIANCE WITH FORMAL REQUIREMENTS

A. Mandatory Notices Under 37 C.F.R. §§ 42.8(b)(1)-(4)

1. Real Party-In-Interest

BOE Technology Group Co., LTD is the real party-in-interest.

2. Related Matters

The 509 patent is subject to the following actions: *Optronic Sciences LLC v. BOE Technology Group Co., LTD,* 2:23-cv-00549 (EDTX).

3. Lead and Backup Counsel

Lead Counsel	Backup Counsel
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4. Service Information

Please address correspondence to counsel at the addresses above. Petitioner consents to electronic service to: dla-boe-optronicsciences-IPR@us.dlapiper.com and the email addresses listed above.

B. Proof of Service on the Patent Owner

In accordance with 37 C.F.R. §§42.6(e) and 42.105, as identified in the attached Certificate of Service, a copy of this Petition in its entirety is being served electronically (by agreement) on counsel for Patent Owner in the District Court Litigation.

C. Power of Attorney

Powers of attorney are being filed with designation of counsel in accordance with 37 C.F.R. § 41.10(b).

D. Standing

In accordance with 37 C.F.R. §42.104(a), Petitioner certifies that the 509 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.

E. Fees

The undersigned authorizes the Director to charge the fee specified by 37 C.F.R. § 42.15(a) and any additional fees that might be due in connection with this Petition to Deposit Account No. 07-1896.

XVII. CONCLUSION

All Challenged Claims of the 509 patent should be found unpatentable for the reasons discussed in this Petition.

Respectfully submitted,

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Attorney for Petitioner, BOE Technology Group Co., LTD.

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), Petitioner certifies that this petition includes 13,973 words, as measured by Microsoft Word, exclusive of the table of contents, mandatory notices under § 42.8, certificates of service, word count, claim listing, and exhibits.

Date: July 5, 2024

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Attorney for Petitioner, BOE Technology Group Co., LTD.

CERTIFICATE OF SERVICE

The undersigned certifies pursuant to 37 C.F.R. §§ 42.6(e) and 42.105 that on July 5, 2024, a true and correct copy of the Petition for Inter Partes Review of U.S. Patent No. 9,263,509 was served by emailing a copy of same (by agreement) to the following attorneys for the Patent Owner:

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Respectfully submitted,

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