

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG DISPLAY CO., LTD.,
Petitioner,

v.

PICTIVA DISPLAYS INTERNATIONAL LTD.,
Patent Owner.

Case No. IPR2024-01222
Patent No. 6,949,389

**PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO.
6,949,389 UNDER 35 U.S.C. §§ 311-319 AND 37 C.F.R. § 42.100 *et seq.***

First Petition, Asserting Prior Art Under Sections 102(a), (b), and (e)

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Exhibit No.	Description
1001	U.S. Patent No. 6,949,389 (“the ’389 patent”)
1002	Certified File History for U.S. Patent No. 6,949,389
1003	Declaration of Vivek Subramanian, Ph.D. (Yamazaki and Weaver grounds)
1004	Declaration of Vivek Subramanian, Ph.D. (Kijima grounds)
1005	U.S. Patent Application Publication No. 2003/0206332 (“Yamazaki”)
1006	U.S. Patent Application Publication No. 2001/0052752 (“Ghosh”)
1007	U.S. Patent Application Publication No. 2003/0011300 (“Palanisamy”)
1008	U.S. Patent Application Publication No. 2002/0140347 (“Weaver”)
1009	U.S. Patent No. 6,866,901 (“Burrows”)
1010	Japanese Published Application No. H09-245964, certified translation (“Kijima”)
1011	Japanese Published Application No. H09-245964, original document
1012	U.S. Patent No. 6,198,217 (“Suzuki”)
1013	U.S. Patent No. 6,087,196 (“Sturm”)
1014	Japanese Published Application No. H10-41069, certified translation (“Fujimori”)
1015	Japanese Published Application No. H10-41069, original document
1016	International Publication No. WO 2001/08242 (“Duthaler”)
1017	U.S. Patent No. 6,660,409 (“Komatsu”)
1018	J. Birnstock et al., <i>Screen-Printed Passive Matrix Displays Based on Light-Emitting Polymers</i> , 78 Appl. Phys. Lett. 3905 (2001) (“Birnstock”)
1019	Complaint, <i>Pictiva Displays Int’l Ltd. v. Samsung Elecs. Co., Ltd., et al.</i> , 2:23-cv-00495-JRG (E.D. Tex. Oct. 19, 2023)
1020	U.S. Patent Application Publication No. US 2003/0062186 (“Boroson”)
1021	U.S. Patent No. 6,770,502 (“Cok”)
1022	U.S. Patent No. 6,214,631 (“Burrows-631”)

Exhibit No.	Description
1023	Jun Hyung Souk, <i>Advances and New Challenges in LCD</i> , International Meeting on Information Display Digest, 24 (2002) (“Souk”)
1024	<i>OLED Fundamentals: Materials, Devices, and Processing of Organic Light-Emitting Diodes</i> (Daniel J. Gaspar & Evgueni Polikarpov eds., 1st ed. 2015) (excerpted) (“Gaspar”)
1025	Takashi Ohta, <i>Next Generation AMLCD Production Technologies for Large Substrate</i> , International Meeting on Information Display Digest, 3 (2001) (“Ohta”)

I. INTRODUCTION

Samsung Display Co., Ltd. (“Petitioner”) petitions for *inter partes* review (“IPR”) seeking cancellation of claims 34-37 and 40-46 (the “Challenged Claims”) of U.S. Patent No. 6,949,389 (Ex.1001, “’389 patent”).¹

II. STANDING, MANDATORY NOTICES AND FEE AUTHORIZATION

Grounds for Standing: Pursuant to 37 C.F.R. § 42.104(a), Petitioner certifies that the ’389 patent is available for IPR and that Petitioner is not barred or estopped from requesting an IPR challenging the ’389 patent on the grounds identified in this petition.

Real Party-in-Interest: Petitioner identifies Samsung Display Co., Ltd., Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc. as real parties-in-interest.

¹ As explained in Petitioner’s accompanying Explanation of Parallel Petitions, this petition is being filed concurrently with a second petition that relies only on prior art that qualifies under Section 102(b), in view of Patent Owner’s contention that the asserted claims of the ’389 patent may be entitled to an earlier right of priority.

Related Matters: Patent Owner² has asserted the '389 patent in litigation against Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. in *Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.*, Case No. 2:23-cv-00495 (E.D. Tex.) and *Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.*, Case No. 2:24-cv-00532 (E.D. Tex.).

Lead and Back-Up Counsel: Petitioner designates David A. Garr (Reg. No. 74,932, dgarr@cov.com) as lead counsel, of Covington & Burling LLP, One CityCenter, 850 Tenth Street, NW, Washington, DC 20001 (postal and hand delivery), telephone: (202) 662-6000, facsimile: (202) 662-6291.

Petitioner designates Scott Weidenfeller (Reg. No. 54,531, sweidenfeller@cov.com) as back-up counsel, of Covington & Burling LLP, One CityCenter, 850 Tenth Street, NW, Washington, DC 20001 (postal and hand delivery), telephone: (202) 662-6000, facsimile: (202) 662-6291.

Service Information: Service information is provided in the designation of counsel above. Petitioner consents to service of all documents via electronic mail at the email addresses above and at SDC-Pictiva-IPR@cov.com.

² In the litigation, defendants have challenged Pictiva's ownership of the '389 patent, and Pictiva has moved to amend the complaint in response.

Fee Authorization: The Office is authorized to charge all fees due in connection with this proceeding to Deposit Account No. 60-3160.

III. SUMMARY OF CHALLENGE

Petitioner requests IPR based on the following grounds:

- ***Ground I:*** Claims 34, 35, 37, and 40 are obvious over Yamazaki in view of the applicant admitted prior art (“AAPA”) and/or Ghosh;
- ***Ground II:*** Claims 41-46 are obvious over Yamazaki in view of AAPA/Ghosh and Fujimori;
- ***Ground III:*** Claims 34 and 40 are obvious over Weaver;
- ***Ground IV:*** Claims 35 and 36 are obvious over Weaver in view of Palanisamy; and
- ***Ground V:*** Claim 37 is obvious over Weaver in view of Burrows.

The ’389 patent was filed on May 2, 2002 and does not claim priority to any earlier application. Based on that filing date, asserted references are available as prior art under 35 U.S.C. § 102 (pre-AIA) as shown in the following table.

Exhibit	Reference	Dates	Availability as Prior Art
Ex.1005	U.S. Patent Application Publication No. 2003/0206332 (“Yamazaki”)	Filed Mar. 27, 2001	102(e)
Ex.1006	U.S. Patent Application	Filed Feb. 15, 2001;	102(a), 102(e)

Petition for *Inter Partes* Review of U.S. Patent No. 6,949,389

Exhibit	Reference	Dates	Availability as Prior Art
	Publication No. 2001/0052752 (“Ghosh”)	published Dec. 20, 2001	
Ex.1008	U.S. Patent Application Publication No. 2002/0140347 (“Weaver”)	Filed Mar. 29, 2001	102(e)
Ex.1007	U.S. Patent Application Publication No. 2003/0011300 (“Palanisamy”)	Filed July 12, 2001	102(e)
Ex.1009	U.S. Patent No. 6,866,901 (“Burrows”)	Filed Sep. 28, 2001	102(e)
Ex.1014 (translation) Ex.1015 (original)	Japanese Published Application No. H10-41069 (“Fujimori”)	Published Feb. 13, 1998	102(a), 102(b)

The prior art and arguments in this Petition are not the same (or substantially the same) as those previously presented to the Office under 35 U.S.C. § 325(d). None of these prior art references, besides Ghosh, were cited or considered by the Examiner during prosecution of the ’389 patent. For Ghosh, as pertinent to the grounds below, the applicants did not dispute that Ghosh teaches a method of encapsulating a plurality of OLED devices fabricated upon a substrate. *See* Section VII.C below; Ex.1002, 291-292, 376. Additionally, the supporting declaration from Vivek Subramanian, Ph.D. (Ex.1003) was not before the Examiner.

IV. OVERVIEW OF THE '389 PATENT

The '389 patent relates to encapsulated organic light emitting diode (“OLED”) devices and methods of forming them. “Encapsulation is a way to protect the OLED device from the damaging environmental effects—primarily from oxygen and moisture.” '389 patent, 1:8-10.

The '389 patent describes “a cheaper and better method of encapsulation, called ‘direct thin-film encapsulation’” that was supplanting use of glass encapsulation for OLED devices. *Id.*, 1:10-13, 1:17-19. The patent explains that such “thin-film encapsulation is typically described as “a ‘polymer multi-layer’ (PML),” *id.*, 1:17-22, and depicts a prior art “typical PML structure 100” in Figure 1. *Id.*, 1:23-24:

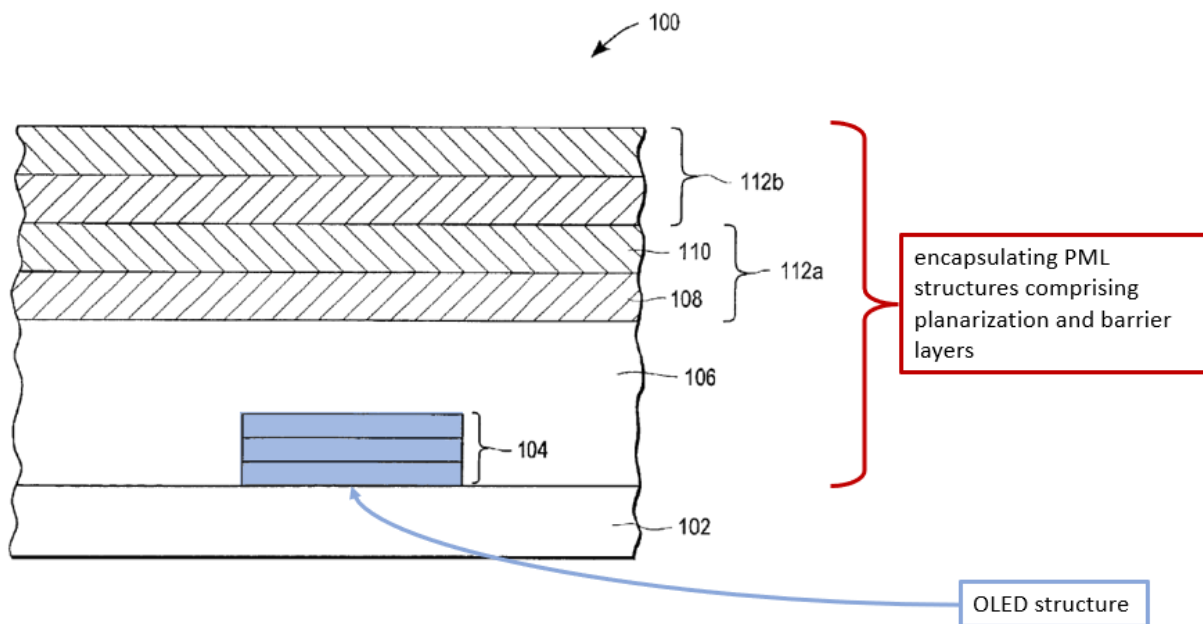


FIG. 1 (PRIOR ART)

Id., Fig. 1 (annotated). This PML “compris[es] alternating and repeating layers of an organic (usually an acrylate or the like) and a barrier layer.” *Id.*, 1:19-22. “Typically, for PML structures, a planarization layer 106 is formed on top of OLED structure 104” and the “[p]lanarization layer 106 typically is an organic layer.” *Id.*, 1:30-34. On top of the organic planarization layer, “[b]arrier layer 108 provides the necessary environmental isolation from the corrosive effects of oxygen and moisture.” *Id.*, 1:37-40.

The '389 patent emphasizes that “during the batch fabrication of many OLED devices upon a single large sheet of glass—such as shown as a top view in FIG. 2, ... several tens (or even hundreds) of OLED devices 202 may be so fabricated.” *Id.*, 1:63-65:

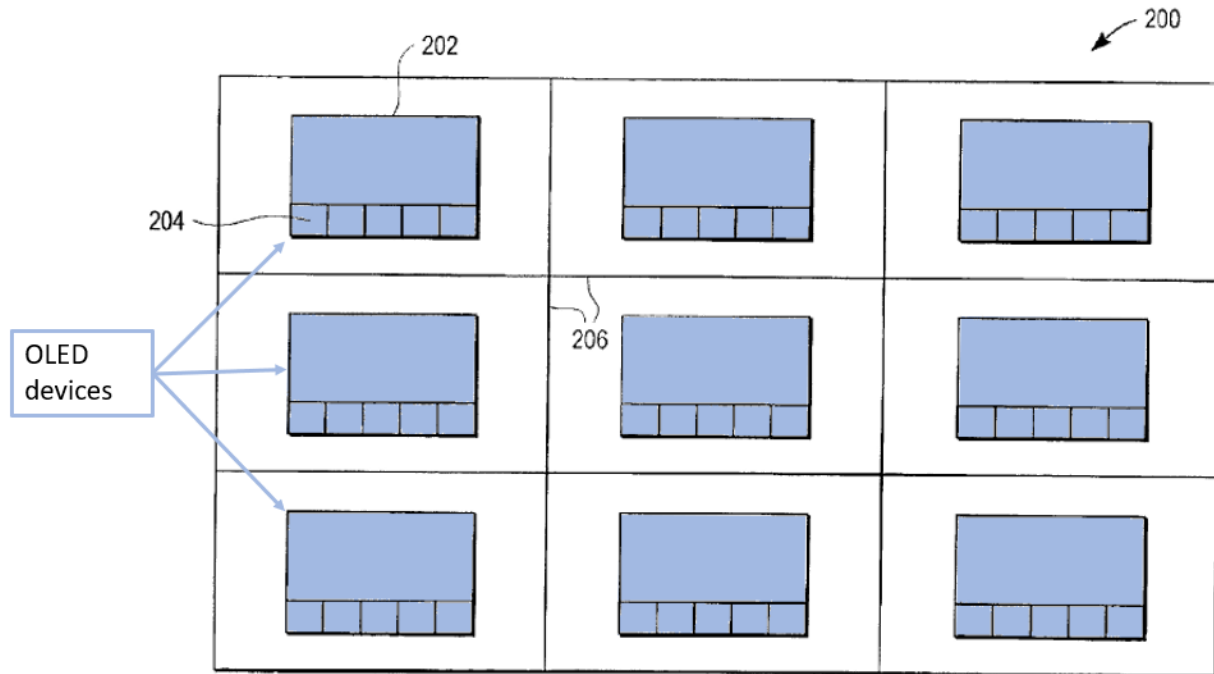


FIG. 2 (PRIOR ART)

Id., Fig. 2 (annotated). Conventionally, “the PML structure is deposited ... over the entire glass sheet.” *Id.*, 2:5-8. “After encapsulation, singulation is performed ... so that individual OLED devices 202 may be separated and further processed.” *Id.*, 2:12-16.

According to the '389 patent, “[t]he problem with this PML technique is that the only part of the device that requires encapsulation is the OLED structure itself—and not, e.g., the electrical contact pads.” *Id.*, 2:17-28. “Another potential problem ... is that by having the PML layer over the scribe and break lines and/or the glue lines the integrity of the sealed package may be deteriorated, for example by delamination” *Id.*, 2:24-27.

One solution described by the '389 patent is to “selectively” deposit the organic planarization layer and/or the barrier layer over the OLED device. As shown in Figure 5, “organic layer 506 is deposited selectively,” “in a patterned fashion,” over an “OLED device 504 ... formed upon substrate 502,” *id.*, 6:53-58, and “barrier layer 508 may be selectively deposited” over the organic layer 506, *id.*, 7:3-6.

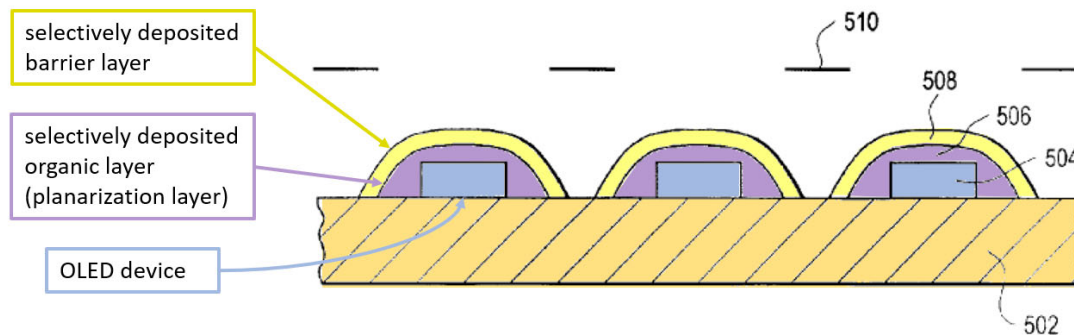
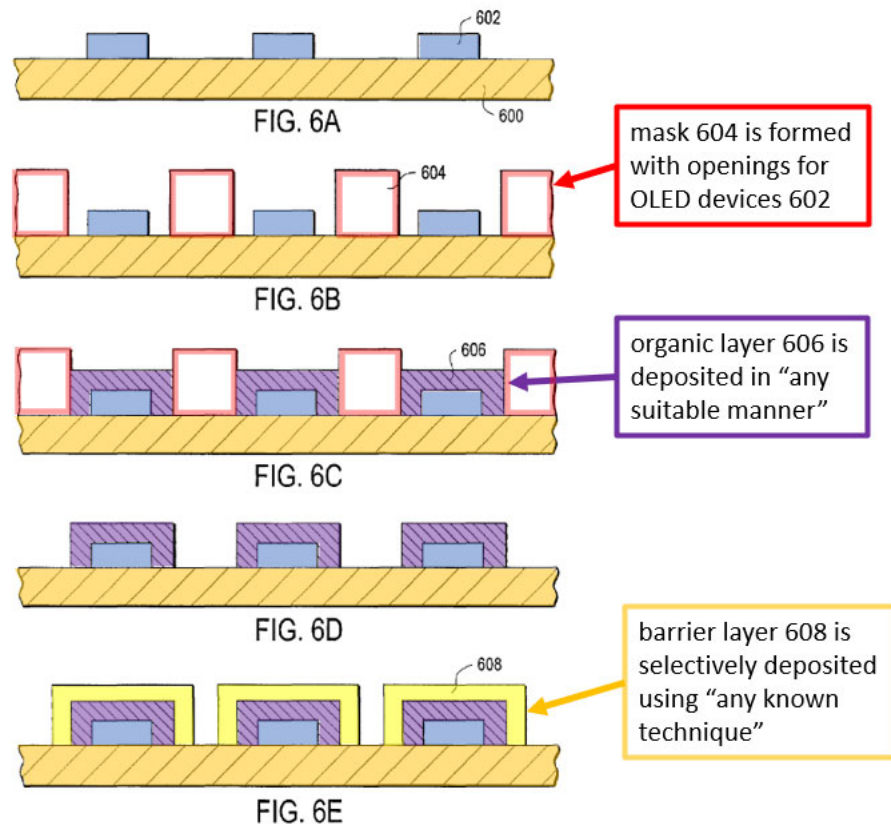


FIG. 5

Id., Fig. 5 (annotated).

The '389 patent also includes an embodiment, depicted in Figure 6 below, in which a “mask 604 is formed onto substrate 600 with mask openings for OLED devices 602.” *Id.*, 7:24-25. Then, “organic layer 606 is deposited in any suitable manner.” *Id.*, 7:54-55.



Id., Fig. 6 (annotated).

Independent claim 34 recites a method, as in Figure 5, in which at least one planarization layer and barrier layer are selectively deposited.

Independent claim 41 recites a method, as in Figure 6, in which a mask is used for depositing the planarization layer.

V. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art (“POSITA”) for the ’389 patent would have had a bachelor’s degree in Electrical Engineering, Materials Science, or a related field, and at least one year of experience in display technologies. Ex.1003,

¶44. Additional education might compensate for a deficiency in experience, and vice-versa. *Id.*

VI. CLAIM CONSTRUCTION

A. “depositing by shadow mask, sputtering, ink jet deposition, screen printing evaporation”

Claim 40 omits a coordinating conjunction in its listing of deposition methods. However, the file history indicates that it should be interpreted to include an “or” as inserted below:

40. The method as recited in claim 34 wherein the step for selectively depositing at least one barrier layer further comprises depositing by shadow mask, sputtering, ink jet deposition, screen printing [*or*] evaporation.

As initially filed, the claim 40 recited:

40. (original): The method as recited in Claim 34 wherein the step for selectively depositing at least one barrier layer further comprises one of a group, said group comprising: depositing by shadow mask, sputtering, ink jet deposition, screen printing and evaporation.

Ex.1002, 399. An Examiner’s amendment subsequently altered the claim as follows:

In claim 40, at lines 2-3, **delete** “one of a group, said group comprising :” and at line 4, **replace** “and” with -- or --.

Id., 418; Ex.1003, ¶¶45-48.

B. “non-sucking to OLED substrate”

Claim 44 requires a “mask comprising a material *non-sucking* to OLED substrate.” The file history indicates that this reflects a typographical error in the as-issued patent. The claim during prosecution instead used the term “non-sticking”:

44. (original): The method as recited in Claim 41 wherein the step of depositing said mask further comprises depositing a mask, said mask comprising a material substantially **non-sticking** to OLED substrate over the areas in between the active areas.

Ex.1002, 400 (highlighting added). Accordingly, Petitioner has addressed the claim under the assumption that “*non-sucking* to OLED substrate” should be interpreted as “*non-sticking* to OLED substrate,” as well as under the alternative scenario in which the claim is applied as written. Ex.1003, ¶¶49-50.

VII. OVERVIEW OF PRIOR ART

A. Yamazaki (Ex.1005)

Yamazaki teaches selective encapsulation methods for an OLED device, for use in a “self-light emitting device,” i.e., a “display device.” Yamazaki, [0004]. As shown below, Yamazaki includes embodiments in which OLED devices (blue) fabricated on a substrate are encapsulated by forming a planarizing “cover layer ... made of an organic resin film evenly on the pixel portion” (purple), *id.*, [0177], as well as an inorganic “barrier layer ... to cover the cover layer” (yellow), *id.*, [0183].

Fig.11

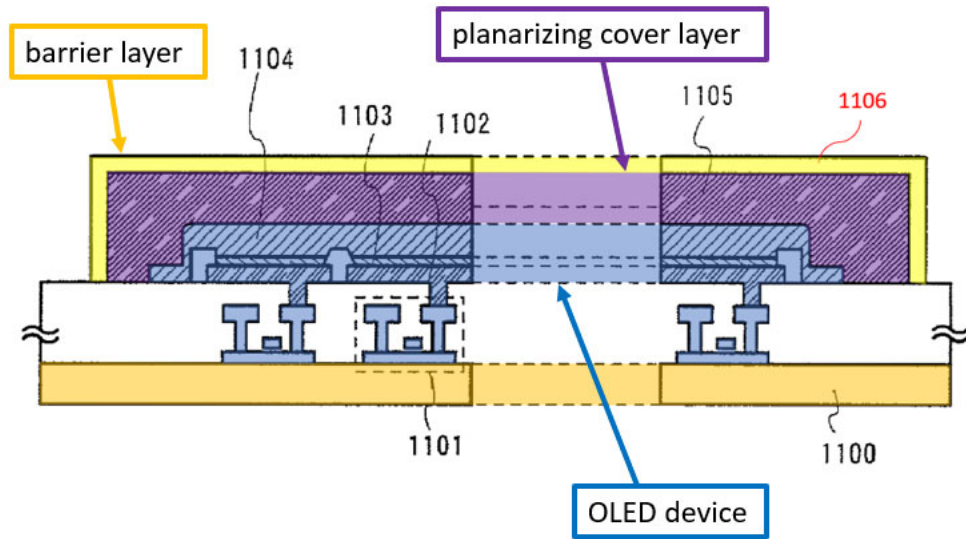
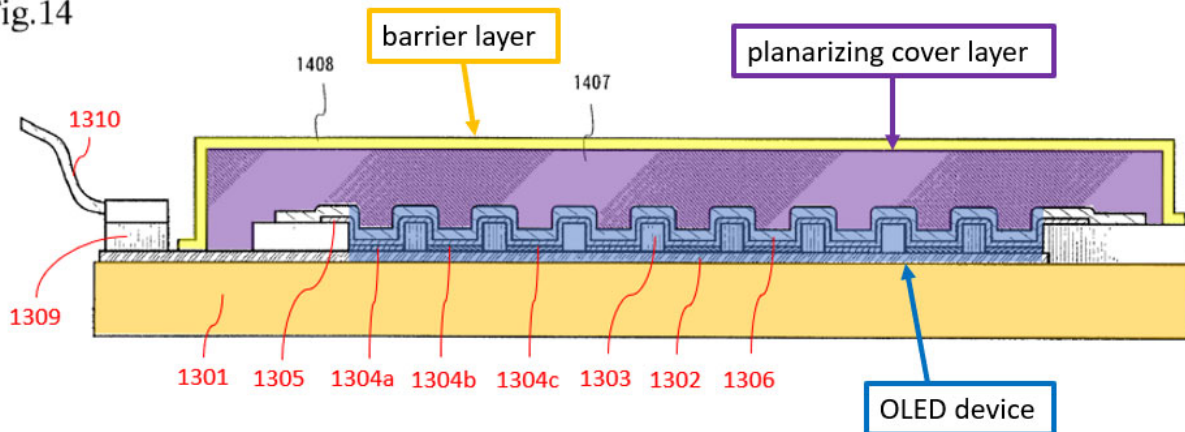


Fig.14



Id., Figs. 11 and 14 (annotated). Yamazaki illustrates that its cover layer forms a planar surface on which the barrier layer is formed, and explains that the layer is made from a “material that ... has planarity,” *id.*, [0178].

Like the '389 patent, Yamazaki discloses selectively depositing these planarizing cover and barrier layers. For example, the “cover layer 1105 is formed using the ink jet method” and therefore “can be selectively formed on the pixel

dicing operation following completion of the encapsulation assembly” to yield individual devices. *Id.*

During prosecution of the '389 patent, the Examiner applied Ghosh in rejecting claim 34 (among others), explaining that Ghosh teaches a “method of encapsulating a plurality of devices fabricated upon a substrate,” that comprises “fabricating a plurality of devices 3 (i.e. OLED) on a substrate 2 (Fig.3)”; depositing and patterning “at least one planarization layer 21”; and “selectively depositing at least one barrier layer 22 ... over the patterned planarization layer.” Ex.1002, 292. The applicants overcame this rejection, arguing that “[i]n *Ghosh*, the ‘second encapsulation layer 22’ (in the Office Action the Examiner refers to this layer as the ‘barrier layer’) is nonselectively deposited” *Id.*, 376. However, the applicants did not dispute that Ghosh teaches a method of encapsulating a plurality of OLED devices fabricated upon a substrate (or that Ghosh’s method comprises selectively depositing at least one planarization layer), *see id.*; Ex.1003, ¶¶54-58.

C. Fujimori (Ex.1014)

Fujimori discloses an approach for selectively depositing OLED display elements using a “mask attached to a substrate with magnetic force,” Fujimori, [0010], such that “adhesion between the mask and substrate is improved,” *id.*, [0029], thereby allowing for “favorable pattern processing accuracy,” *id.*, [0009]; Ex.1003, ¶68.

D. Weaver (Ex.1008)

Weaver discloses “structures that protect organic optoelectronic devices [e.g., OLEDs] from the surrounding environment,” Weaver, [0001], [0003], and methods for creating them, *see id.*, [0057]. For example, Figure 6 of Weaver shows that an “OLED 140” (blue) is protected (i.e., encapsulated) by a “barrier region 150” comprising a series of organic “planarizing layers” 151a-c and “high-density layers” 152a-c:

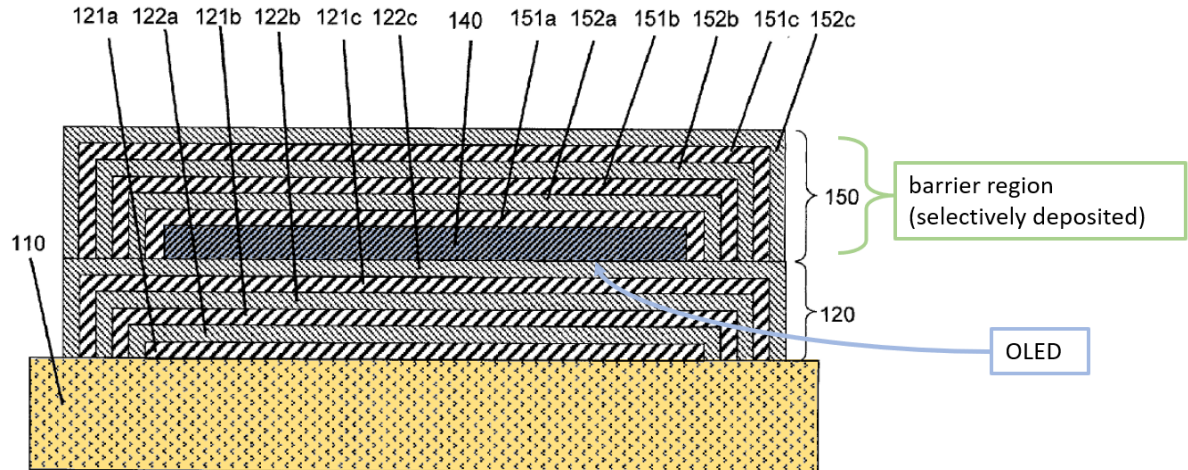


Fig. 6

Id., Fig. 6 (annotated).

These encapsulation layers are deposited selectively over the underlying device, as shown in Figure 6. Similar to the '389 patent, Weaver teaches that such selective encapsulation is advantageous when manufacturing multiple OLED devices on “large sheets of material.” *Id.*, [0038]. Weaver explains that under conventional (non-selective) approaches for multi-layer encapsulation, “cutting a

large sheet produces a structure with exposed edges.” *Id.*, [0038]. “This situation is improved by the structures of [Weaver’s] invention”—i.e., where selective encapsulation allows the barrier layers to “extend[] down the sides.” *Id.*, [0041]-[0042]; Ex.1003, ¶¶59-62.

E. Palanisamy (Ex.1007)

Palanisamy discloses a number of techniques for “selectively applying an organic passivation material” for OLEDs so that “contact areas (and other areas which should not be passivated) may remain unpassivated,” Palanisamy, [Abstract]. Palanisamy’s techniques include selective application using “an ink jet printer,” *id.*, [0021], “a mask” to define regions where the material is to be applied, *id.*, [0022], and “a screen printing technique,” *id.*, [0024]; Ex.1003, ¶¶63-67.

F. Burrows (Ex.1009)

Burrows teaches multi-layer encapsulation techniques that are similar to those of Weaver using a “shadow mask” for selective deposition of such layers. Burrows, 7:53-8:04; Ex.1003, ¶¶69-72.

VIII. APPLICATION OF PRIOR ART TO THE CHALLENGED CLAIMS

A. Ground I: Claims 34, 35, 37, and 40 Are Obvious Over Yamazaki in View of AAPA/Ghosh

1. Claim 34

- a. **Element 34[Pre]: “A method of encapsulating a plurality of devices fabricated upon a substrate, the steps of said method comprising:”**

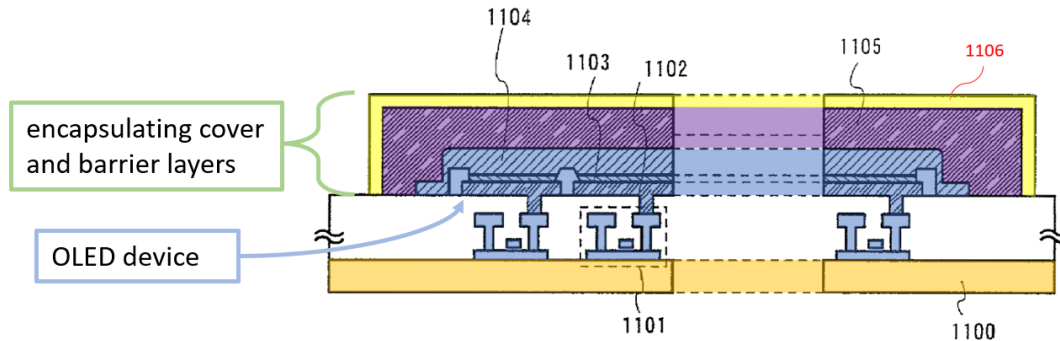
This element is obvious based on Yamazaki in view of the admitted prior art and/or Ghosh. Yamazaki discloses *methods of encapsulating* an OLED display panel *device fabricated upon a substrate*. Further, it would have been obvious to apply these methods for *encapsulating a plurality* of such display devices during batch fabrication, as was known (i) based on the admitted prior art and (ii) as further taught by Ghosh.

Yamazaki discloses methods for manufacturing OLED display panels, explaining that “[t]he present invention relates to ... a method of manufacturing an electric appliance having the self-light emitting device as a display unit ... also referred to as an OLED” Yamazaki, [0002]. In particular, Yamazaki teaches *methods of encapsulating* such devices using “a barrier layer and a cover layer.” *Id.*, [Abstract].

First, the embodiment of Figure 11 depicts “an active matrix type self-light emitting device,” *id.*, [0026], which includes a *device* (active matrix OLED display

panel) that is *fabricated upon a substrate* (“substrate 1100”), and *encapsulated* by a “cover layer 1105” and “barrier layer 1106,” as shown below.

Fig.11



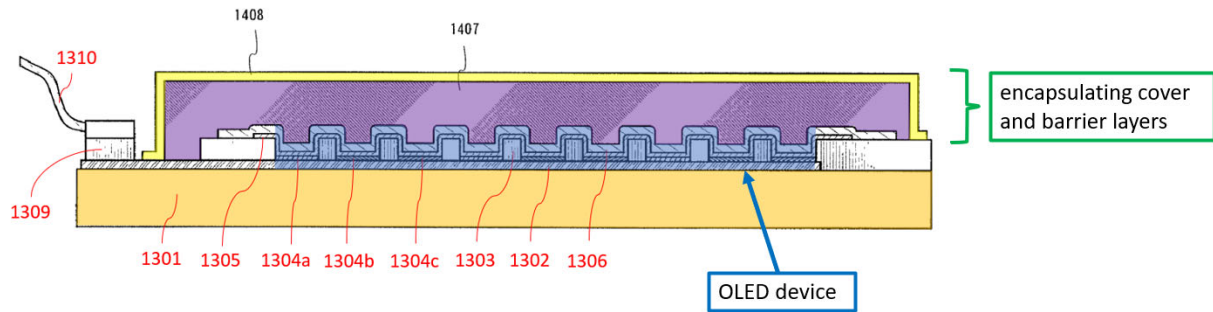
Id., Fig. 11 (annotated), [0177], [0178], [0183].

This constitutes a *method of encapsulating* the OLED device: “by forming the cover layer 1105 and the barrier layer 1106 on the active matrix substrate, the invasion of degrading factors to the EL [electroluminescent] element, such as moisture and oxygen, from the outside can be prevented.” *Id.*, [0184].

Second, the embodiment of Figure 14 depicts a “passive matrix” configuration, *id.*, [0029], which includes a *device* (passive matrix OLED display panel) that is *fabricated upon a substrate* (1301), and *encapsulated* by a “cover layer 1407” and “barrier layer 1408,” as shown below.⁴

⁴ Yamazaki explains that the constitutions of these embodiments “may be implemented freely combining” with each other. Yamazaki, [0204]. Therefore, its teachings regarding Figure 11 are pertinent to those of Figure 14 and vice-versa.

Fig.14



Id., Fig. 14 (annotated), [0186]-[0203].⁵

It would have been obvious to use Yamazaki's methods for *encapsulating a plurality* of such devices in batch fabrication. A POSITA would have known that flat panel displays, such as the OLED panels in Yamazaki, were conventionally manufactured in bulk on a large sheet of substrate, in order to reduce costs, increase throughput, and increase yield. Ex.1003, ¶¶73-80.

⁵ Figures 13 and 14 of Yamazaki depict two alternative configurations of its “passive type” (or “simple matrix”) display, which it describes as “Embodiment 4.” The configurations are the same except that in Figure 13 “the cover layer 1308 is formed on the barrier 1307,” whereas in Figure 14 (relied upon here) “barrier layer 1408 is formed after forming a cover layer 1407.” Yamazaki, [0203]. Figure 14 omits labels for the structures that are identical between Figures 13 and 14. Petitioner has annotated Figure 14 to add the omitted labels.

The admitted prior art of the '389 patent confirms this background knowledge of a POSITA that such batch manufacture of OLED devices was routine and beneficial. The patent describes “the batch fabrication of many OLED devices upon a single large sheet of glass—such as shown as a top view in FIG. 2.” '389 patent, 1:63-65. Figure 2 of the '389 patent, labeled as “PRIOR ART,” depicts this batch fabrication:

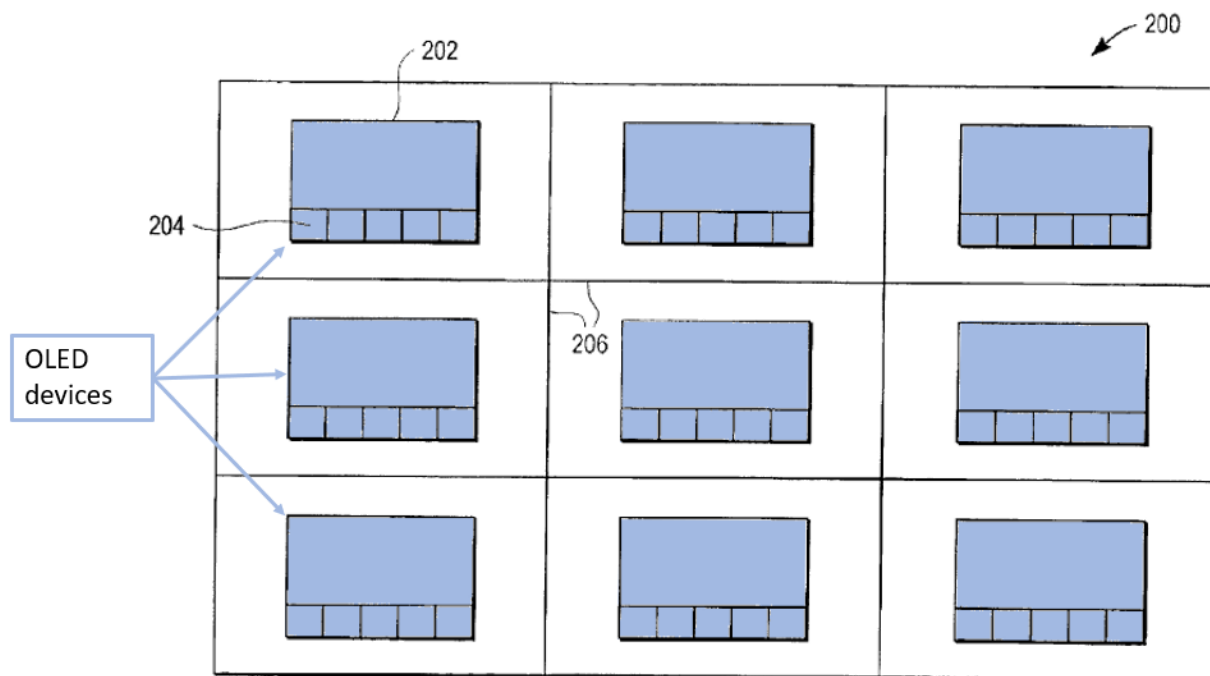
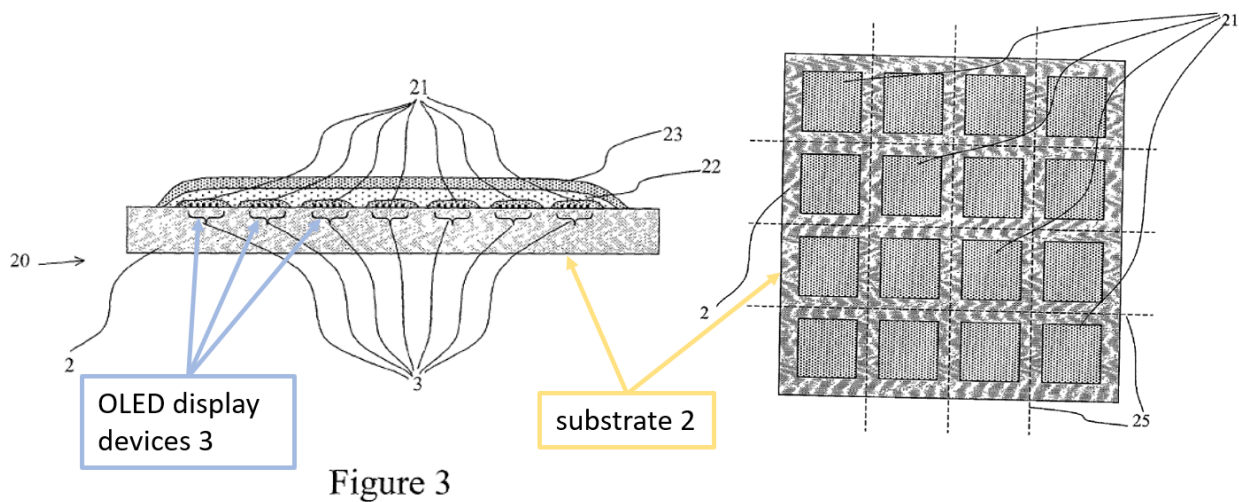


FIG. 2 (PRIOR ART)

Id., Fig. 2 (annotated). “As depicted, OLED devices 202 are typically laid down in rows and columns on a large sheet of glass 200,” *id.*, 1:67-2:2; *see also id.*, 1:65-67, followed by a “thin film encapsulation step,” *id.*, 2:5-12. After the OLED devices

are fabricated and encapsulated, “individual OLED devices 202 may be separated.” *Id.*, 2:12-16.

To the extent that any separate reference is necessary (beyond the admitted prior art) to confirm that it was known to manufacture OLED devices such as those of Yamazaki in batch on a large sheet of substrate, Ghosh teaches precisely such batch fabrication (and encapsulation) of OLED devices. Ghosh discloses an encapsulation assembly “for a plurality of OLED display devices 3 on a substrate 2” as shown Figures 3 and 5. Ghosh, [0031]:



Id., Figs. 3, 5 (annotated). The OLED display devices 3 are covered with a first encapsulation layer 21 that is selectively “patterned,” and the “dashed lines 25 in FIG. 5 indicate where the substrate would be cut as part of the dicing operation following completion of the encapsulation assembly.” *Id.*, [0032].

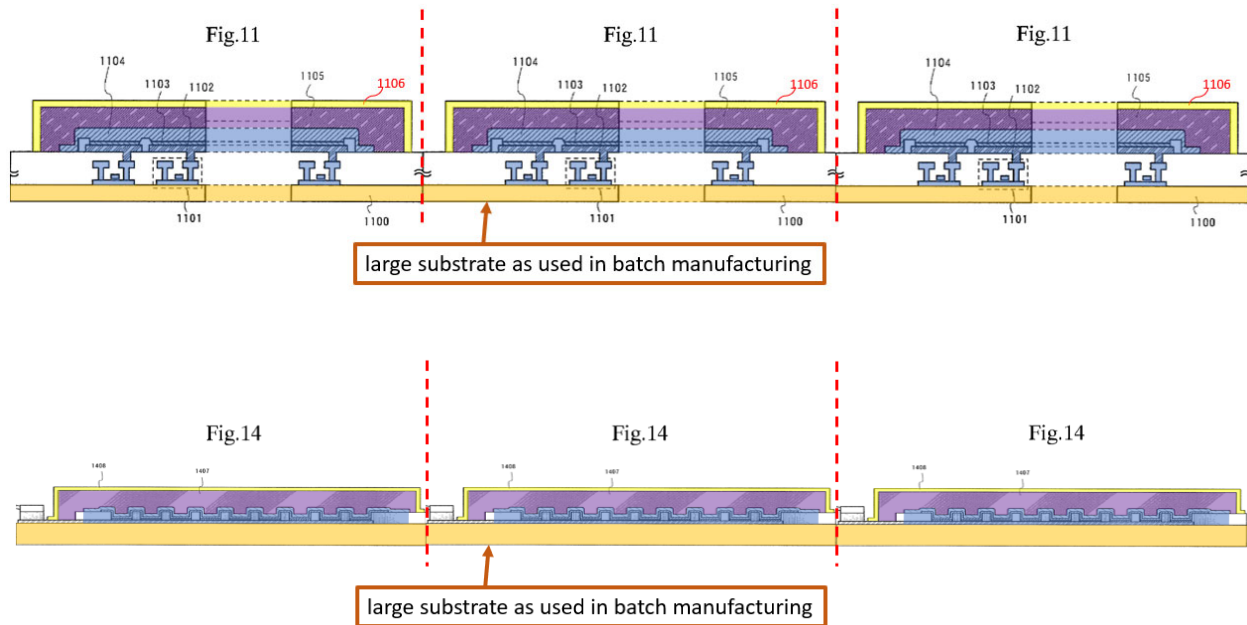
Thus, as the Examiner found during prosecution (and the applicants did not dispute), Ghosh teaches a “method of encapsulating a plurality of devices fabricated upon a substrate,” that comprises “fabricating a plurality of devices 3 (i.e. OLED) on a substrate 2 (Fig.3).” Ex.1002, 292; Ex.1003, ¶¶81-83.

A POSITA would have been motivated to use batch fabrication when applying the methods of Yamazaki’s Figures 11 and 14 for *encapsulating a plurality* of OLED display panel devices on a large sheet of substrate because such batch fabrication was the conventional mode of manufacturing display panels for OLEDs. A POSITA also would have recognized the known benefits of batch manufacture. Ex.1003, ¶¶84-85.

A POSITA would have had a reasonable expectation of success in using batch fabrication when applying Yamazaki’s encapsulation methods because, as the ’389 patent admits, it was conventional to use batch fabrication to manufacture OLED display devices with thin-film encapsulation. *See* ’389 patent, 1:63-2:12. In addition, Ghosh, like Yamazaki, is directed to encapsulation of an OLED display device with multiple thin-film layers, where at least the first encapsulation layer 21 is selectively deposited—i.e., “patterned to leave exposed a portion of the substrate surface in between the individual OLED devices.” Ghosh, [0032].

Therefore, a POSITA would have appreciated that Yamazaki’s methods may be readily applied to encapsulate a plurality of OLED devices on a large sheet of

substrate. This may be illustrated by laying multiple instances of Figures 11 and 14 side-by-side, as shown in the following annotation, in which the red vertical lines indicate where the encapsulated devices would subsequently be separated:



Yamazaki, Figs. 11 and 14 (replicated and annotated); Ex.1003, ¶¶84-86.

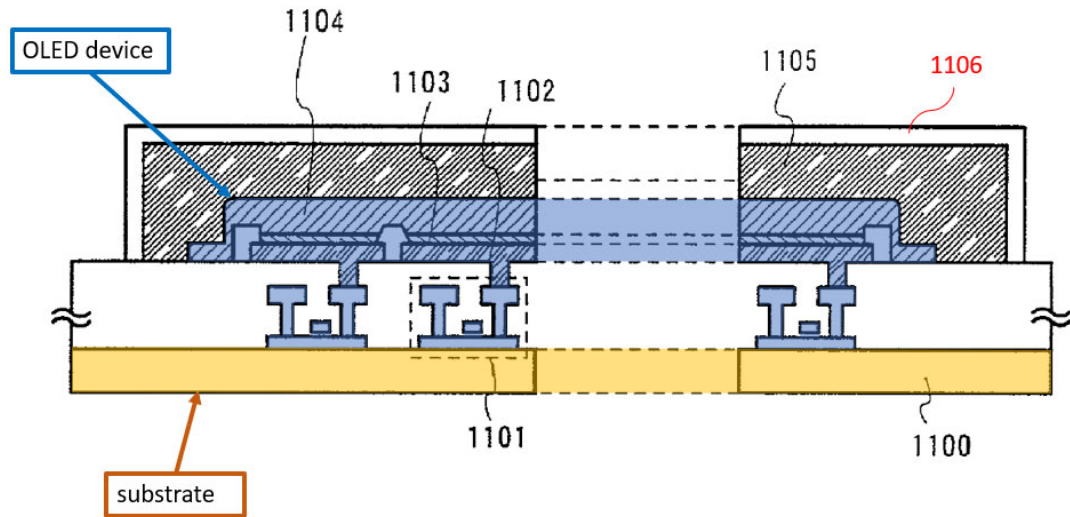
b. Element 34[a]: “fabricating a plurality of devices on a substrate;”

Applying Yamazaki’s methods to encapsulate a plurality of OLED display panels would satisfy this element, because Yamazaki’s encapsulation methods entail *fabricating* an OLED display device *on a substrate*.

In Figure 11, the OLED display panel (*device*) comprises TFTs 1101, pixel electrodes 1102 electrically connected to the TFTs 1101, EL layers 1103, and cathode 1104. Yamazaki, [0176], [0177]; Ex.1003, ¶¶87-88. This device is

fabricated on a substrate (substrate 1100). *See id.*, [0176] (manufacturing begins with “TFT 1101 formed on a substrate 1100”).

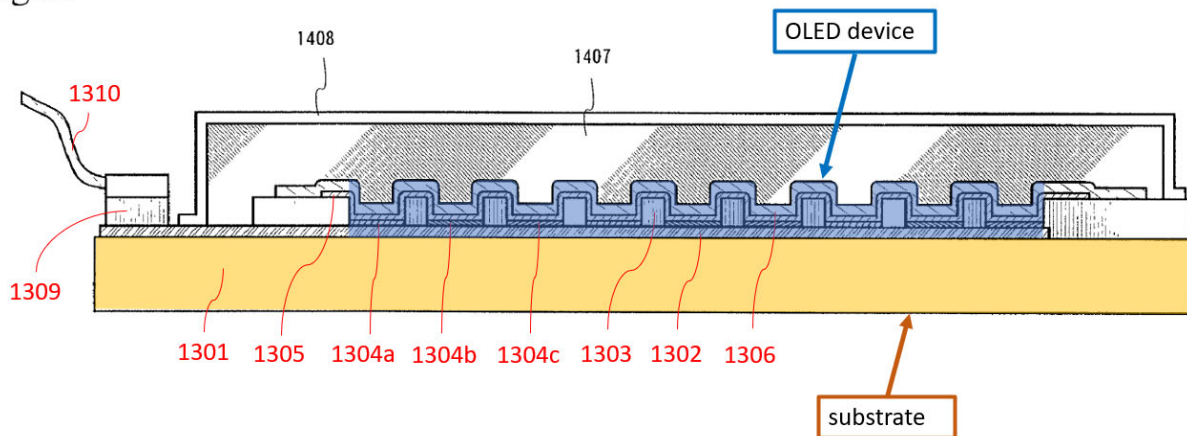
Fig.11



Yamazaki, Fig. 11 (annotated).

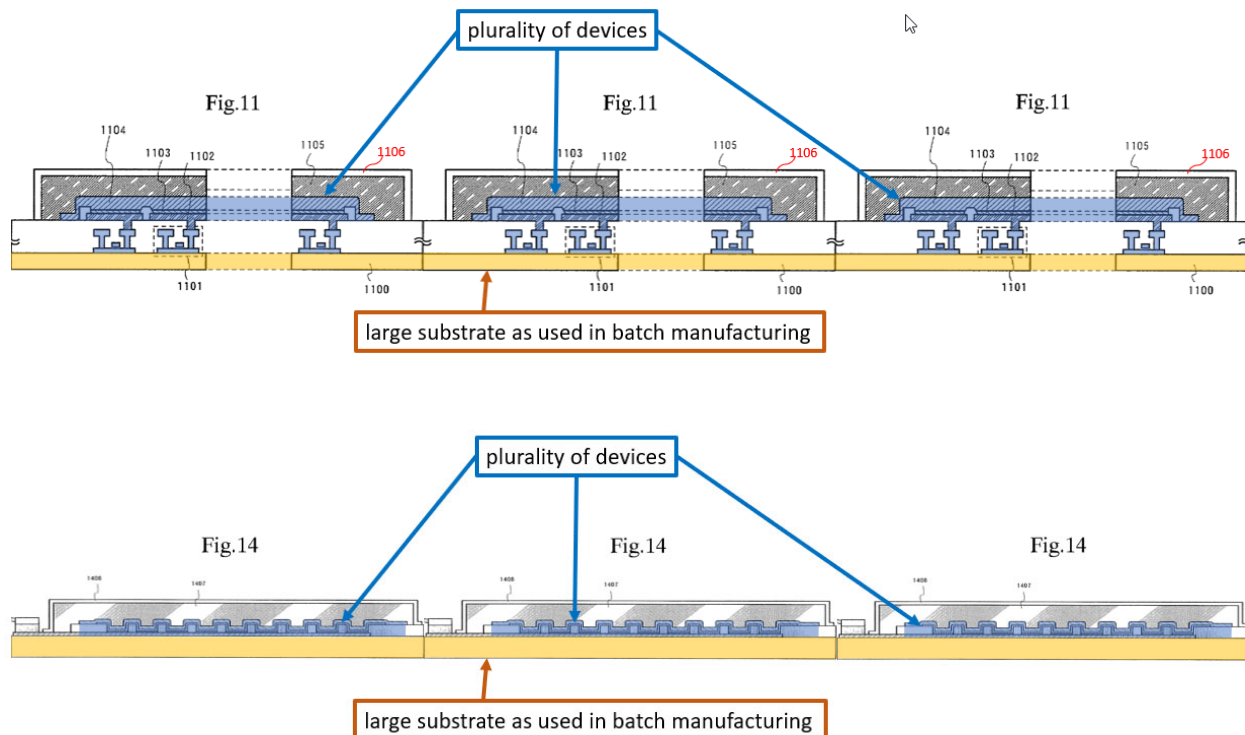
Similarly in Figure 14, the OLED display panel (*device*) comprises anode 1302, bank 1303, EL layers 1304a-c, cathode 1305, and protective electrode 1306. *See* Yamazaki, [0186]–[0188]; Ex.1003, ¶89. This device is *fabricated on a substrate* (substrate 1301). *See* Yamazaki, [0200] (“EL element is ... formed on the substrate 1301”).

Fig.14



Id., Fig. 14 (annotated).

Thus, using Yamazaki's methods in batch fabrication would entail *fabricating a plurality of such OLED devices* on a large sheet of *substrate*, as shown below.



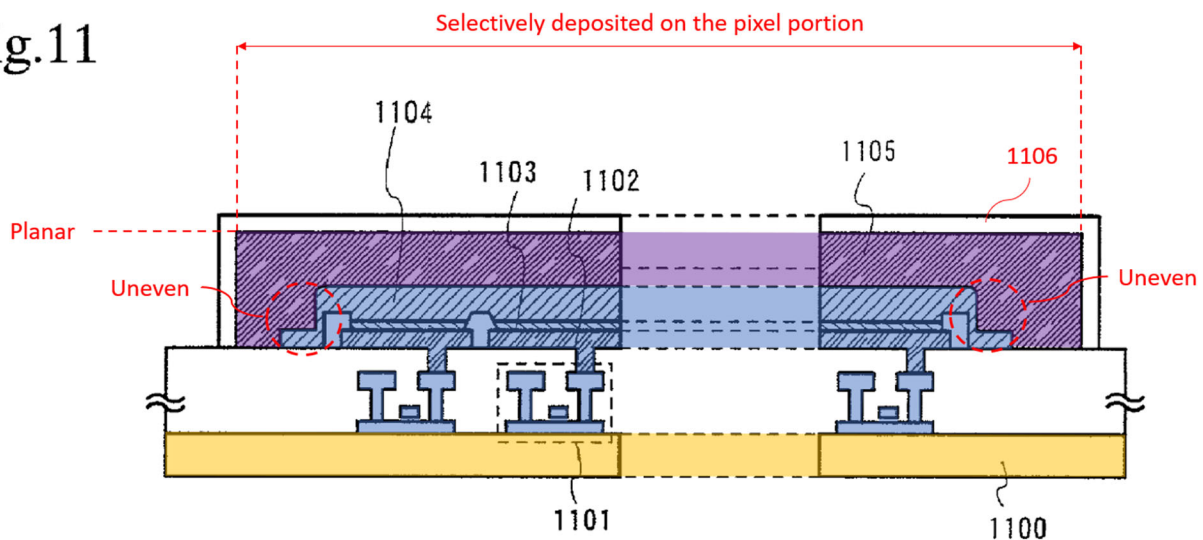
Id., Figs. 11 and 14 (replicated and annotated); Ex.1003, ¶90.

c. Element 34[b]: “selectively depositing at least one planarization layer upon said devices; and”

Applying Yamazaki’s methods to encapsulate a plurality of OLED display panels would satisfy this element, because Yamazaki’s encapsulation methods entail *selectively depositing at least one planarization layer*—namely, cover layer 1105/1407—upon its OLED display (*device*).

In Figure 11, the cover layer 1105 (purple) is selectively deposited upon the OLED display panel (blue) as shown below. As Yamazaki explains, “the ink jet method is ... used to form a cover layer 1105 made of an organic resin film evenly on the pixel portion.” Yamazaki, [0177]. Ink jet is a “film deposition” method. *Id.*, [0007], [Abstract].

Fig.11



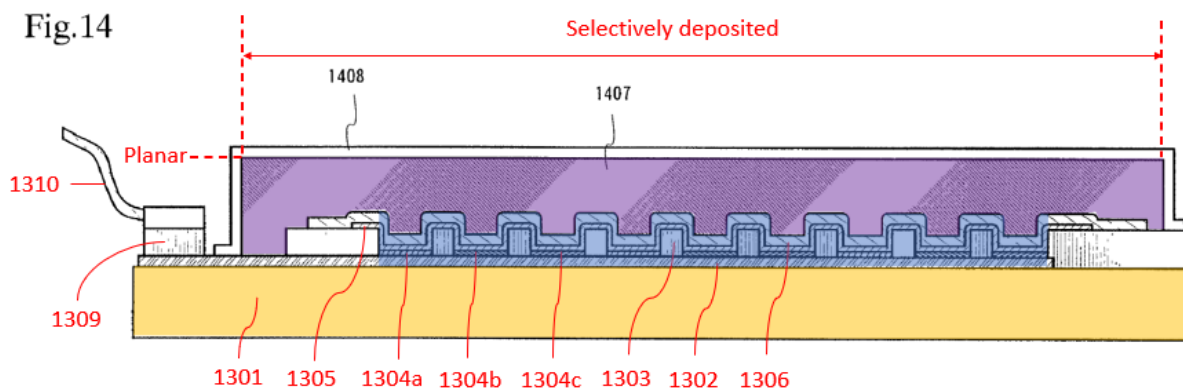
Id., Fig. 11 (annotated).

Yamazaki teaches *selectively depositing* the cover layer 1105 upon the display panel. “Because the cover layer 1105 is formed using the ink jet method, it can be

selectively formed on the pixel portion.” *Id.*, [0178]. This selective deposition is also evident in Figure 11, which shows the cover layer is formed only on a certain portion of the underlying structure; Ex.1003, ¶¶91-93.

Further, Yamazaki’s cover layer 1105 constitutes a *planarization layer*. For example, the reference teaches that “[a]s a material for forming the cover layer 1105 made of an organic resin, it is appropriate to use a material that ... has planarity.” Yamazaki, [0178]. And as evident in Figure 11 above, the top of the cover layer 1105 is planar (flat), whereas the underlying cathode 1104 has uneven surfaces. Thus, Yamazaki teaches that the uneven surfaces are planarized (flattened) by the cover layer. Indeed, it was known to use such an organic layer to “make[] a smooth surface on the relatively irregular surface of the cathode” when forming OLED devices. Suzuki, 5:59-62; Ex.1003, ¶94.

Similarly in Figure 14, a planarizing cover layer 1407 (purple) is selectively deposited upon the OLED display panel (blue) as shown below:

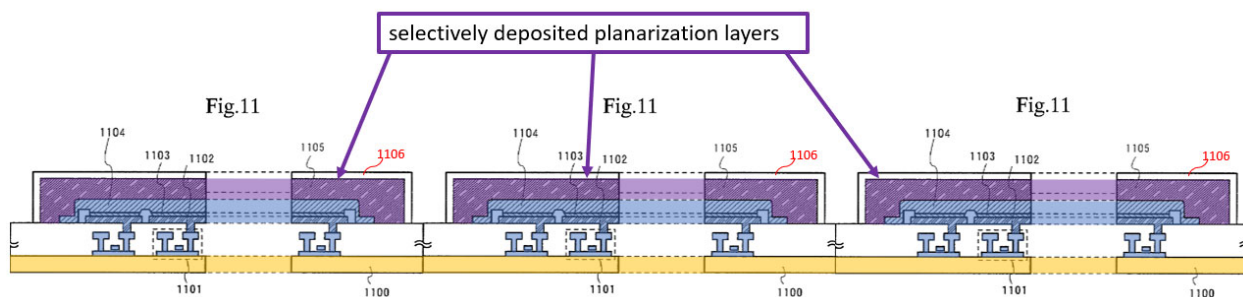


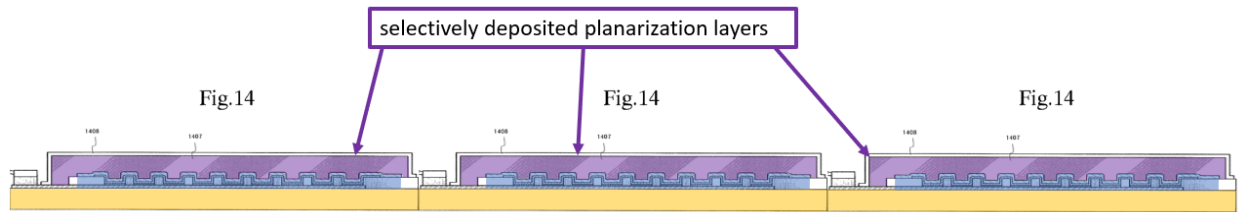
Yamazaki, Fig. 14 (annotated).

Figure 14 shows that the cover layer 1407 is *selectively deposited* as it encapsulates only the light-emissive areas (e.g., pixels) and leaves exposed the FPC 1310, which would be attached to the contact pads. This is comparable to the selective deposition described in the '389 patent. '389 patent, 6:2-4 (“[I]t might be desirable to encapsulate only the organic light-emissive areas (e.g. pixels) and leave the contact pads.”). Moreover, Yamazaki explains that “the application liquid for the EL layer can be selectively applied on to the desired position of the pixel,” Yamazaki, [0191] and the “cover layer” in this embodiment “is subsequently formed by the same method used for forming the EL layer,” *id.*, [0202]; *see also id.*, [0035] (“[T]he cover layer ... may be selectively formed only at the desired positions.”).

Further, this cover layer 1407 constitutes a *planarization layer*, because the top surface of cover layer 1407 is flat (i.e., planar) even though the underlying structure is uneven and thus the addition of layer 1407 results in a planar surface topography. Ex.1003, ¶¶94-97.

Thus, using Yamazaki’s methods in batch fabrication would entail *selectively depositing at least one planarization layer* upon each of the devices, as shown below.





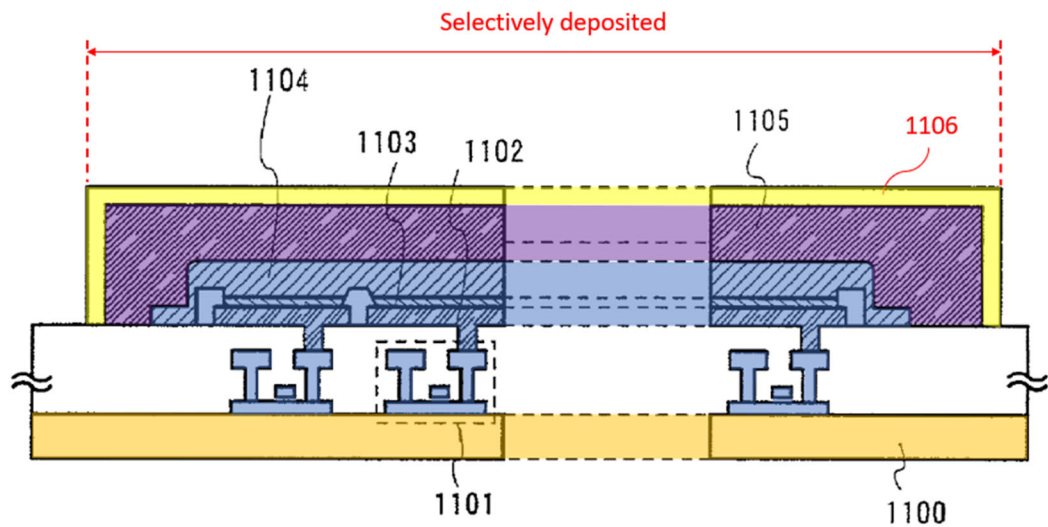
Yamazaki, Figs. 11 and 14 (replicated and annotated); Ex.1003, ¶98.

d. Element 34[c]: “selectively depositing at least one barrier layer over said planarization layer.”

Applying Yamazaki’s methods to encapsulate a plurality of OLED display panels would satisfy this element, because Yamazaki’s encapsulation methods entail *selectively depositing at least one barrier layer*—namely, barrier layer 1106/1408—*over said planarization layer* (cover layer 1105/1407).

In Figure 11, as shown below, a barrier layer 1106 (yellow) is selectively deposited over the cover layer 1105 (purple). That is, “after the formation of the cover layer 1105, a barrier layer 1106 is formed by sputtering to cover the cover layer 1105.” Yamazaki, [0183]. Sputtering is a known deposition method. Ex.1003, ¶¶99-100.

Fig.11



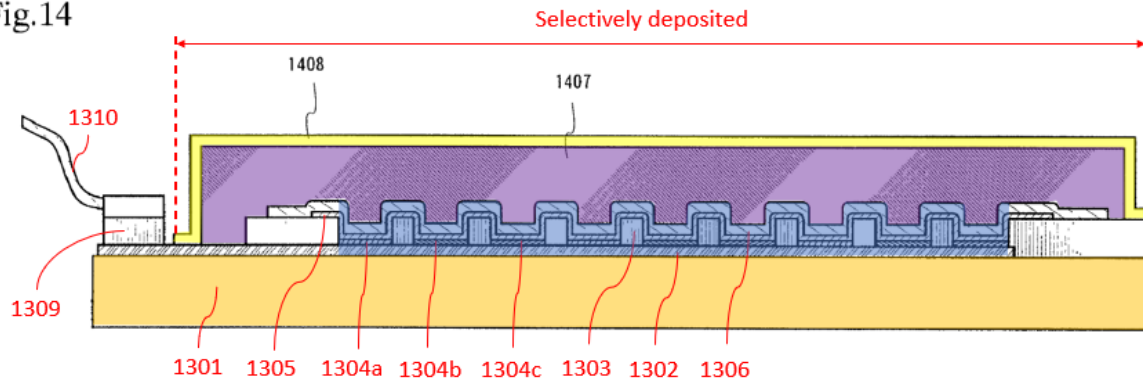
Yamazaki, Fig. 11 (annotated).

Yamazaki’s “barrier layer 1106” is a *barrier layer* because it is “provided for the purpose of preventing moisture and oxygen from penetrating into the EL layer.” *Id.*, [0033]. This is just like the ’389 patent’s barrier layer, which “provides the necessary environmental isolation from the corrosive effects of oxygen and moisture.” ’389 patent, 1:38-41; *see also* Yamazaki, [0184].

Yamazaki further discloses *selectively depositing* the barrier layer 1106 over the cover layer 1105 (*planarization layer*). “It is note[d] that the barrier layer 1106 is formed selectively using a shadow mask.” *Id.*, [0183]. This selective deposition is also evident in Figure 11, which shows that the barrier layer is formed only on a certain portion of the underlying structure.

Similarly in Figure 14, the barrier layer 1408 (yellow) is selectively deposited over the cover layer 1407 (purple), as shown below:

Fig.14

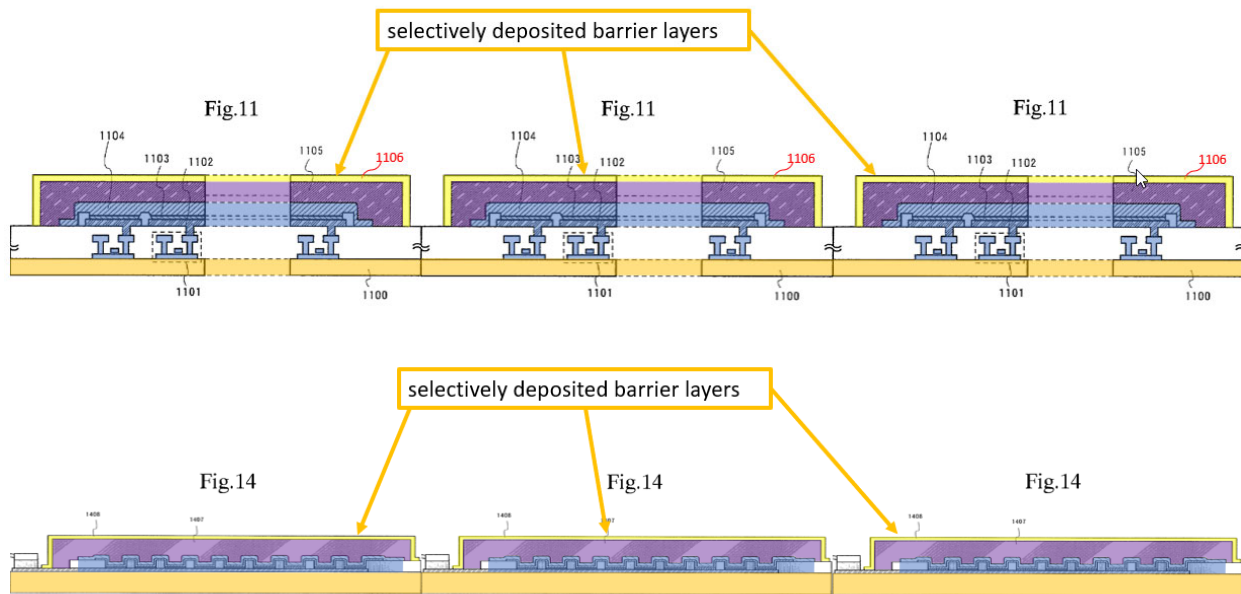


Id., Fig. 14 (annotated).

Barrier layer 1408 is provided for the same purpose as the *barrier layer* in the '389 patent. *See id.*, [0008] (“By further forming a film made of an inorganic material (hereinafter referred to as a barrier layer) on the cover layer, moisture and oxygen can be prevented from permeating into the cover layer or the EL layer.”), [0033] (“[T]he barrier layer is referred to as a passivation film provided for the purpose of preventing moisture and oxygen from penetrating into the EL layer....”).

Barrier layer 1408 is *selectively deposited* over the cover layer 1407 (*planarization layer*). As shown in Figure 14, the barrier layer is formed only on a certain portion of the underlying structure.

Thus, using Yamazaki’s methods in batch fabrication would entail *selectively depositing at least one barrier layer* over each *planarization layer*, as shown below.



Id., Figs. 11 and 14 (replicated and annotated); Ex.1003, ¶¶101-106.

2. **Claim 35: “The method as recited in claim 34 wherein the step for selectively depositing at least one planarization layer further comprises depositing by ink jet of an organic layer.”**

Yamazaki satisfies the additional element of dependent claim 35. Yamazaki teaches that the planarization layer of Figure 11 (cover layer 1105) is formed by *depositing by ink jet of an organic layer*:

After forming the cathode 1104, the *ink jet* method is again used to form a cover layer 1105 made of an *organic resin film* evenly on the pixel portion.

Yamazaki, [0177]; *see also id.*, [0011] (“cover layer made of an organic material by the *ink jet* method”); *id.*, [0034]; Ex.1003, ¶107.

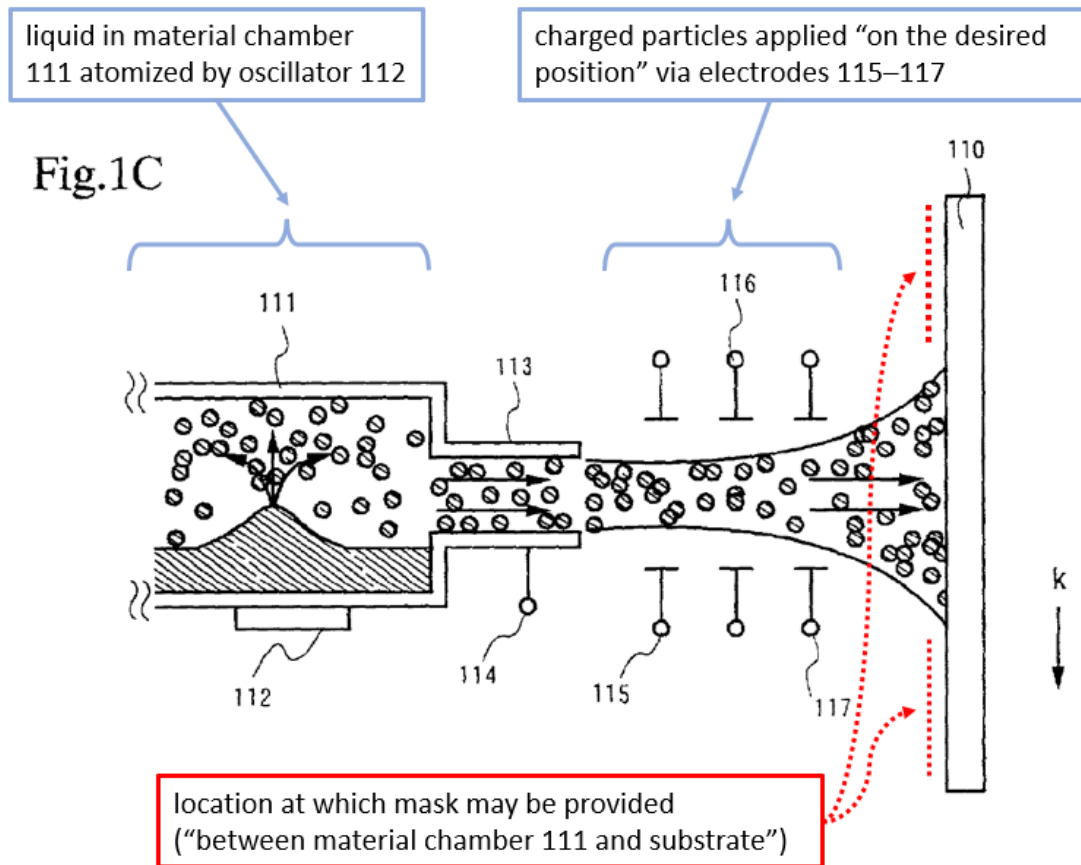
3. Claim 37: “The method as recited in claim 34 wherein the step for selectively depositing at least one planarization layer further comprises depositing an organic layer through a shadow mask.”

Yamazaki satisfies the additional element of dependent claim 37. Yamazaki teaches forming its planarization layer (cover layer) by *depositing an organic layer through a shadow mask*. Additionally, this element is obvious in view of Ghosh.

First, Yamazaki discloses that its cover layer is an *organic layer* “made of organic material,” specifically an “organic resin film.” Yamazaki, [0011], [0177], [0178], [0202].

Second, Yamazaki teaches *depositing* this organic layer *through a shadow mask*. Yamazaki notes that the cover layer of Figure 14 is “formed by the same method for forming the EL layer,” *id.*, [0202], namely “the electric field application method,” *id.*, [0188], in which “a mask may be provided ... to thereby control the positions on the substrate” where the material is applied, *id.*, [0086].

In this method, as shown in Figure 1C below, application liquid in a “material chamber 111” is first “atomized by the ultrasonic oscillator 112”; then “become[s] charged particles through influence of an electric field”; and is subsequently “extracted,” “accelerated,” and “controlled” by electrodes 115–117, such that it is “applied on the desired position.” *Id.*, [0082].



Id., [0082], Fig. 1C (annotated).

In this method, "a mask may be provided between the material chamber 111 and the substrate to thereby control the positions on the substrate at which the application liquid is [applied] via the mask." *Id.*, [0086]. A POSITA would understand that this mask is a *shadow mask*, because it prevents the deposition of the material in the areas where the mask is present, but allows the deposition of the material in the areas of the mask openings. *See* Ex.1003, ¶112.

Third, to the extent there is any question whether Yamazaki teaches or suggests a shadow mask, it would have been obvious to selectively deposit

Yamazaki's organic cover layer through a shadow mask based on Ghosh, which discloses a method for depositing an organic encapsulation layer through a shadow mask. Ghosh, [0032].

Yamazaki teaches that its organic cover layer may be applied using alternative selective deposition methods. Yamazaki specifically discusses "forming the ... cover layer ... by the *ink jet method* or the *electric field application method*." Yamazaki, [0011]. Yamazaki cites these as known "film deposition" methods in its "Description of the Related Art." *Id.*, [0007].

Depositing through a shadow mask was among these known selective deposition methods. Indeed, the '389 patent acknowledges that "there are many manners of depositing this organic [planarization] layer upon the OLED device." '389 patent, 4:48-49; *see also id.*, 6:66-7:3 (further explaining that "selectively depositing the organic [planarization] layer ... may be accomplished in a variety of ways," including "through a shadow mask.").

In particular, Ghosh teaches that "patterning [of the first encapsulation layer] may be achieved by any well-known, conventional means, including shadow masking before layer formation." Ghosh, [0032]. Ghosh explains that this technique achieves selective deposition, explaining that the layer "is patterned to leave exposed a portion of the substrate surface in between the individual OLED devices." *Id.* Ghosh further explains that "the first encapsulation layer comprises a polymer, and

more preferably, that polymer comprises a parylene,” which is an organic material. *Id.*, [0015]; Ex.1003, ¶116.

A POSITA would have been motivated to use the shadow mask disclosed in Ghosh to selectively deposit the cover layer in Yamazaki. Although other selective deposition techniques may have their own benefits, a POSITA would have recognized benefits of using the shadow mask in a method such as Yamazaki’s. *See PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197–98 (Fed. Cir. 2014) (“Our precedent ... does not require that the motivation be the best option, only that it be a suitable option from which the prior art did not teach away.”). Using a shadow mask has known advantages, including allowing for good control of the positions on the substrate where the planarizing layers are formed and being amenable for use in conjunction with other processes for depositing a layer of liquid material, such as flash evaporation. Ex.1003, ¶117; *see also* Burrows-631 (Ex.1022), 4:18-19 (explaining that a shadow masks allow using a “known technology for achieving uniform deposition over a wide area to fabricate a large array of devices simultaneously”).

A POSITA would have had a reasonable expectation of success of depositing the cover layer in Yamazaki through the shadow mask disclosed in Ghosh. Like the cover layer in Yamazaki, the first encapsulation layer in Ghosh preferably comprises an organic polymer, such as a “parylene.” Ghosh, [0015]. A POSITA would have

understood that parylene is a planarizing material. Ex.1003, ¶118; *see also, e.g.*, Weaver, [0035] (“Preferred planarizing materials are polymers, such as ... parylenes.”). During prosecution, the Applicant did not dispute that Ghosh’s first encapsulation layer is a planarization layer or that Ghosh’s first encapsulation layer is selectively deposited. Thus, a POSITA would have recognized that Ghosh’s disclosures for selectively depositing its first encapsulation layer are readily applicable to Yamazaki’s organic cover layer. Ex.1003, ¶¶108-19.

4. Claim 40: “The method as recited in claim 34 wherein the step for selectively depositing at least one barrier layer further comprises depositing by shadow mask, sputtering, ink jet deposition, screen printing [or] evaporation.”

Yamazaki satisfies the additional element of dependent claim 40 because Yamazaki teaches depositing its barrier using a *shadow mask*, by *sputtering*, and by *evaporation*. For example, in Figure 11:

[A] barrier layer 1106 is formed by *sputtering* to cover the cover layer 1105.... It is note[d] that the barrier layer 1106 is formed selectively using *a shadow mask*.

Yamazaki, [0183]. Likewise for Figure 14, “[t]he barrier layer can be formed by plasma CVD, *sputtering*, or *evaporation*.”). *Id.*, [0201]; *see also id.*, [0011] (“a *sputtering* chamber for forming the barrier layer”), [0034] (“Using *sputtering* or plasma CVD, the barrier layer is formed”), [0141] (“The barrier layer 353 is formed by employing *sputtering*”); Ex.1003, ¶120.

B. Ground II: Claims 41-46 Are Obvious Over Yamazaki in View of AAPA/Ghosh and Fujimori

Claims 41-46 would have been obvious based on Yamazaki in view of AAPA and/or Ghosh and further in view of Fujimori. These claims relate to a method of encapsulating a plurality of devices via at least one planarization layer and barrier layer (as in claim 34), but also specify particular requirements for using a mask when depositing the planarization layer.

Fujimori discloses an approach for manufacturing OLED display elements using a “mask attached to a substrate with magnetic force,” Fujimori, [0010], thereby “achiev[ing] favorable pattern processing accuracy,” *id.*, [0009]. Fujimori teaches that its approach is advantageous over conventional masking techniques, where for example “adhesion between the substrate and mask deteriorates due to warping and other factors.” *Id.*, [0008]. As discussed below, it would have been obvious to use this magnetic masking approach when applying Yamazaki’s methods to encapsulate a plurality of OLED display panels in batch manufacturing, thereby satisfying the limitations of claims 41-46. Ex.1003, ¶¶121-22.

1. Claim 41:

- a. Element 41[Pre]: “A method of encapsulating a plurality of devices fabricated upon a substrate, the steps of said method comprising:”**

This element is obvious based on Yamazaki in view of the admitted prior art and/or Ghosh for the same reasons set forth for identical Element 34[pre] in Ground

I above. That is, Yamazaki discloses *methods of encapsulating* an OLED display panel *device fabricated upon a substrate*, as shown in Figures 11 and 14. It would have been obvious to apply these methods for *encapsulating a plurality* of such display devices during batch fabrication, as was known based on the admitted prior art and as further taught by Ghosh. Ex.1003, ¶123.

Fig.11

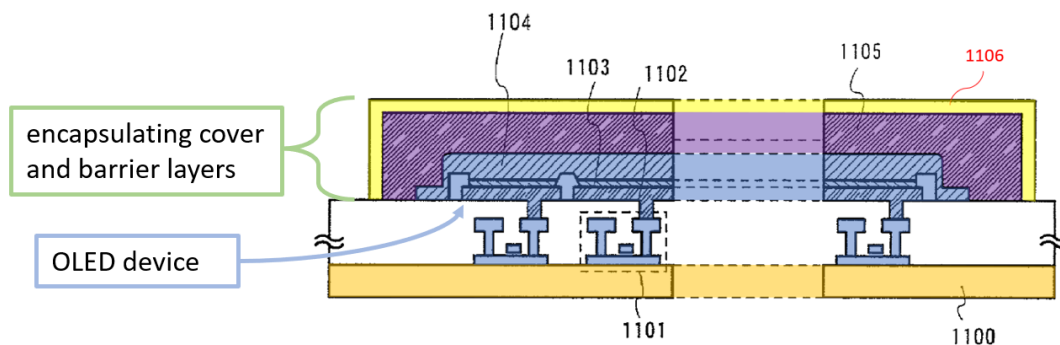
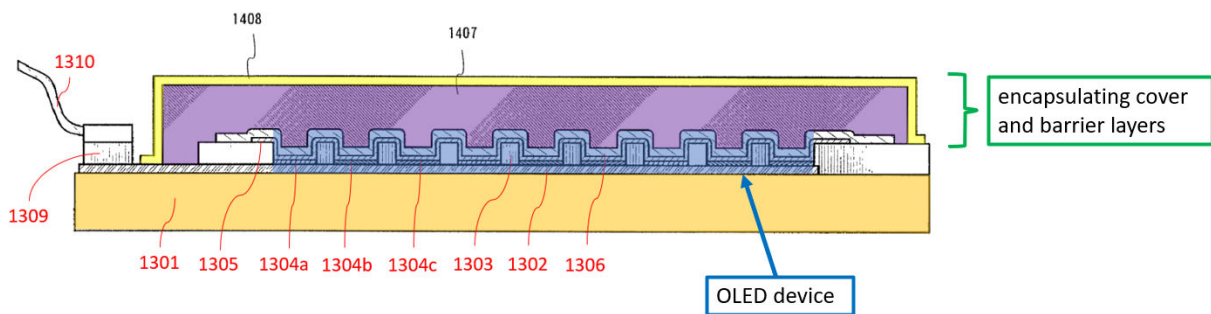


Fig.14



Yamazaki, Figs 11 and 14 (annotated).

b. Element 41[a]: “fabricating a plurality of devices on a substrate;”

Applying Yamazaki’s methods to encapsulate a plurality of OLED display panels would satisfy this element for the same reasons set forth above for identical

Element 34[a] in Ground I. That is, Yamazaki's encapsulation methods entail *fabricating an OLED display device on a substrate*, as shown in Figures 11 and 14.

Fig.11

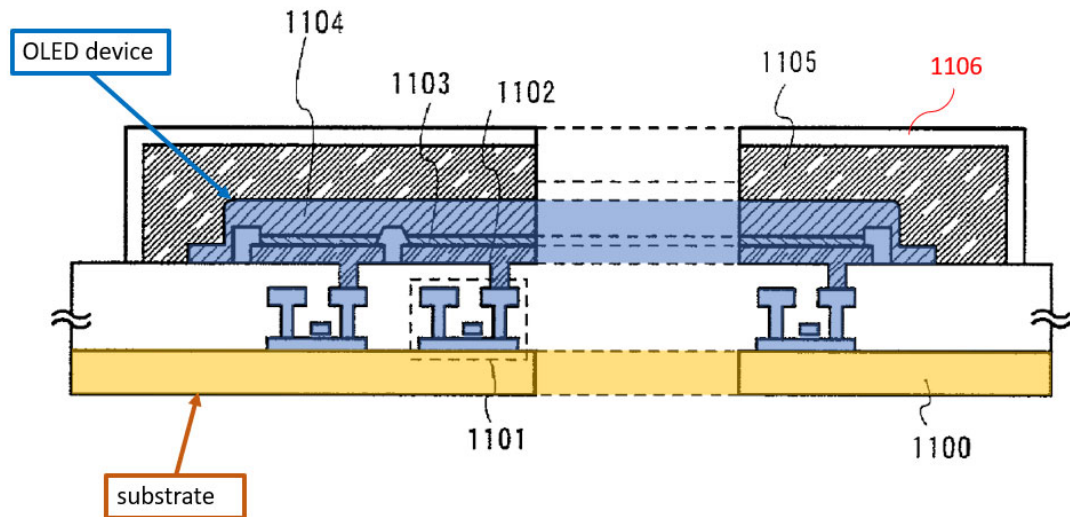
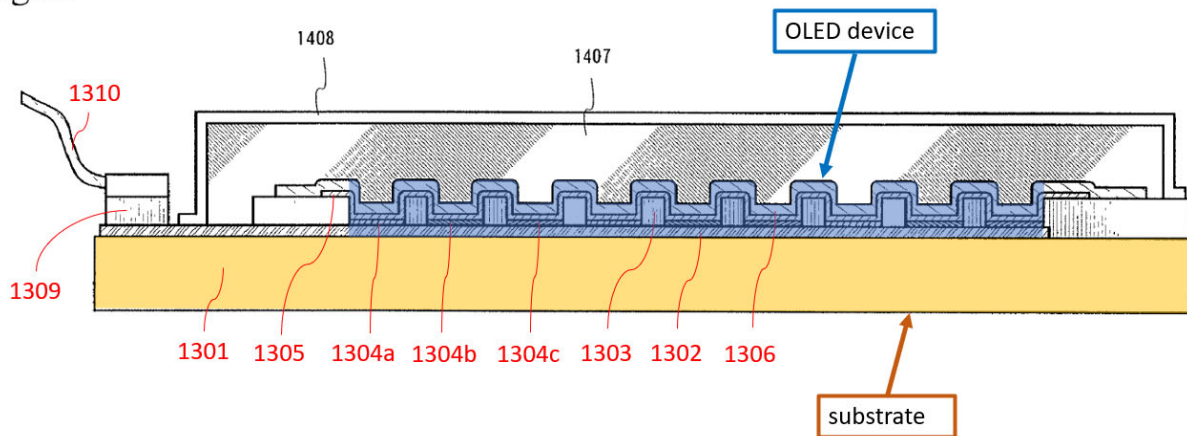


Fig.14



Yamazaki, Figs 11 and 14 (annotated). Ex.1003, ¶124.

c. Element 41[b]: “depositing a mask on top of said substrate, such that the mask openings are placed on top of said devices;”

This element would have been obvious in view of the further teachings of Fujimori. As explained below, it would have been obvious to use Fujimori’s magnetic masking approach for selectively depositing Yamazaki’s planarizing “cover layer.” Doing so in batch manufacturing would entail *depositing a mask* (Fujimori’s magnetically held mask) *on top of said substrate* (Yamazaki’s substrate) *such that the mask openings are placed on top of said devices* (the plurality of OLED display devices).

Yamazaki teaches that its organic cover layer may be applied using alternative selective deposition methods. Yamazaki discusses “forming the ... cover layer made ... by the *ink jet method* or the *electric field application method*.” Yamazaki, [0011]. Yamazaki describes these as known “film deposition” methods in its “Description of the Related Art.” *Id.*, [0007]. Yamazaki further notes that “a mask may be provided” in its electric field method to “control the positions on the substrate” where the material is deposited. *Id.*, [0086].

Yamazaki’s disclosure is consistent with other prior art references, which teach that organic planarization layers can be selectively deposited using various methods. *See, e.g.*, Palanisamy, [0021]-[0025] (discussing that an organic “passivation layer may be selectively applied” using an ink jet printer, a shadow

mask, or screen printing); Ghosh, [0032] (teaching “patterning [of the first encapsulation layer] ... by any well-known, conventional means, including shadow masking before layer formation”). The ’389 patent acknowledges that “there are many manners of depositing this organic [planarization] layer upon the OLED device.” ’389 patent, 4:48-55; *see also id.*, 6:66-7:3 (further explaining that “selectively depositing the organic [planarization] layer ... may be accomplished in a variety of ways,” including “through a shadow mask”), 7:26-27.

Fujimori discloses a particular approach in which OLED elements are “formed through a mask attached to a substrate with magnetic force.” Fujimori, [0010]. In conventional masks, “adhesion between the substrate and mask deteriorates due to warping and other factors,” which “mak[es] it difficult to pattern the element with adequate accuracy.” *Id.*, [0008]. However, Fujimori teaches that adhesion between the mask and the substrate is improved by magnetic force. This reduces the material deposited from the mask opening that bleeds to the shadow portion of the mask and thereby “achiev[es] fine pattern processing not conventionally possible.” *Id.*, [0029].

Fujimori further explains that its magnetically held mask may be used for forming not only the OLED elements “involved in the light emission” but also for “non-light-emitting portions formed for the purpose of improving the contrast, pattern accuracy, and electrical insulation of the portions involved in light emission

according to need, and therefore are not particularly limited.” *Id.*, [0023]. For example, its mask is suitable for organic light-emitting layers, *id.*, [0024]-[0025], electrodes, *id.*, [0026], and “non-light-emitting portions to be patterned ... [which] are not particularly limited,” *id.*, [0027]. Ex.1003, ¶¶125-31.

A POSITA would have been motivated to use Fujimori’s magnetic masking approach for selectively depositing Yamazaki’s cover layer.

First, Yamazaki states that an “object of [its] invention is to form the cover layer *at a desirable position with good control.*” Yamazaki, [0010]; *see also id.*, [0035] (“the layers may be selectively formed *only at* the desired positions”) . Indeed, insufficient control over the deposition may have undesirable effects, including unduly expanding the footprint of the cover layer beyond an intended area. Ex.1003, ¶133. Fujimori’s approach allows for improved accuracy. *See id.*; Fujimori, [Abstract].

Second, shadow masks and/or the underlying substrate are vulnerable to problems of warping or bending, which likewise adversely impact control over patterning of deposited layers. Ex.1003, ¶134. Fujimori recognizes that “adhesion between the substrate and mask deteriorates due to warping and other factors,” which “mak[es] it difficult to pattern the element with adequate accuracy.” Fujimori, [0008]. Accordingly, a POSITA would have found additional motivation to employ Fujimori’s mask to counter the adverse effects of warping, and to otherwise afford

precision sufficient to achieve Yamazaki's objective of "good control" and "desirable position[ing]" when depositing the cover layer. Ex.1003, ¶134.

Third, Fujimori's magnetic masking approach would further Yamazaki's provision that the "same method is used to form the EL layer and ... cover layer." Yamazaki, [0008]. As noted above, Fujimori's mask is suitable for organic light-emitting layers, *id.*, [0024]-[0025], electrodes, *id.*, [0026], and "non-light-emitting portions to be patterned ... [which] are not particularly limited," *id.*, [0027].

In this regard, Fujimori's magnetic masking approach would also be advantageous when forming Yamazaki's OLED display. Fujimori's approach allows for advanced displays with fine pattern pitches (i.e., small pixel spacing, where the "pitch" is the distance between the centers of adjacent pixels), "achieving fine pattern processing not conventionally possible." *Id.*, [0029]. Accordingly, using Fujimori's approach for Yamazaki's EL and cover layers would permit the manufacturing of more advanced, higher resolution OLED displays. Ex.1003, ¶136.

Fujimori's masking approach also may be used to selectively deposit Yamazaki's barrier layer, thus further simplifying the manufacturing process. Yamazaki already contemplates that "the barrier layer 1106 is formed selectively using a shadow mask." Yamazaki, [0183]. Thus, Yamazaki's masking approach is readily applicable to forming the barrier layer.

Additionally, a POSITA would have reasonably expected success in using Fujimori's magnetic masking approach in Yamazaki's methods. Yamazaki, like Fujimori, contemplates using the same method to selectively deposit both light-emitting layers (such as Yamazaki's EL layer), and non-light emitting layers (such as Yamazaki's cover layer). While Yamazaki's approach entails selectively depositing both layers in an application chamber using ink jet or electric field, it does not foreclose using other techniques. Ex.1003, ¶138.

Combining the teachings of Fujimori with Yamazaki would have constituted nothing more than the application of known techniques (i.e., forming and encapsulating an OLED device using an magnetically held mask as taught by Fujimori's) to a known method ready for improvement (i.e., Yamazaki's encapsulation methods as illustrated in Figures 11 and 14), to yield predictable results (greater precision in forming OLED devices suited for excellent display performance, and good control and avoiding bleed through when selectively depositing the cover layer and barrier layer). Ex.1003, ¶¶132-39.

* * *

When Fujimori's magnetic masking approach is used in applying Yamazaki's encapsulation methods, Element 41[b] would be satisfied. That is, using Fujimori's masking technique to selectively deposit Yamazaki's planarizing cover layer 1105/1407 would entail *depositing a mask* (Fujimori's mask) *on top of said substrate*

(Yamazaki's substrate) *such that the mask openings are placed on top of said devices* (the plurality of OLED display devices), as shown below.

Fig.11

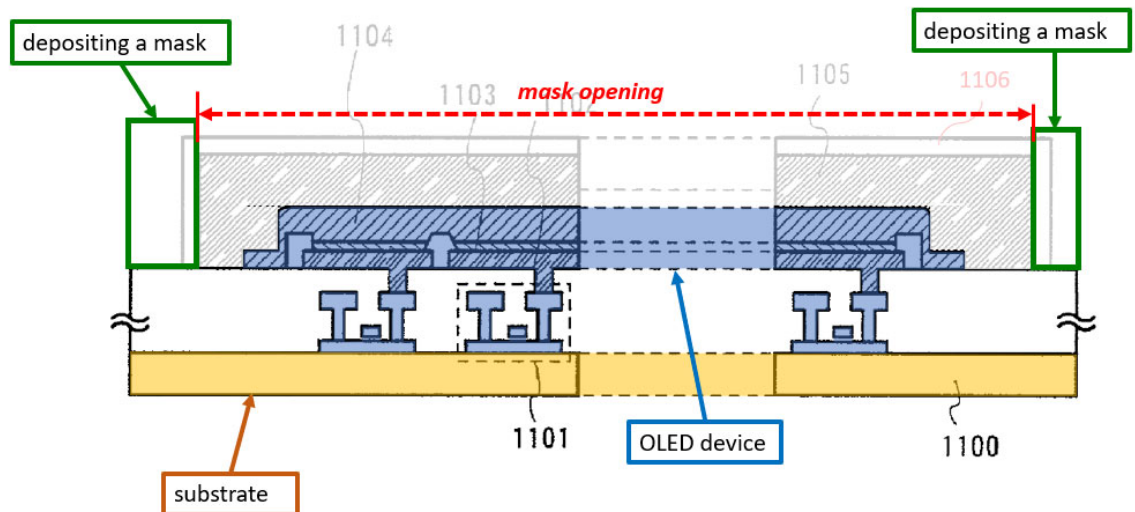
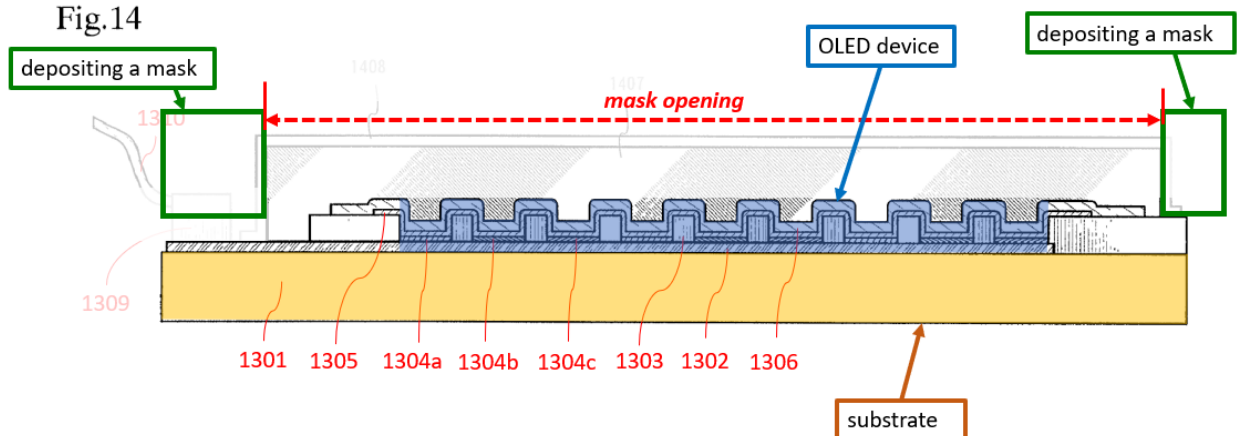


Fig.14



Yamazaki, Figs. 11 and 14 (annotated).⁶

⁶ As drawn, Figure 14 of Yamazaki appears to depict a “bank” that extends beyond the right side of the OLED device, suggesting that the surface to the right of the

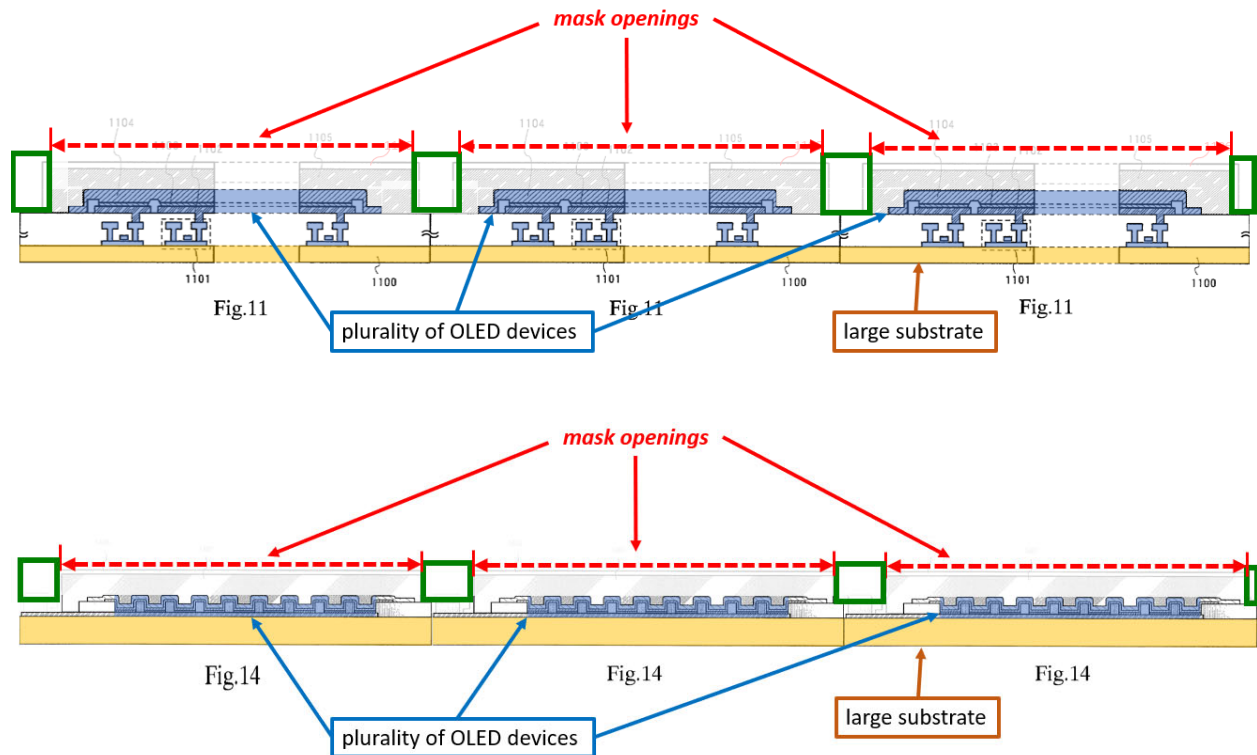
Applying Fujimori’s magnetic masking approach would constitute *depositing a mask on top of said substrate*. Fujimori teaches that its mask is adhered to the underlying substrate by magnetic force, explaining that: “the magnetic force should be adequate for *mask adhesion and positional affixing*.” Fujimori, [0030]; *see also id.*, [Abstract] (“An organic electroluminescent element ... is formed through a mask *attached to a substrate* with magnetic force.”), [0009], [0037].

cover layer may be higher than the surface to the left of it. A POSITA would have appreciated, based on Fujimori’s disclosure, that improved adhesion may be obtained even with such an uneven surface, with proper “positional affixing” and ensuring that the “magnitude of the magnetic force” is “adequate.” Fujimori, [0030]. Regardless, to the extent that an uneven surface would affect the proper adhesion of Fujimori’s mask, a POSITA would appreciate that this issue may be readily alleviated by adjusting the geometry of Yamazaki’s device (e.g., by having the bank symmetrically extend beyond both sides of the OLED, or neither) or Fujimori’s mask, so that the mask sufficiently follows the contours of the underlying surface. Further, Petitioner has grayed out the “anisotropic conductive film 1309” and “flexible printed circuit,” i.e., “FPC 1310,” in Figure 14, as Yamazaki explains that those features are attached *after* the cover layer is deposited. *See* Yamazaki, [0157], [0202]; Ex.1003, ¶140, n.4.

Adhering the mask in this manner would constitute *depositing a mask* on top of said substrate within the meaning of the '389 patent. The '389 patent clearly contemplates that its mask 604 “could be made of magnetic material and thus held by magnetic forces,” in describing manners through which the “mask 604 is deposited.” '389 patent, 7:47-49, 7:54-55. Moreover dependent claim 42 specifies that the “step of depositing” recited in this Element 41[b] may “comprise[] ... depositing a ... magnetically held mask.” *Id.*, cl. 42.

Using Fujimori’s approach for the cover layer 1105/1407 would further entail depositing the mask *such that mask openings are placed on top of said devices*. Fujimori explains that “[o]rganic material or electrode material flying toward the substrate in vapor deposition or the like is deposited on the substrate through the mask opening placed in front of the substrate to achieve the [desired] patterning of the organic electroluminescence element corresponding to the mask opening shape.” Fujimori, [0028]. Accordingly, using Fujimori’s mask to deposit Yamazaki’s cover layer would entail the mask openings to be *on top of said devices* (as identified above), in order to achieve the patterning (selective deposition) of the cover layer in the location shown in Yamazaki Figures 11 and 14.

Finally, using Fujimori’s masking technique to encapsulate a plurality of devices in batch fabrication would entail multiple *mask openings ... placed on top of said devices*, as shown below. Ex.1003, ¶¶140-44.



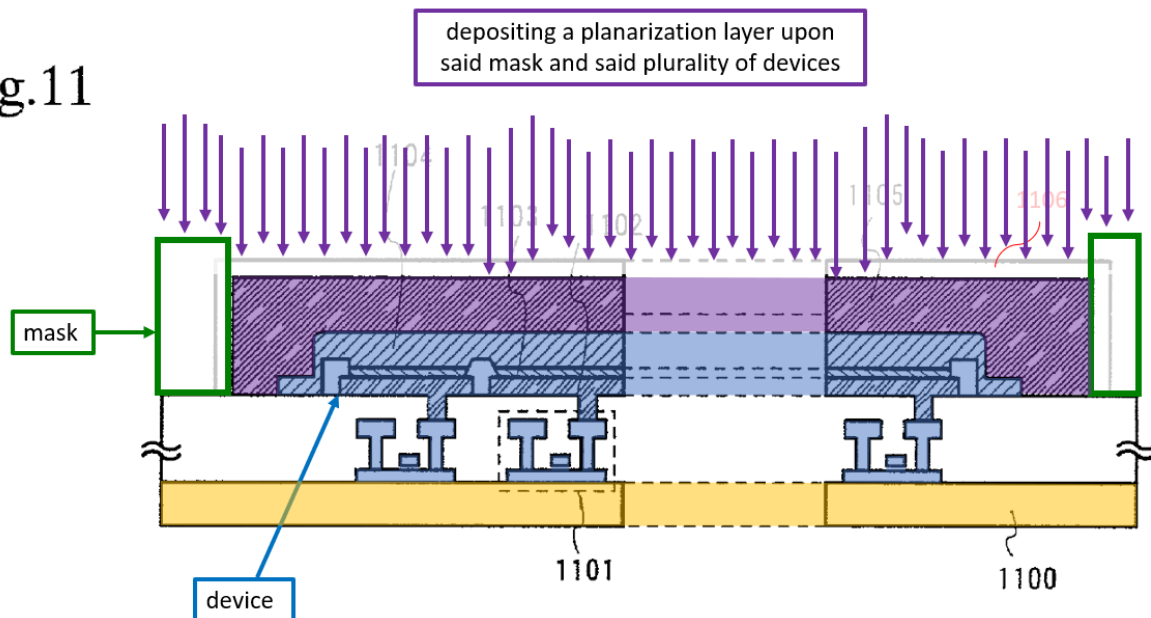
Yamazaki, Figs. 11 and 14 (replicated and annotated).

d. Element 41[c]: “depositing at least one planarization layer upon said mask and said plurality of devices;”

This element would be satisfied by or at least obvious over Yamazaki’s encapsulation methods as modified to use Fujimori’s masking approach.

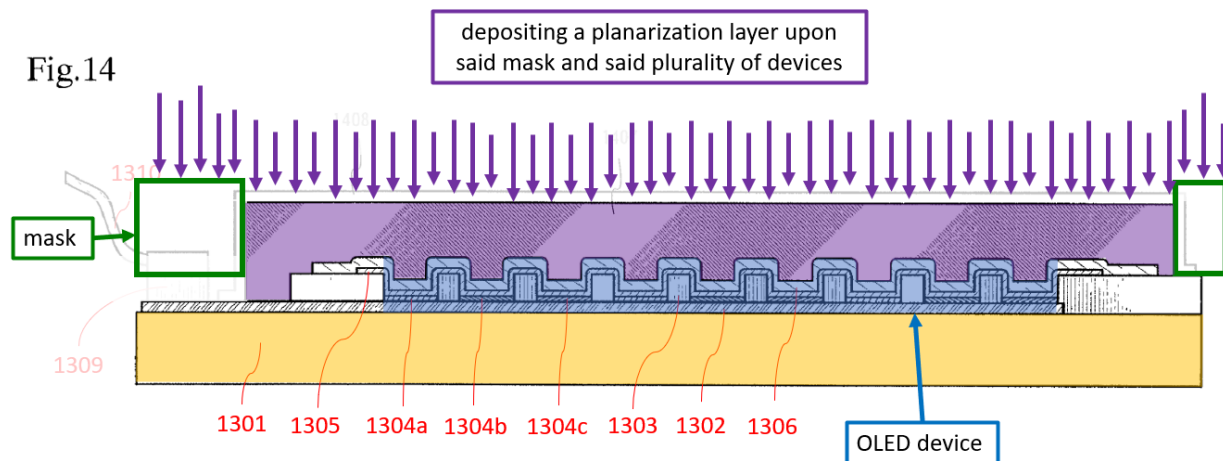
When Fujimori’s magnetic mask is used with Yamazaki, the formation of the cover layer would entail *depositing at least one planarization layer* (Yamazaki’s cover layer 1105 or 1407) *upon said mask* (Fujimori’s mask) *and said plurality of devices* (the plurality of OLED display devices). This is illustrated in Figures 11 and 14 below, with annotations showing the deposition of the cover layers 1105 and 1407, respectively.

Fig.11



Yamazaki, Fig. 11 (annotated).

Fig.14



Yamazaki, Fig. 14 (annotated).

First, Yamazaki's cover layers constitute a *planarization layer* as discussed for Element 34[b] in Ground I above.

Second, the formation of this layer using Fujimori's mask would entail *depositing* the planarization layer *upon said mask and said plurality of devices*. Fujimori explains the use of its mask as follows: “[o]rganic material or electrode material flying toward the substrate in vapor deposition or the like is deposited on the substrate through the mask opening placed in front of the substrate to achieve the [desired] patterning of the organic electroluminescence element corresponding to the mask opening shape.” Fujimori, [0028]. Accordingly, a POSITA would have appreciated that using Fujimori's magnetic masking approach to deposit Yamazaki's cover layer would entail depositing a layer of “organic material,” Yamazaki, [0008], *upon said mask and said plurality of devices*, in order for the material to get deposited through the mask openings, in order to achieve the patterning (selective deposition) of the cover layer in the respective locations shown in Figures 11 and 14. *See* Ex.1003, ¶¶145-49.

e. Element 41[d]: “removing said mask from said substrate; and”

This element would be satisfied by or at least obvious over Yamazaki's encapsulation methods as modified to use Fujimori's mask.

When Fujimori's magnetic masking approach is used with Yamazaki, the method would entail *removing said mask from said substrate* because the mask would need to be removed after forming the cover layer, in order to subsequently deposit the barrier layer. Yamazaki, [0008], [0183], [0203], Figs. 11, 14.

A POSITA would have understood that deposition masks are removed after deposition is complete. Fujimori acknowledges that its magnetic mask would be adhered only temporarily when it explains that an “electromagnet,” which “can electrically control the switching of magnetic field”—i.e., turn it off and on—“is particularly suitable in the present invention.” Fujimori, [0033]. Likewise, Fujimori discusses removing the mask before the next step in the process in its Embodiment 4. *Id.*, [0050] (“Subsequently, the mask for the light-emitting layers was removed and 20 nm of Alq3 was deposited on the entire surface of the substrate as a light-emitting layer covering layer 43.”).

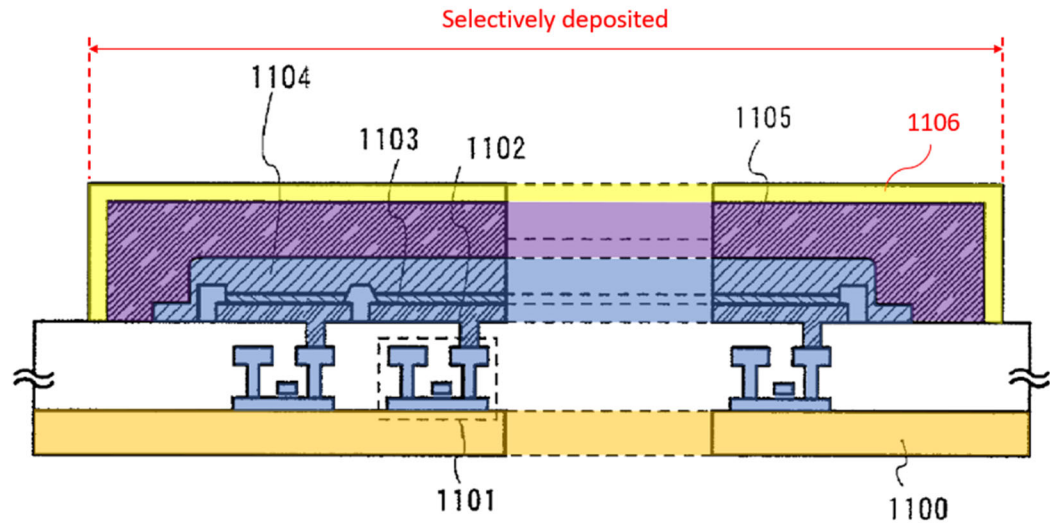
Additionally, Yamazaki’s method entails depositing an additional larger layer over the cover layer—namely, the barrier layer. Yamazaki, [0183], [0203], Figs. 11, 14. Therefore, a POSITA would have understood that the mask would need to be *remov[ed] ... from said substrate* after cover layer 1105 or 1407 is formed, so that a separate mask with corresponding larger openings could then be used to deposit the barrier layer. *See* Ex.1003, ¶¶150-53.

f. Element 41[e]: “selectively depositing at least one barrier layer over said planarization layer.”

Yamazaki satisfies this element for the same reasons as set forth above for identical Element 34[c] in Ground I. That is, Yamazaki’s encapsulation method entails *selectively depositing at least one barrier layer* (barrier layer 1106 or 1408)

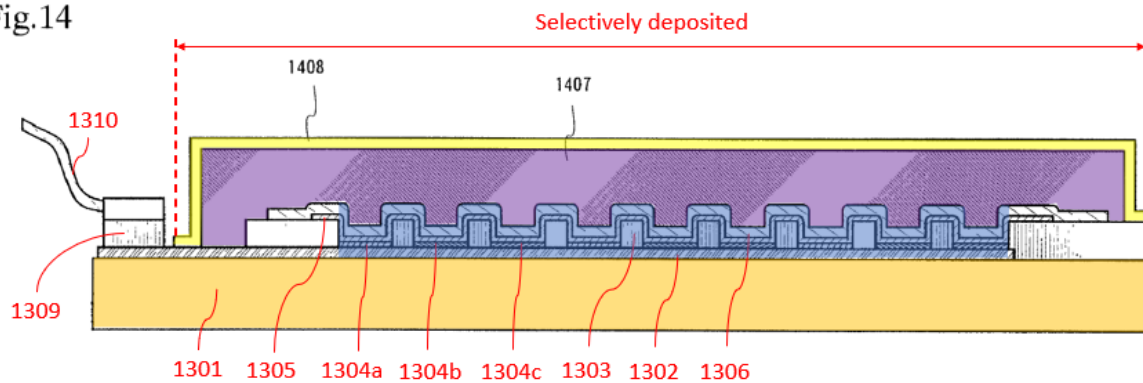
over said planarization layer (cover layer 1105 or 1407), as illustrated in Figures 11 and 14, respectively:

Fig.11



Yamazaki, Fig. 11 (annotated).

Fig.14



Id., Fig. 14 (annotated). Yamazaki states that “barrier layer 1106 is formed selectively using a *shadow* mask,” *id.*, [0183]. Additionally, as noted for Element 41[b] above, Fujimori’s magnetic masking approach may be used for the barrier layer as well as the cover layer, thus further simplifying the manufacturing process.

However, claim 41 does not recite any specific requirements as to the method used for selectively depositing the barrier layer. Ex.1003, ¶¶154-55.

2. **Claim 42: “The method as recited in claim 41 wherein the step of depositing said mask further comprises depositing a stamp mask, depositing a laminated film-mask, depositing a vacuum mask, or magnetically held mask.”**

Yamazaki’s encapsulation methods as modified to use Fujimori’s magnetic masking approach would entail *depositing a ... magnetically held mask*. As discussed for Element 41[b] above, Fujimori teaches that its mask is adhered to the underlying substrate by magnetic force. *See* Fujimori, [Abstract], [0009], [0030], [0037]. Ex.1003, ¶156.

3. **Claim 43: “The method as recited in claim 41 wherein the step of depositing said mask further comprises depositing said mask such that said mask is in contact with said substrate.”**

Yamazaki’s encapsulation methods as modified to use Fujimori’s magnetic masking approach would entail *depositing said mask* (Fujimori’s mask) *such that said mask is in contact with said substrate*, as shown below.

Fig.11

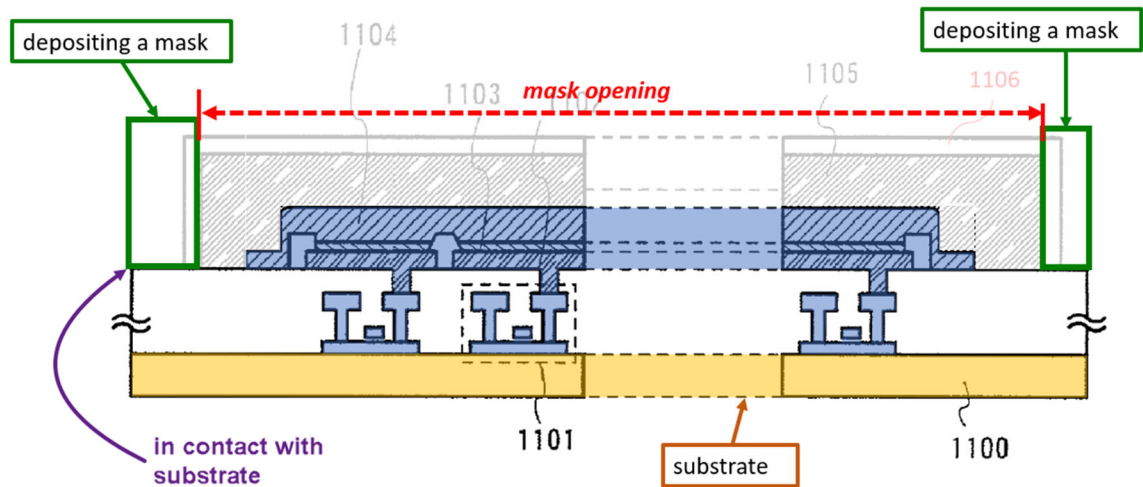
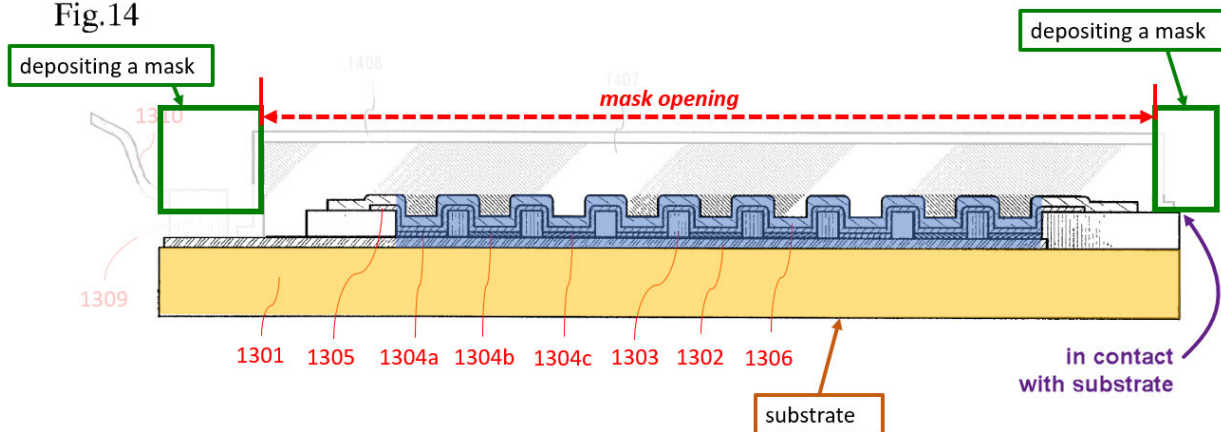


Fig.14



Yamazaki, Figs. 11 and 14 (annotated).

As discussed for Element 41[b] above, Fujimori teaches that its mask is adhered to the underlying substrate by magnetic force. See Fujimori, [0030], [Abstract]. Fujimori explains that the mask is “*attached to a substrate with magnetic force,*” *id.*, [0010], and that one of Fujimori’s “object[s]” is “to provide a method to achieve adequate *adhesion between the mask and the substrate,*” *id.*, [0009]; see also *id.*, [0030] (“[W]hen the mask is affixed with *mechanical contact*”). These

disclosures indicate that the mask is in contact with the underlying substrate. Ex.1003, ¶158.

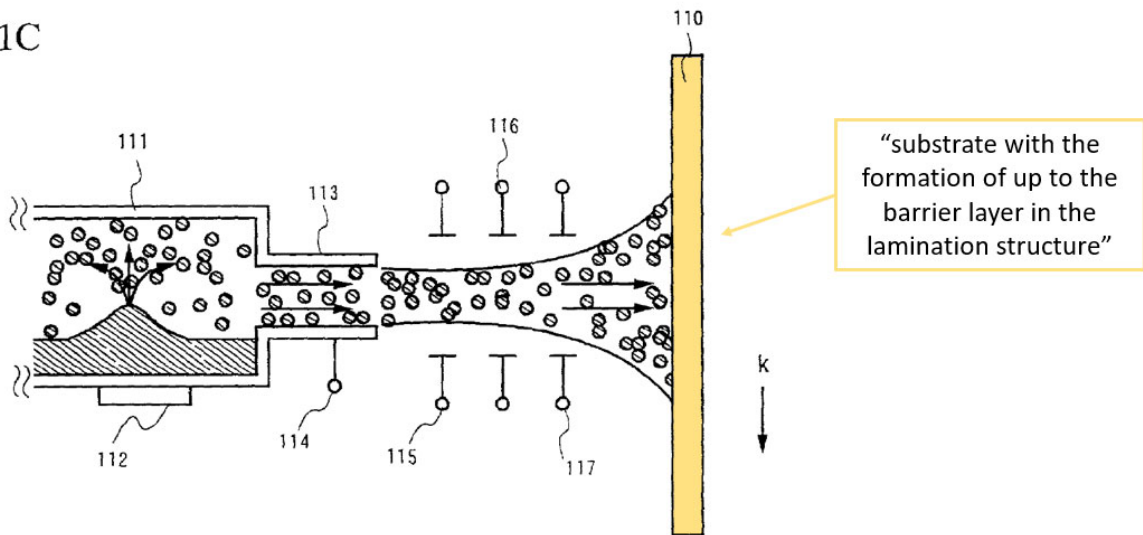
Additionally, Fujimori addresses the need “to prevent the mask from damaging the organic layer and the like deposited on the substrate when the manufacturing surface of the organic electroluminescent element and the mask are adhered to each other,” Fujimori, [0038], explaining that this function can be achieved by “coating the entire surface of the mask with a relatively flexible material such as a resin,” *id.*, [0039]. These disclosures underscore that the mask is physically adhered to the underlying substrate—that is, the coating is used to prevent damage that would occur due to the mask being *in contact* with the substrate. Ex.1003, ¶159.

Further, the mask is “in contact” with the Yamazaki substrate in a manner consistent with the ’389 patent’s disclosure, even if it is not in immediate contact with Yamazaki’s bottom-most “substrate 1100” or “substrate 1301.” The ’389 patent distinguishes masks that are merely above (but not in physical contact with) the underlying layers (e.g., Fig. 5 element 510), with masks that are deposited so as to be *in contact* with the underlying layers (Fig. 6B element 604), and discusses a benefit of the latter approach:

The mask might be such that it could be brought into contact with the OLED sufficiently well so that the encapsulation organic is confined over the desired areas and does not seep under the areas where the encapsulation organic is not desired (e.g. contact pads).

'389 patent, 7:41-46. Fujimori's mask is "brought into contact with the OLED" in this manner, as shown in the annotation above. Similarly, Yamazaki uses "substrate" to encompass not only the base layer but also a "substrate 110" (Yamazaki, [0042]) that "denotes the substrate with the formation of up to the barrier layer in the lamination structure" (*id.*, [0039]) as shown in Figure 1C below. That is, the "substrate" includes the entire "lamination structure" as placed in the deposition chamber.

Fig.1C



Id., Fig. 1C (annotated). Thus, when Fujimori's mask is used in Yamazaki's method, the mask is *in contact with* Yamazaki's substrate. See Ex.1003, ¶¶157-61.

4. **Claim 44: “The method as recited in claim 41 wherein the step of depositing said mask further comprises depositing a mask, said mask comprising a material substantially non-sucking [or non-sticking] to OLED substrate over the areas in between the active areas.”⁷**

Yamazaki’s encapsulation method as modified to use Fujimori’s magnetic masking approach would satisfy the additional requirements of this claim. Fujimori teaches or suggests that the magnetic mask comprises *a material substantially non-sucking [or non-sticking] to OLED substrate over the areas in between the active areas*.

As an initial matter, given that the mask is to be removed from the substrate as discussed for Element 41[d] above, it would have been obvious to use a material that does not stick to the substrate to allow it to be removed without causing damage. Ex.1003, ¶163.

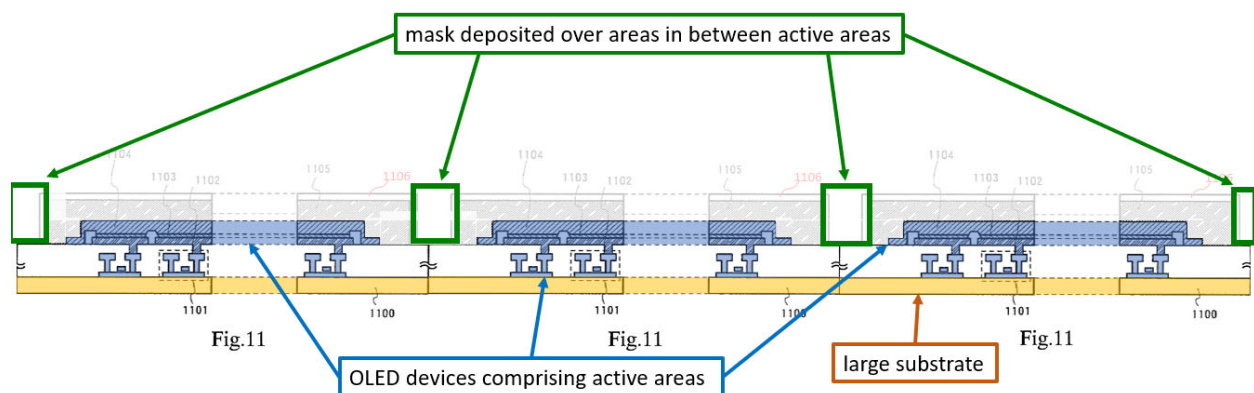
Additionally, as noted for Claim 43 above, Fujimori discloses “coating the entire surface of the mask with a relatively flexible material such as a resin,” Fujimori, [0039], in order “to prevent the mask from damaging the organic layer and the like deposited on the substrate,” *id.*, [0038]. Fujimori also explains that material

⁷ As noted in the claim construction section above, the file history indicates that “non-sucking” reflects a typographical error, since the claim during prosecution instead used the term “non-sticking.”

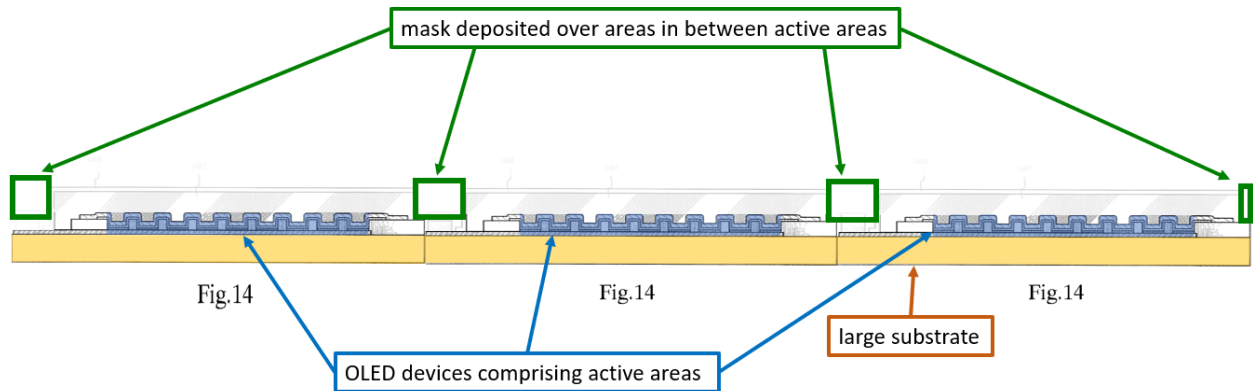
of the mask itself may include “rubber or resin.” *Id.*, [0034]. A POSITA would have understood that the resin should be a material that is *substantially non-sticking* to the substrate in order avoid damaging the substrate when the mask is removed.

The resin would also be a material that is *substantially non-sucking* to the substrate. The '389 patent uses “suck” to refer to magnetic adhesion, *see* '389 patent, 7:48-49 (“magnet ... that ‘sucks’ the mask to the substrate”). A resin is not a material that is fixed by magnetic force and thus does not “suck” in the sense used in the '389 patent.

Finally, a POSITA would understand that Yamazaki’s substrate would be an *OLED substrate* because it is a substrate on which OLED devices are formed. The magnetically held mask would be *over the areas in between* the OLED devices comprising the *active areas* (e.g., areas that emit light), as shown below. Ex.1003, ¶¶162-67.



Yamazaki, Fig. 11 (replicated and annotated).



Id., Fig. 14 (replicated and annotated).

5. **Claim 45:** “The method as recited in claim 41 wherein the step of depositing said mask further comprises depositing a mask, said mask comprising a metal, a ceramic, a plastic, a polymer, PTFE, or poly-siloxane.”

Yamazaki’s encapsulation method as modified to use Fujimori’s magnetic masking approach would satisfy the additional requirements of this claim because Fujimori teaches that the magnetic mask *compris[es] a metal, a plastic, and/or a polymer*.

Specifically, Fujimori teaches that the mask “desirably contains ... at least one of the magnetic elements Fe, Co, and Ni” (all of which are metals) and that “[i]t is favorable to fabricate the mask from [magnetic] materials molded into thin sheets, but it is *also possible to use rubber or resin* mixed with magnetic powder.” Fujimori, [0034]. Additionally, as discussed for Claim 43 above, Fujimori discloses “coating the entire surface of the mask with a relatively flexible material such as a resin.” *Id.*, [0039]. Fujimori thus discloses that the mask *compris[es] a metal* (e.g., Fe, Co, or

Ni), *a plastic* (e.g., resin), and/or *a polymer* (e.g., rubber or resin). Ex.1003, ¶¶168-70.

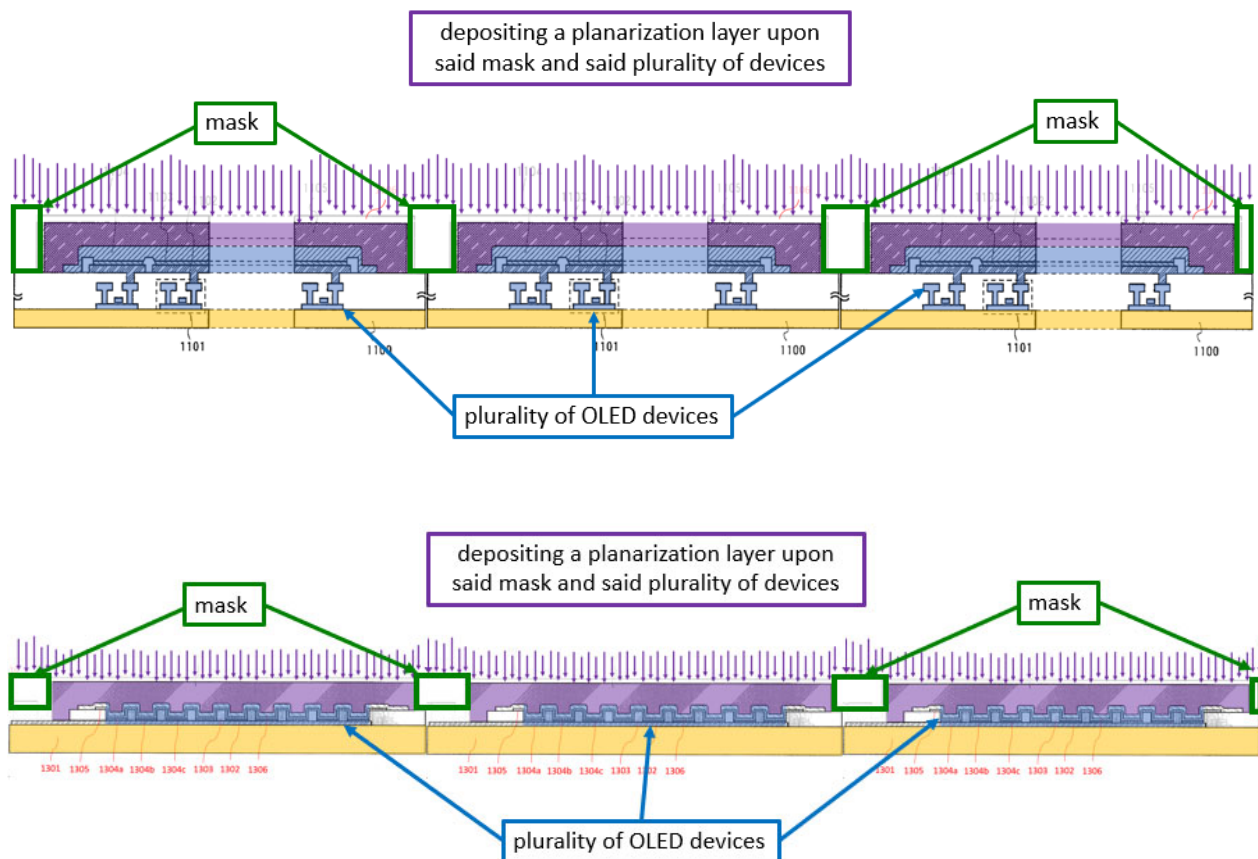
6. Claim 46: “The method as recited in claim 41 wherein the step of depositing at least one planarization layer further comprises depositing an organic layer over the entire mask.”

Yamazaki’s encapsulation method as modified to use Fujimori’s magnetic masking approach would satisfy the additional requirements of this claim, as depositing the *planarization layer* (Yamazaki’s cover layer) in this manner entails *depositing an organic layer over the entire mask*.

First, as explained for claim 37 in Ground I above, Yamazaki discloses that its cover layer is “made of organic material,” specifically an “organic resin film.” Yamazaki, [0011], [0177], [0178], [0202].

Second, as explained for Element 41[c] above, when using Fujimori’s mask with Yamazaki, the organic material for the cover layer is deposited through the mask openings to the underlying OLED devices, as illustrated in the following annotations. *See* Fujimori, [0028] (“Organic material . . . flying toward the substrate in vapor deposition or the like is deposited on the substrate through the mask opening placed in front of the substrate to achieve the [desired] patterning of the organic electroluminescence element corresponding to the mask opening shape.”). A POSITA would have understood this to entail depositing an organic layer over the entire mask (and at a minimum this would be obvious) because the layer would need

to be deposited over the entire mask in order to ensure that the layer is formed on each of the OLED devices. Ex.1003, ¶¶171-73; *see also* Palanisamy, [0022], Fig. 4 (illustrating an approach in which passivation is “spray[ed] ... over the display panel 12,” where a “mask 52 with openings 54 may be utilized to define the regions where passivation may be applied and where it should not be applied”).



Yamazaki, Figs. 11 and 14 (replicated and annotated).

C. Ground III: Claims 34 and 40 Are Obvious Over Weaver

1. Claim 34

- a. Element 34[Pre]: “A method of encapsulating a plurality of devices fabricated upon a substrate, the steps of said method comprising:”**

Weaver discloses this element or at least renders it obvious. Weaver discloses “structures that protect organic optoelectronic devices from the surrounding environment,” Weaver, [0001], and methods for creating such structures, *see id.*, [0057]. Figure 6 below shows an “OLED 140” encapsulated by a “barrier region 150”:

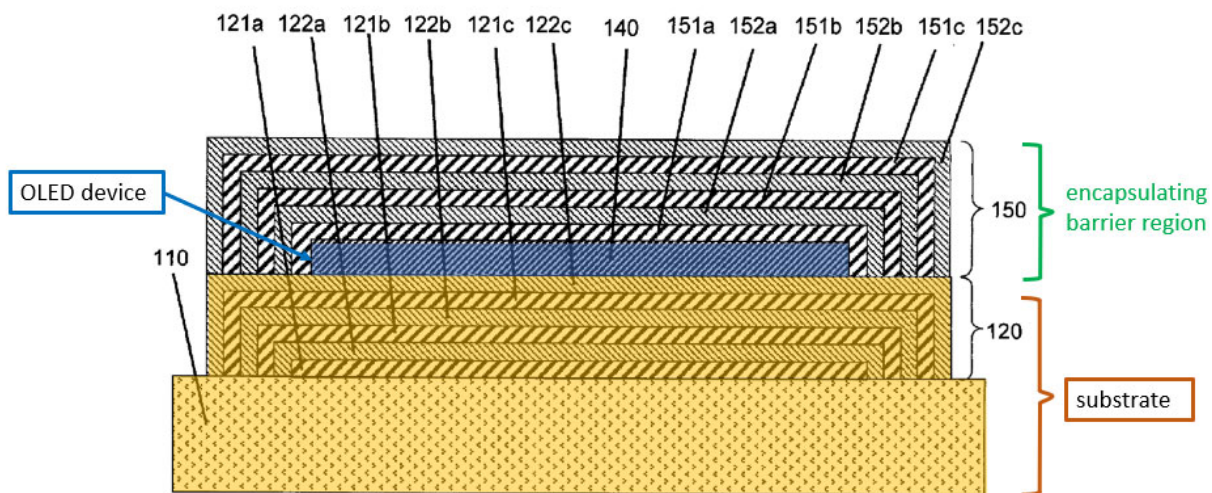


Fig. 6

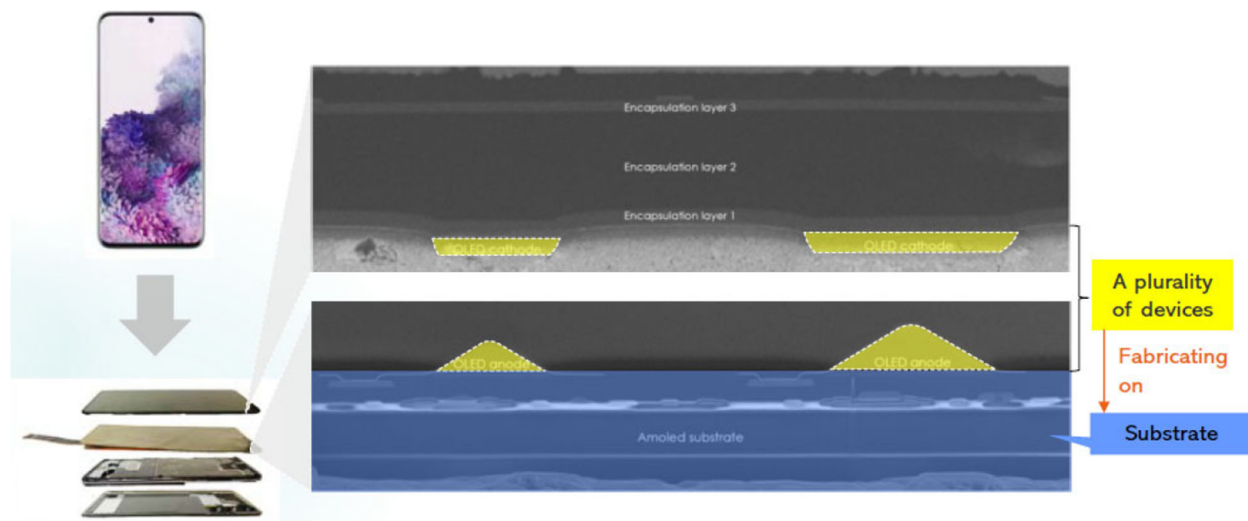
Id., Fig. 6 (annotated). Barrier region 150 comprises “an alternating series of planarizing layers 151a-c and high-density layers 152a-c.” *Id.*, [0052].

This approach forms a protective structure that *encapsulates* a device (OLED 140, blue). As Weaver explains, its barrier regions “provide an effective barrier

between the organic optoelectronic device and the ambient atmosphere, reducing adverse effects due to chemical species ... such as moisture and oxygen.” *Id.*, [0011].

Weaver’s device is *fabricated upon a substrate* (base substrate 110 and a “first barrier region 120,” orange). The ’389 patent describes a substrate as encompassing a structure that “has formed upon its surface several OLED devices,” stating that “this structure is to be construed very broadly.” ’389 patent, 3:45-47. Patent Owner has identified structures encompassing a series of layers as the claimed substrate.⁸ Under this understanding, which Petitioner adopts for purposes of this specific proceeding, Weaver’s OLED 140 is fabricated upon a substrate comprising

⁸ In its district court complaint (Ex. 1019, ¶ 34), Patent Owner asserts that a Galaxy S20 smartphone includes a “plurality of devices on a substrate,” pointing to a substrate as follows:



“substrate layer 110” and the first “barrier region 120”—which Weaver collectively refers to as a “covered substrate,” *id.*, [0028], [0056].

Weaver discloses a method of forming such encapsulating barrier regions based on “[d]eposition of progressively larger cooperative barrier layers” (i.e., alternating planarizing and high-density layers), explaining that “[p]referred techniques are continuous techniques such as web-based processing techniques.” *Id.* at [0057]. To that end, Weaver discloses a web-based approach for depositing the planarizing and high-density layers using “an apparatus 200 containing various rolls,” in which “a web of substrate [] is passed under several deposition sources 221a-c and 222a-c” as illustrated in Figure 8 below. *Id.* at [0057].

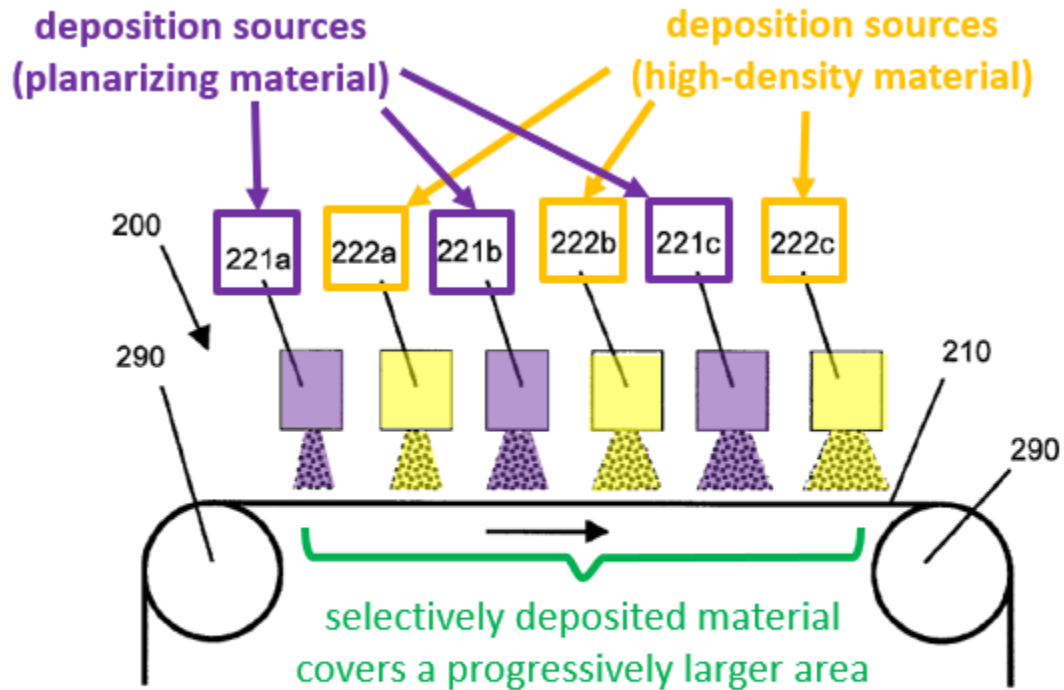


Fig. 8

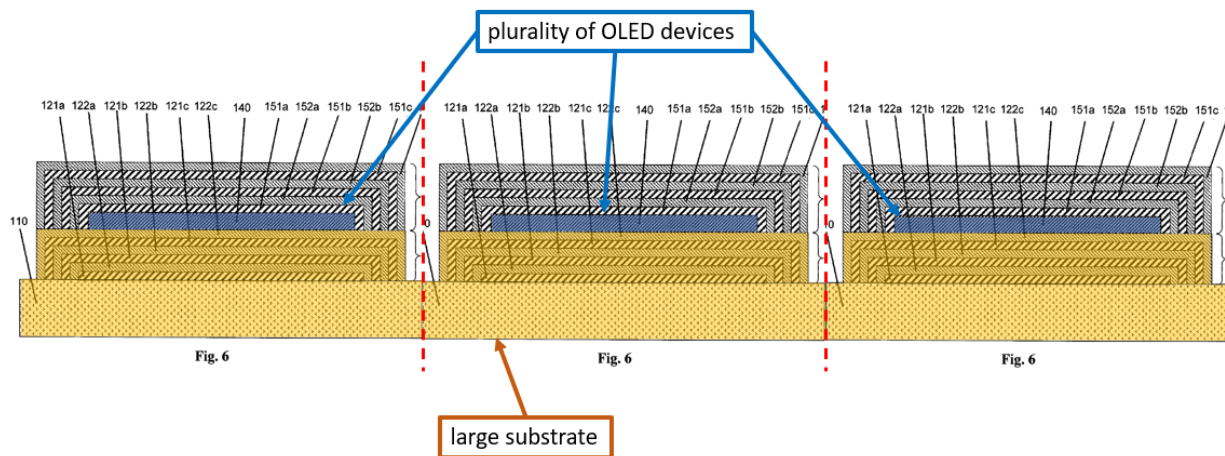
Id., Fig. 8 (annotated).

Weaver further teaches (or at a minimum strongly suggests) using its method for encapsulating a *plurality* of such OLED devices, explaining that such “[c]ontinuous processing techniques, such as web based processing techniques, typically involve the formation of large sheets of material [that] can be subsequently subdivided into sheet sizes appropriate for the final application (e.g., into sheets the size of a computer monitor screen).” *Id.*, [0038]. Accordingly, a POSITA would have understood that Weaver’s web-based manufacturing approach (as illustrated in

Figure 8 above) would involve forming multiple OLEDs on such a web of substrate.

Id., [0057]; Ex.1003, ¶176.

This large sheet can be depicted by laying multiple instances of Figure 6 side-by-side, as shown in the following annotation, in which the red vertical lines indicate where the encapsulated devices would subsequently be subdivided into individual devices:



Id., Fig. 6 (replicated and annotated).

In fact, Weaver explains that its structures are intended to address a problem with such sheet-based manufacturing, in that “cutting a large sheet produces a structure with exposed edges like that shown in FIG. 1a,” reproduced below. *Id.*, [0038].

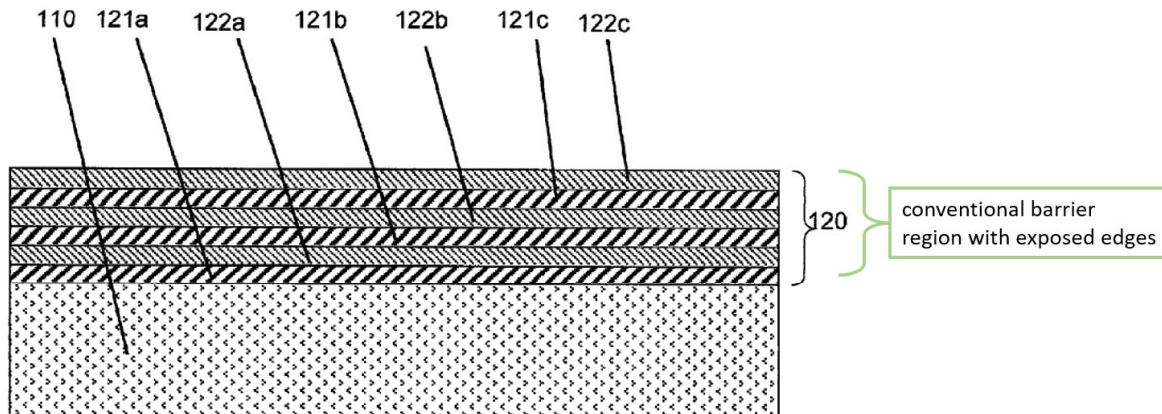


Fig. 1a

Id., Fig. 1a (annotated). “Unfortunately, in exposing the edges of layers 121a-c and 122a-c in the barrier region 120, lateral diffusion of moisture and oxygen, as well as other species, becomes increasingly problematic.” *Id.* “This situation is improved by the structures of the present invention.” *Id.*, [0041]. In Figure 6, for example, the OLED 140 is completely encapsulated by a barrier region 150 with no exposed edges (as shown below), leading to increased protection. *See id.* (“As a result, lateral diffusion of water and oxygen within the planarizing layers 121a-c is reduced ...”).

This discussion underscores that Weaver’s method is used to encapsulate a plurality of devices on a large sheet of material.

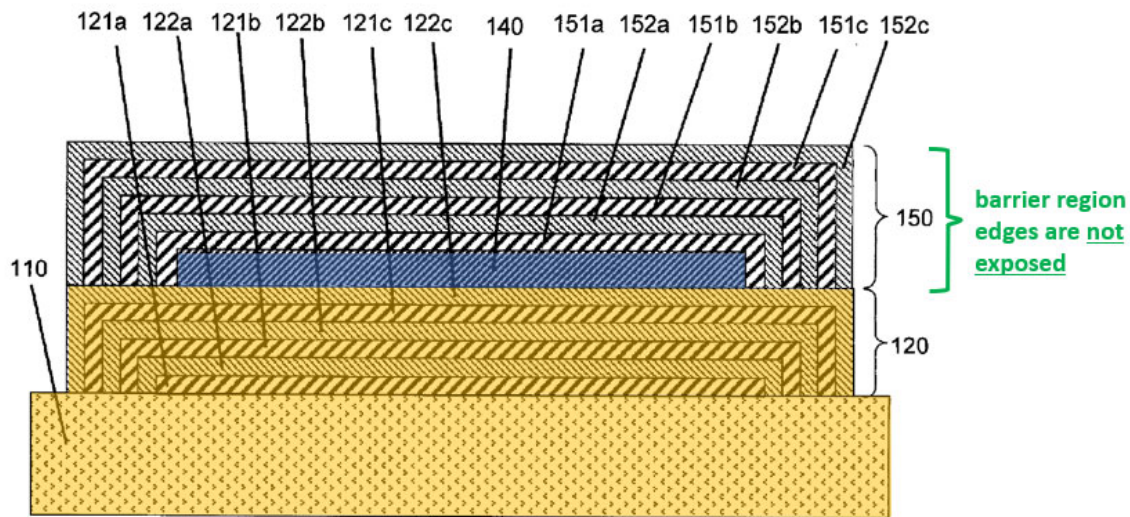


Fig. 6

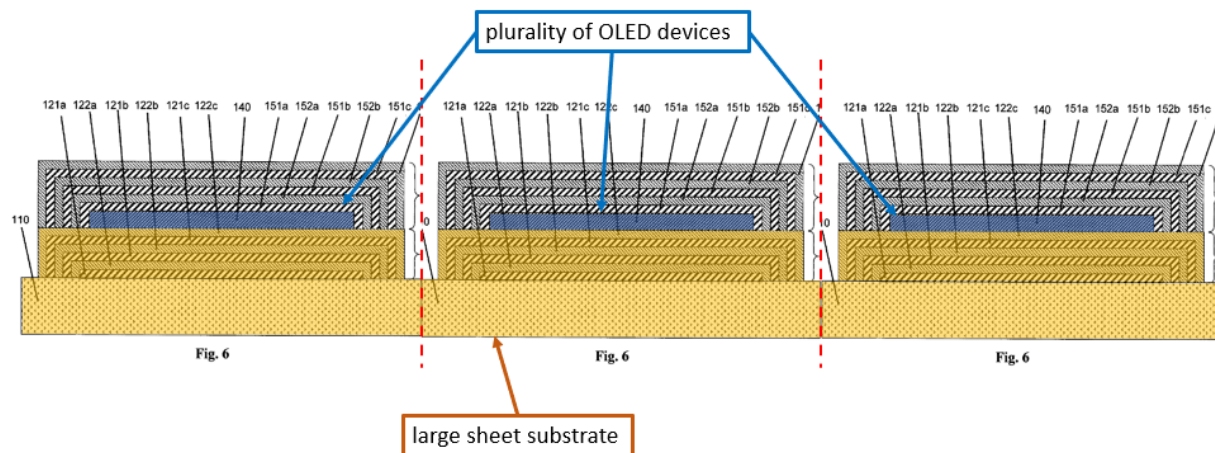
Id., Fig. 6 (annotated).

Weaver's teachings regarding continuous or web-based processing on a large sheet are consistent with the knowledge of a POSITA that flat panel displays were conventionally manufactured in bulk, as explained for Ground I above.

Accordingly, Weaver teaches or suggests that its encapsulation method is used to encapsulate *a plurality of devices*, and at a minimum it would have been obvious to a POSITA to use Weaver's encapsulation method (as illustrated in the Figure 6 embodiment) in such a manner, in order to obtain the known benefits such as reducing costs, increasing throughput, and increasing yield, as explained for Ground I above. Ex.1003, ¶¶174-83.

b. Element 34[a]: “fabricating a plurality of devices on a substrate;”

Weaver discloses this element or at least renders it obvious. As discussed for Element 34[pre] above, Weaver teaches or suggests a method of encapsulating a plurality of OLED devices using a continuous or web-based manufacturing approach. This entails *fabricating a device* (“OLED 140”) *on a substrate* (Weaver’s “substrate 110” along with the initial “barrier region 120”), as illustrated below.



Weaver, Fig. 6 (replicated and annotated).

As explained above for element 34[Pre], under Patent Owner’s understanding of the term “substrate,” which Petitioner adopts for purposes of this proceeding, the entire set of layers underlying Weaver’s OLED device 140—the substrate 110 along with the initial barrier region 120—collectively constitute a “substrate” on which the device is fabricated. Ex.1003, ¶¶184-85.

c. Element 34[b]: “selectively depositing at least one planarization layer upon said devices; and”

Weaver discloses this element or at least renders it obvious. In Figure 6 below, “planarizing layer” 151a (purple) is a *planarization layer* that is *selectively deposited upon said devices* (OLED 140):

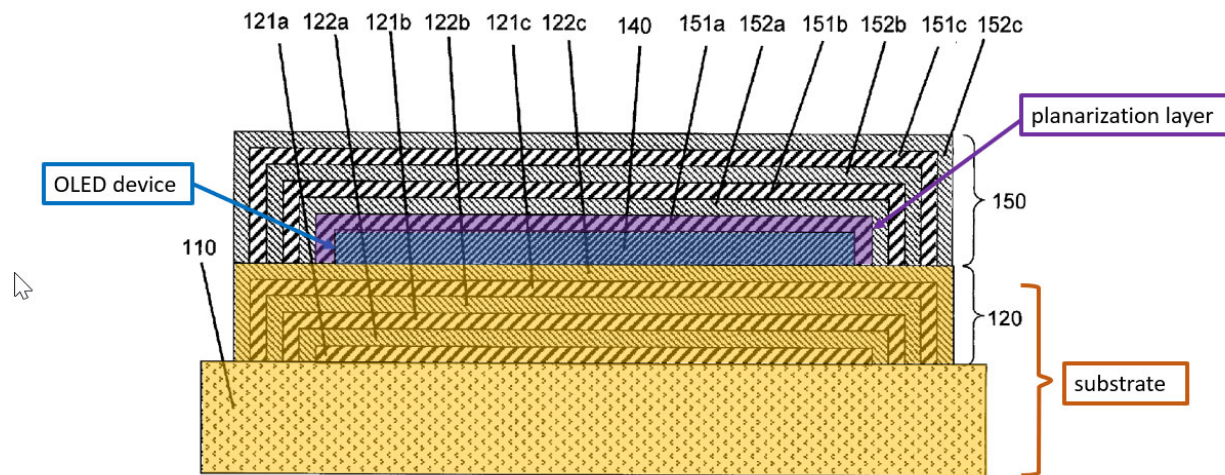


Fig. 6

Weaver, Fig. 6 (annotated), [0052].

This planarizing layer 151a constitutes a *planarization layer* because it is used to form a smooth planar surface. Weaver explains that its “planarizing layers” are made from a “layer of planarizing material,” which “mean[s] a material that forms a smooth planar surface upon application, rather than forming a surface that reflects irregular contours of the underlying surface.” *Id.*, [0035].

Weaver further teaches that planarizing layer 151a is *selectively deposited* upon the OLED 140. The selective deposition is evident from Figure 6, which shows the planarization layer as surrounding the OLED device from the top and sides, but

not extending laterally over the entire surface of the substrate. *See also id.*, [0042] (describing, with respect to Figure 2, that successive planarizing and high-density layers each “completely cover[] an underlying ... layer (i.e., by covering the top of the underlying layer *and extending down the sides of the underlying layer to the substrate*”), *id.*, [0054] (similar discussion for Figure 4).

Weaver further explains that its web-based manufacturing approach utilizes “deposition sources” with “apertures” that are used to selectively deposit its planarizing layers (and high-density layers), as shown below in Figure 8. According to Weaver:

In FIG. 8, ***each deposition source is provided with an aperture*** that is larger than that of the adjacent upstream source ... such that the material being deposited from each source ***progressively covers a wider area*** as the substrate proceeds downstream (i.e., from left to right).

Id., [0057]-[0059].

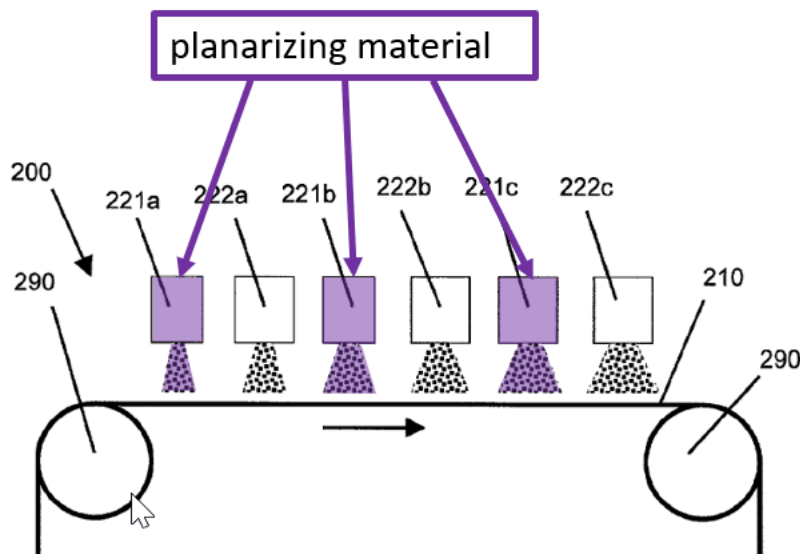
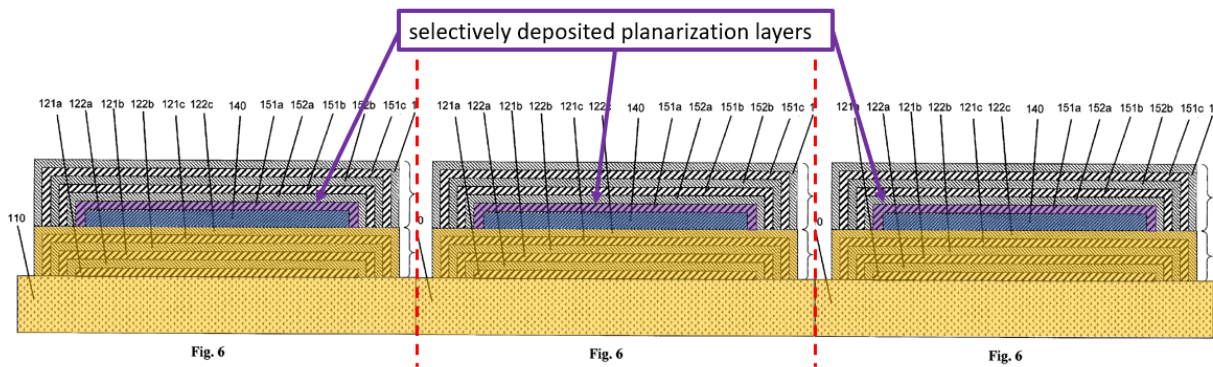


Fig. 8

Id., Fig. 8. That is, Weaver's deposition sources are used for *selectively depositing* the planarizing and high-density layers in specific areas.

Accordingly, Weaver teaches *selectively depositing at least one planarization layer* (i.e., planarizing layer 151a) *upon said devices* (OLED 140), as shown in the below annotation. Ex.1003, ¶¶186-91.



Weaver, Fig. 6 (replicated and annotated).

d. Element 34[c]: “selectively depositing at least one barrier layer over said planarization layer.”

Weaver discloses this element or at least renders it obvious. In Figure 6 below, high-density layer 152a (yellow) is a *barrier layer* that is *selectively deposited over said planarization layer* (planarizing layer 151a).

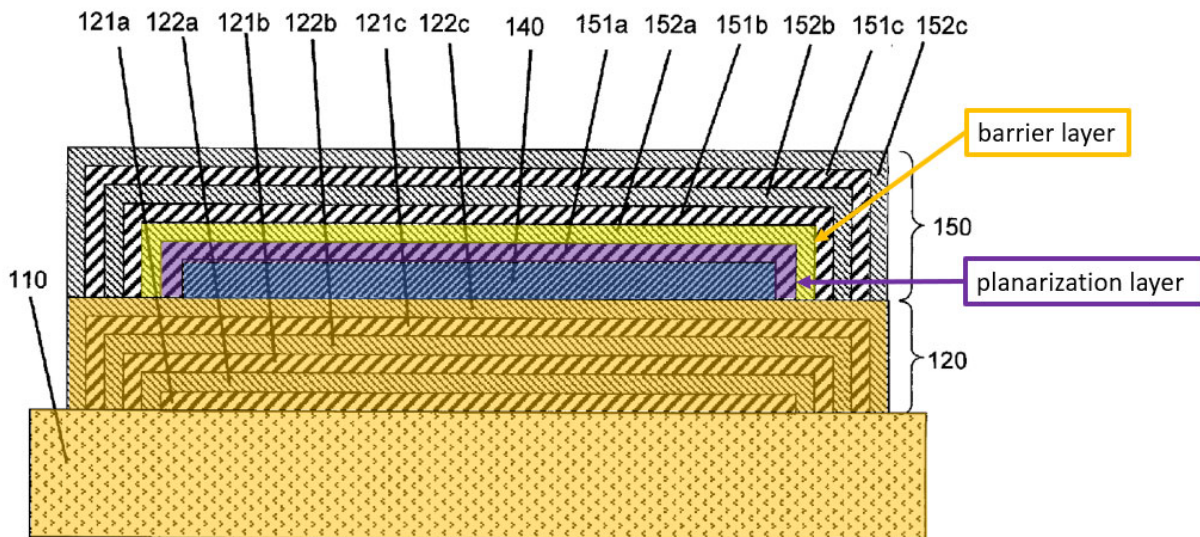


Fig. 6

Weaver, Fig. 6 (annotated).

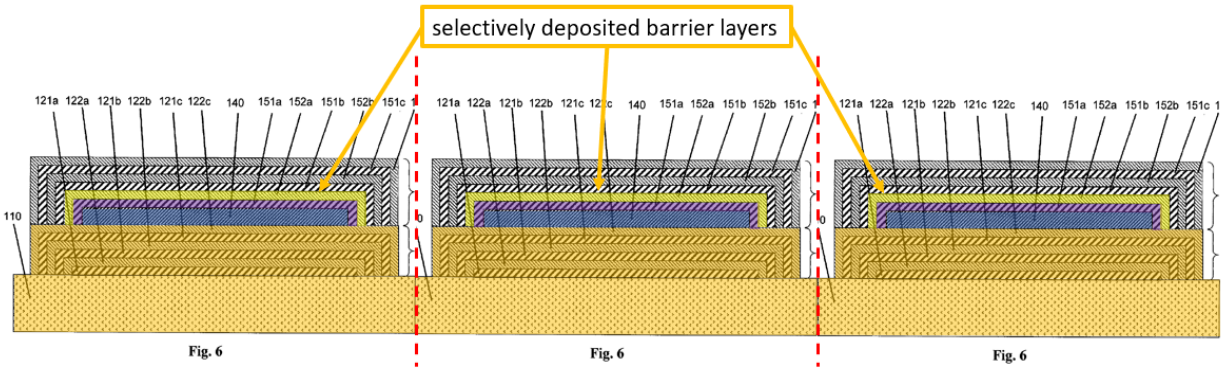
This high-density layer constitutes a *barrier layer* under the '389 patent. Weaver explains that its “high-density layers” are made from a “layer of high-density material,” *id.* [0034], which “mean[s] a material with sufficiently close atomic spacing such that diffusion of outside species, particularly water and oxygen,

are hindered.” *Id.*, [0036].⁹ Therefore, just like “barrier layer 108” in the ’389 patent, the high-density layer “provides the necessary environmental isolation from the corrosive effects of oxygen and moisture.” ’389 patent, 1:19-41.

Weaver further teaches that high-density layer 152a is *selectively deposited* over the planarizing layer 151a. Again, this selective deposition is evident from Figure 6, which shows the high-density layer as surrounding the planarization layer from the top and sides, but not extending laterally over the entire surface of the substrate. Additionally, as discussed above for Element 34[b], Weaver’s web-based manufacturing approach utilizes “deposition sources” with “apertures” that are used to selectively deposit its high-density layers in specific areas.

Accordingly, Weaver teaches *selectively depositing at least one barrier layer* (i.e., high-density layer 152a) *over said planarization layer* (planarizing layer 151a), as shown in the below annotation:

⁹ Although paragraph [0036] references high-density layers 122a-c of Figure 2, this description is equally applicable to the high-density layers 152a-c of the “additional barrier region 150,” which likewise constitute “progressively larger barrier layers.” Weaver, [0052], [0057]; Ex.1003, ¶193,n.8.



Weaver, Fig. 6 (replicated and annotated); Ex.1003, ¶¶192-95.

2. **Claim 40:** “The method as recited in claim 34 wherein the step for selectively depositing at least one barrier layer further comprises depositing by shadow mask, sputtering, ink jet deposition, screen printing [or] evaporation.”

Weaver further satisfies the added requirements of claim 40. As Weaver explains, its high-density layer 152a (i.e., the claimed “barrier layer”) is a layer that “can be applied using techniques known in the art such as *thermal evaporation*, *sputtering*, plasma-enhanced chemical vapor deposition (PECVD) methods and electron-beam techniques.” Weaver, [0036]; Ex.1003, ¶¶196-97.

D. Ground IV: Claims 35 and 36 Are Obvious Over Weaver in View of Palanisamy

1. **Claim 35:** “The method as recited in claim 34 wherein the step for selectively depositing at least one planarization layer further comprises depositing by ink jet of an organic layer.”

This claim is obvious based on Weaver as applied to claim 34 above, in view of Palanisamy. Weaver teaches that its *planarization layer* (planarizing layer 151a)

is formed by *depositing ... an organic layer*. It would have been obvious based on Palanisamy to use *ink jet* to selectively deposit this layer.

First, Weaver discloses that its planarization layers (such as layer 151a) are formed by *depositing ... an organic layer*. Specifically, Weaver teaches that “[p]referred planarizing materials are polymers, such as fluorinated polymers, parylenes, cyclotenes and polyacrylates.” Weaver, [0035]. A POSITA would have appreciated that many polymers, including parylenes, are organic materials. Ex.1003, ¶199.

Second, Weaver discloses an approach for selectively depositing its planarizing layers (and high-density layers), using a series of selective deposition sources, where “each deposition source is provided with an aperture that is larger than that of the adjacent upstream source.” Weaver, [0059]; *see also* Ground III, Element 34[b] above. Weaver does not describe these deposition sources or their apertures in detail, but states that its planarizing layers can be “provided using techniques known in the art.” Weaver, [0035]. Additionally, Weaver explains that the “[d]eposition of progressively larger cooperative barrier layers can be achieved in a number of ways.” *Id.*, [0057].

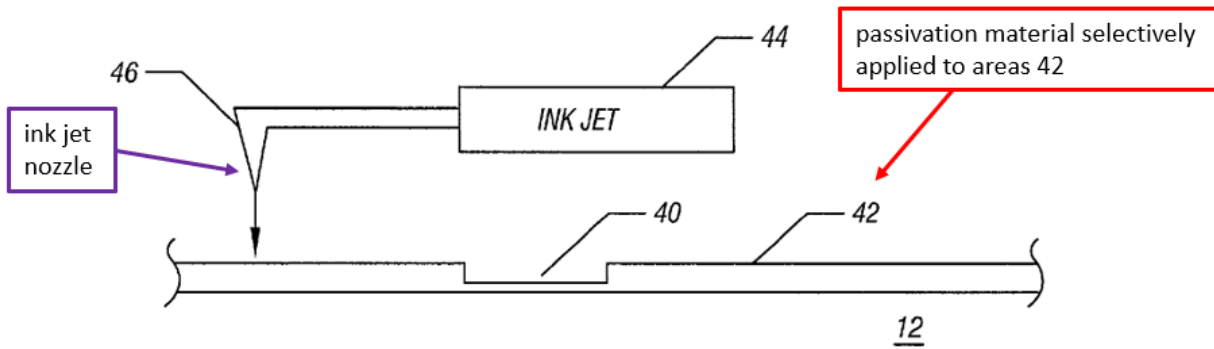
Third, *depositing by ink-jet* was among the “techniques known in the art” for selectively depositing such planarizing layers. *See, e.g.*, Cok (Ex.1021), 10:20-28 (“Patterned deposition can be achieved using ... inkjet method.”). The ’389 patent

acknowledges this: “[i]t will be appreciated” that “many manners” can be used for depositing its organic planarization layer, including “ink-jet printing.” ’389 patent, 4:48-55; *see also id.*, 7:1-5 (“In fact, generally any printing techniques suitable to deliver the desired planarization layer material can be used.”). The ’389 patent further indicates that a POSITA would know how to employ ink jet technology to deposit the planarization layer because the patent does not provide any detail on how to use the ink jet technique. *Id.*, 4:53-55, 7:2-3, 7:14-17. *See Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1379-80 (Fed. Cir. 1986) (information which is well known in the art need not be described in detail in the specification).

Palanisamy specifically teaches the use of “an ink jet printer,” Palanisamy, [0021], which may be used for “selectively applying an organic passivation material to the recently deposited organic light emitting material.” Palanisamy, [Abstract]. Palanisamy describes this technique as follows:

One selective, passivation deposition technique, shown in FIG. 3, involves an inkjet printer 44 to selectively apply passivation to areas 42 while leaving areas 40 over the display panel 20 uncovered. The inkjet printer 44 is capable of applying the passivation material through a nozzle 46 at a very high rate. In this way, passivation may be selectively applied.

Id., [0021].



Id., Fig. 3 (annotated).

Ink jet printing was known to provide specific advantages. For example, ink jet printing is a non-contact deposition technique, and thus minimizes risk of contamination. Ink jet printing is also a directed deposition technique, which limits the amount of waste generated compared to other deposition techniques. Similarly, the technique is conducive to depositing multiple coats, allowing for the deposition of thicker layers. Finally, the technique is scalable, since large numbers of inkjet heads can be ganged together to rapidly print over large areas. *See* Ex.1003, ¶202; *see also* Ex.1016 (describing usefulness of ink-jet technique “for precisely depositing small volumes of materials to form electronic components or component arrays”), 15-16; Sturm, 2:9-62 (discussing advantages of the technique).

Accordingly, a POSITA would have been motivated to use *depositing by ink jet* as taught in Palanisamy to selectively deposit Weaver’s organic planarizing layers (including *planarization layer* 151a). Although other selective deposition techniques have their own benefits, a POSITA would have recognized the benefits

of using the ink jet as taught by Palanisamy—including reduction of contamination risk, efficient use of deposition material, and scalability. At a minimum, a POSITA would have understood from Palanisamy that depositing by ink jet was one of a finite number of predictable solutions for “selectively applying an organic passivation material” for OLEDs, whose materials “are relatively sensitive to moisture, oxygen, and common solvents.” Palanisamy, [0001], [0003].

A POSITA would have had a reasonable expectation of success in using ink jet printing as taught by Palanisamy to selectively deposit Weaver’s planarizing layers. Palanisamy identifies ink jet printing as a method by which an organic passivation layer “may be selectively applied to the areas coated by the OLED while excluding areas where passivation would be undesirable, such as the areas proximate to the contacts.” *Id.*, [0021]. Thus, an ink jet device such as Palanisamy’s ink jet printer 44 with nozzle 46 may be used for selectively depositing the planarizing layers in Weaver’s protective structures. Additionally, a POSITA would have appreciated that ink jet printing may be used as part of a continuous or web-based processing technique as taught in Weaver. For example, an ink jet nozzle may be used in the “deposition sources 221a-c” in Figure 8 of Weaver, in order to selectively deposit Weaver’s planarizing layers (including layer 151a). Weaver, [0059]; Ex.1003, ¶¶198-204.

2. Claim 36: “The method as recited in claim 34 wherein the step for selectively depositing at least one planarization layer further comprises depositing by screen printing of an organic layer or depositing by gas nozzle.”

This claim is obvious based on Weaver as applied to claim 34, in view of Palanisamy. Weaver teaches that its *planarization layer* (planarizing layer 151a) is formed by *depositing ... an organic layer* as discussed for claim 35 above, and it would have been obvious based on Palanisamy to use *screen printing* to selectively deposit this layer.

Weaver discloses an approach for selectively depositing its planarizing layers using a series of selective deposition sources, further stating that that its planarizing layers can be “provided using techniques known in the art,” Weaver, [0035], and that the “[d]eposition of progressively larger cooperative barrier layers can be achieved in a number of ways.” *Id.*, [0057].

Depositing by screen printing was among the “techniques known in the art” for selectively depositing such planarizing layers. *See, e.g.*, Birnstock (Ex.1018), 3905 (discussing benefits of using screen printing to deposit layers, including an organic barrier layer, in passive matrix displays). The ’389 patent acknowledges that “[i]t will be appreciated” that “many manners” can be used for depositing its organic planarization layer, including “screen printing.” ’389 patent, 4:48-55, 7:1-5. The ’389 patent presumes that a POSITA would know how to employ screen printing to

emitting material to air where moisture absorption can occur. The screen printing process is amenable to both liquid and paste passivation materials.

Id., [0025].

Accordingly, it would have been obvious to use *depositing by screen printing* as taught in Palanisamy to selectively deposit Weaver’s organic planarizing layers (including *planarization layer* 151a). Although other selective deposition techniques have their own benefits, a POSITA would have recognized the benefits of using the screen printing technique as taught by Palanisamy—including “rapid processing time” at lower temperatures, and enabling “a range of []material viscosities” to be used for Weaver’s planarizing layer 151a. Palanisamy, [0025]. At a minimum, a POSITA would have understood from Palanisamy that depositing by screen printing was one of a finite number of predictable solutions for “selectively applying an organic passivation material” for OLEDs, whose materials “are relatively sensitive to moisture, oxygen, and common solvents.” *Id.*, [0001], [0003].

A POSITA would have had a reasonable expectation of success in using screen printing as taught by Palanisamy to selectively deposit Weaver’s planarizing layers. Palanisamy identifies screen printing as a method by which an organic passivation layer “may be selectively applied to the areas coated by the OLED while excluding areas where passivation would be undesirable, such as the areas proximate to the contacts.” *Id.*, [0021]. Thus, a screen printing system as illustrated in Figure 5

of Palanisamy may be used for selectively depositing the planarizing layers in Weaver's protective structures. Additionally, a POSITA would appreciate that screen printing may be used as part of a continuous or web-based processing technique as taught in Weaver. For example, a screen printing system may be used for the "deposition sources 221a-c" in Figure 8 of Weaver, in order to selectively deposit Weaver's planarizing layers (including layer 151a). Weaver, [0059]; Ex.1003, ¶¶205-11.

E. Ground V: Claim 37 Is Obvious Over Weaver in View of Burrows

- 1. Claim 37: "The method as recited in claim 34 wherein the step for selectively depositing at least one planarization layer further comprises depositing an organic layer through a shadow mask."**

This claim is obvious based on Weaver as applied to claim 34, in view of Burrows. Weaver teaches that its *planarization layer* (planarizing layer 151a) is formed by *depositing ... an organic layer*, and it would have been obvious based on Burrows to selectively deposit this layer *through a shadow mask*.

First, Weaver discloses that its planarizing layers (such as layer 151a) are formed by *depositing an organic layer* as discussed for claim 35 above.

Second, Weaver discloses an approach for selectively depositing its cooperative barrier layers (i.e., the planarizing and high-density layers), using a series of selective deposition sources, where "each deposition source is provided with an aperture that is larger than that of the adjacent upstream source." Weaver,

[0059]; *see also* Ground III, Element 34[b] above. Weaver does not describe these deposition sources in detail, but this use of deposition “apertures” is at least similar to the shadow masking approach. *See* Ex.1003, ¶214; Burrows-631 (Ex.1022), 1:22-26 (“A ‘shadow’ mask is a mask having apertures through which material is deposited onto a substrate, as opposed to an optical mask, which is used to selectively expose photoresist on a substrate to radiation.”). Weaver further states that its planarizing layers can be “provided using techniques known in the art, for example, by dipping, spin coating, sputtering, evaporative coating, spraying, flash evaporation, chemical vapor deposition and so forth.” Weaver, [0035].

Third, *depositing ... through a shadow mask* was among the “techniques known in the art” for depositing such planarizing layers. The ’389 patent acknowledges that “[i]t will be appreciated” that “many manners” can be used for depositing its organic planarization layer, including “deposit[ing] through a shadow mask.” ’389 patent, 4:48-55, 7:1-5; *see also* Burrows-631 (Ex.1022), 1:20-22 (“The use of a shadow mask to deposit [] patterned thin films on the substrate is well known in the art.”).

Burrows specifically teaches use of shadow masks for selectively depositing an organic planarization layer, in connection with encapsulation techniques that are very similar to those of Weaver.

Burrows is directed to methods for making an “edge-sealed barrier film” for encapsulating “environmentally sensitive devices,” such as “organic light emitting devices.” Burrows, [Abstract], 5:21-41, 2:27-34. Figure 4 illustrates an approach in which the devices are encapsulated with a series of planarizing “decoupling layers 410” (purple) and “barrier layers 415” (yellow). *Id.*, 5:58-65; *see also id.*, 7:13-16 (explaining that the decoupling layer “provid[es] a surface with significantly improved planarity”). An outer “third barrier layer” 435 seals the barrier stack 440 by surrounding it on the top and sides. *Id.*, 6:11-14.

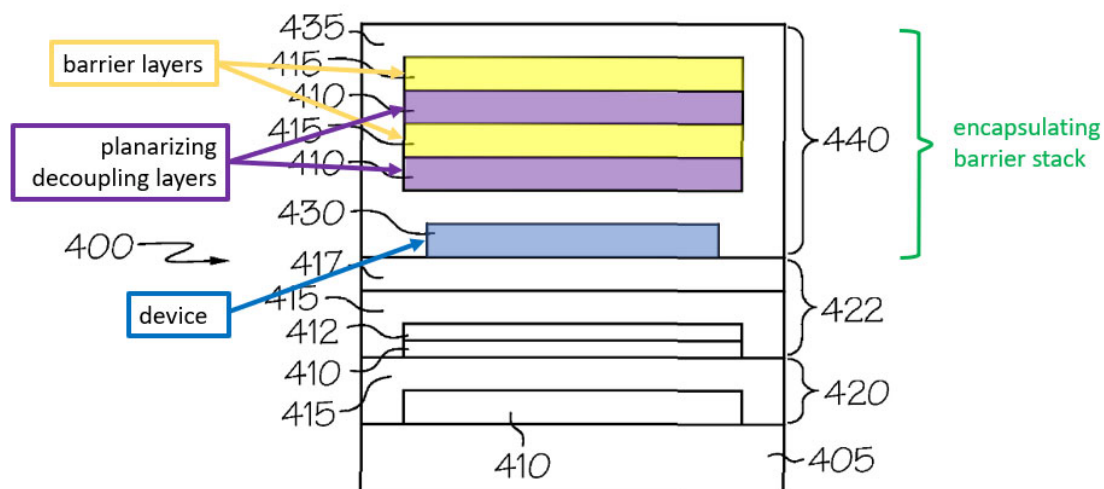
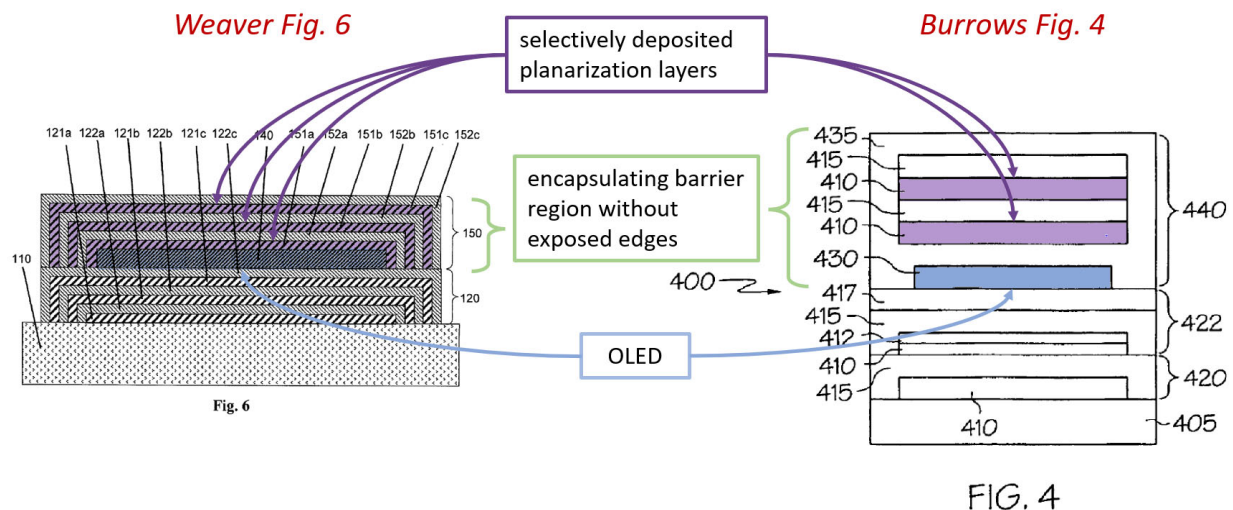


FIG. 4

Id., Fig. 4 (annotated). Accordingly, Burrows, like Weaver, discloses an approach for encapsulating an OLED device using a series of alternating planarization and barrier layers.

Burrows also teaches selectively depositing its planarizing decoupling layer using a “mask ... [that] limits the deposition of the decoupling layer to an area which is smaller than, and contained within, the area covered by the barrier layer.” Burrows, 7:49-58. As in Weaver, this selective deposition ensures that the sides of the device are fully sealed by the barrier layer—thereby avoiding the problem of exposed edges, as illustrated below. *Cf.* Burrows. 4:33-36 (“Because the [planarizing] decoupling layers 210 are sealed within the area covered by the barrier layers 215, ambient moisture, oxygen, and other contaminants cannot diffuse through the decoupling layers to the environmentally sensitive device.”), *with* Weaver, [0041] (“[E]ach planarizing layer 121a-c is separated from the outside environment by at least one high-density [barrier] layer 122a-c. As a result, lateral diffusion of water and oxygen within the planarizing layers 121a-c is reduced ...”).



Weaver, Fig. 6 (annotated); Burrows, Fig. 4 (annotated)

Burrows also specifically teaches the use of “*shadow masks*” for depositing its planarizing decoupling layers, and discloses using this approach to encapsulate a plurality of devices formed on a large substrate:

In order to encapsulate ***multiple small environmentally sensitive devices*** contained on a single large motherglass, the decoupling material *may be deposited through multiple openings in a single shadow mask, or through multiple shadow masks*. This allows the motherglass to be subsequently diced into individual environmentally sensitive devices, each of which is edge sealed.

For example, the mask may be in the form of a rectangle with the center removed (like a picture frame). ***The decoupling material is then deposited through the opening in the mask***. The layer of decoupling material formed in this way will cover an area less than the area covered by the layer of barrier material. ***This type of mask can be used in either a batch process or a roll coating process*** operated in a step and repeat mode.

Burrows, 7:59-8:10.

Accordingly, it would have been obvious to use shadow masks to selectively deposit Weaver’s cooperative barrier layers, including planarizing layer 151a (the claimed *planarization layer*). Shadow masks would have been a straightforward way to implement Weaver’s selective deposition sources. *See* Weaver, [0059], Fig. 8. A POSITA would have appreciated that a series of shadow masks may be used (as taught by Burrows), wherein the respective mask openings correspond to the

“apertures” discussed in Weaver. Ex.1003, ¶220. Indeed, Burrows teaches the use of shadow masks in a similar “roll coating process” that utilizes “decoupling material deposition stations,” Burrows, 8:33-34 and “barrier deposition stations,” *id.*, 8:43-45. Such masks can be used in a “step and repeat mode,” as taught by Burrows, as part of Weaver’s continuous processing technique for encapsulating a plurality of OLED devices as shown in Figure 8. *Id.* In doing so, a POSITA would have appreciated that using shadow masks having progressively larger “openings” or “apertures” would result in “the material being deposited from each source progressively cover[ing] a wide area as the substrate proceeds downstream” as taught in Weaver. *Id.*; Weaver, [0059]. Doing so would have constituted the application of known techniques (e.g., encapsulating an OLED device using Burrow’s shadow masks, equipped with openings, in step-and-repeat mode) to a known device ready for improvement (e.g., Weaver’s Figure 8 apparatus for web-based processing of OLED devices, which already contemplates that each deposition source be “provided with an aperture that is larger than the of the upstream source”) to yield predictable results (selective “[d]eposition of progressively larger cooperative barrier layers”—which Weaver concedes “can be achieved in a number of ways”—and in turn, protection against lateral diffusion by moisture, oxygen, or other contaminants). Ex.1003, ¶221.

A POSITA would further have been motivated to use this approach because using a shadow mask allows precise control of the positions on the substrate where the planarizing layers are formed. In addition, a shadow mask can be used in conjunction with other processes for depositing a layer of liquid material, such as flash evaporation. Ex.1003, ¶¶212-23.

IX. DISCRETIONARY DENIAL IS INAPPROPRIATE UNDER *FINTIV*

The Board should decline to exercise its discretion to deny institution under 35 U.S.C. § 314(a) and *Apple Inc. v. Fintiv, Inc.*, IPR2020-0019, Paper 11 (P.T.A.B. Mar. 20, 2020) (precedential). While the '389 patent is asserted in *Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd., et al.*, Case No. 2:23-cv-00495 (E.D. Tex.) (the “-495 matter”) and *Pictiva Displays International Ltd. v. Samsung Electronics Co., Ltd.*, Case No. 2:24-cv-00532 (E.D. Tex.) (the “-532 matter”), those cases remain in a very early stage.

In the -495 matter, in which Pictiva previously sued the same two Defendants, infringement contentions were served on March 11, 2024. The court issued its initial scheduling order on April 17, 2024, scheduling a trial for August 2025. *See* Ex.1029 (Docket Control Order).

Accordingly, the parties have made no material investments in the parallel litigation. Discovery has only just begun in the -495 matter; the deadline to substantially complete document production is December 24, 2024. No depositions

have taken place, and the claim construction process has not begun. Additionally, this Petition is being filed approximately five months after the service of infringement contentions in the -495 matter and one month after the filing of the Complaint in the -532 matter, demonstrating that Petitioner has acted with diligence in preparing its patent challenge. Finally, Patent Owner will need to narrow the asserted claims in advance of any trial, *see* Ex.1029 at 1, and Petitioner has challenged claims not asserted by Patent Owner, such that a trial could not resolve all of Petitioner's claim challenges. Discretionary denial is further inappropriate because this Petition presents compelling evidence of unpatentability, for the reasons discussed in Section VIII, above.

X. CONCLUSION

Petitioner respectfully requests *inter partes* review and cancellation of the challenged claims 34-37 and 40-46 of the '389 patent.

Petition for *Inter Partes* Review of U.S. Patent No. 6,949,389

Date: August 12, 2024

Respectfully submitted,

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CERTIFICATION UNDER 37 C.F.R. § 42.24(D)

I certify that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 6,949,389 complies with the type-volume limitation of 37 C.F.R. § 42.24 and contains 13,885 words based on the word count indicated by the word-processing system used to prepare the paper, and excluding those portions exempted by § 42.24(a).

Date: August 12, 2024

/David A. Garr/

David A. Garr (Reg. No. 74,932)

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6 and 42.105, I hereby certify that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 6,949,389 under U.S.C. §§ 311–319 and 37 C.F.R. § 42.100 *et seq.*, together with its supporting exhibits, Power of Attorney, and Explanation of Parallel Petitions, was served by FedEx Priority Overnight, a means at least as fast and reliable as Priority Mail Express®, on the following correspondence address of record for patent owner:

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