

*Samsung Display Co., Ltd.*  
*v.*  
*Pictiva Displays International Ltd.*

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Case Nos. IPR2024-01222 and IPR2024-01223  
U.S. Patent No. 6,949,389

# Petitioner's Demonstratives

December 9, 2025 Oral Hearing

**COVINGTON**

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LOS ANGELES NEW YORK PALO ALTO SAN FRANCISCO SEOUL SHANGHAI WASHINGTON

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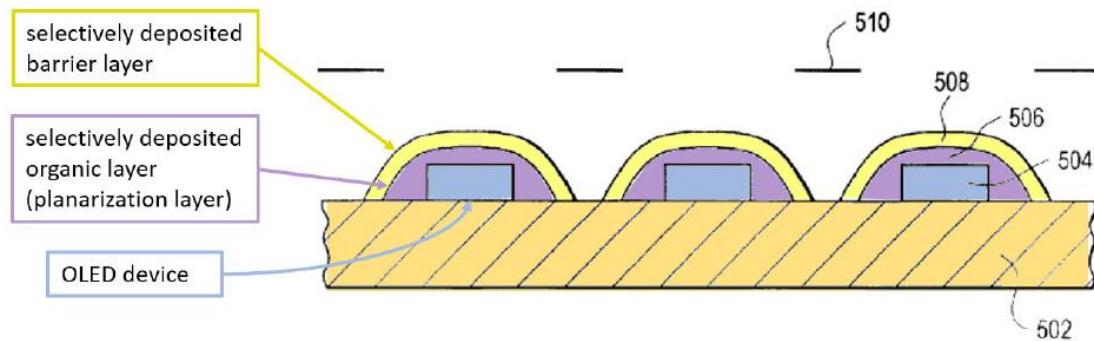


FIG. 5

An embodiment of an encapsulated OLED device is described. This embodiment of the encapsulated OLED device is formed by: fabricating multiple OLED devices on a substrate; depositing at least one planarization layer on the OLED devices; hardening the at least one planarization layer in a patterned manner such that the hardened region substantially covers the OLED device; removing areas of the at least one planarization layer that are not hardened; and selectively depositing at least one barrier layer over the hardened region.

'389 Patent, Fig. 5 (annotated)

'389 Patent, Abstract

# Claims Directed to Methods of “Encapsulating a Plurality of Devices Fabricated Upon a Substrate”

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**34.** A method of encapsulating a plurality of devices fabricated upon a substrate, the steps of said method comprising:

- fabricating a plurality of devices on a substrate;
- selectively depositing at least one planarization layer upon said devices; and
- selectively depositing at least one barrier layer over said planarization layer.

**41.** A method of encapsulating a plurality of devices fabricated upon a substrate, the steps of said method comprising:

- fabricating a plurality of devices on a substrate;
- depositing a mask on top of said substrate, such that mask openings are placed on top of said devices;
- depositing at least one planarization layer upon said mask and said plurality of devices;
- removing said mask from said substrate; and
- selectively depositing at least one barrier layer over said planarization layer.

# Claim Construction

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- “Planarization layer”
  - Patent owner seeks to apply district court construction:
    - *“a layer of material that planarizes such that the propagation of defects from one layer to another layer can be interrupted and the topography of the underlying layer is not reproduced”*
  - Prior art in both petitions teaches “planarization layer” regardless of whether this construction is adopted

# Claim Construction

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- “Selectively depositing”
  - Patent Owner seeks to apply district court construction proposed by defendants (even though Patent Owner “disagrees with that interpretation,” POR, 22):
    - *“depositing a material only in desired areas, such that no additional processing must be performed for removing unwanted material”*
  - District court construed term to mean “depositing a material in desired areas”
  - Prior art in both petitions satisfies “selectively depositing” elements under any construction

# IPR2024-01222 (First Petition)

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

# Instituted Grounds of Unpatentability

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Ground I: Yamazaki in view of Ghosh/AAPA renders obvious claims 34, 35, 37, and 40

Ground II: Yamazaki in view of Ghosh/AAPA and Fujimori renders obvious claims 41, 42, 43, 44, 45

Ground III: Weaver renders obvious claims 34 and 40

Ground IV: Weaver in view of Palanisamy renders obvious claims 35 and 36

Ground V: Weaver in view of Burrows renders obvious claim 37

\* Independent claims underlined.

# Yamazaki and Weaver Disclose Planarization Layers

## Yamazaki's "Cover Layer"

[0178] As a material for forming the cover layer 1105 made of an organic resin, it is appropriate to use a material that has a high degree of hardness, is unlikely to allow substances such as moisture and oxygen to permeate, and has planarity. To be more specific, organic resins such as epoxy resin, acrylic resin, polyimide, polyamide, and silicon resin are preferable. Because the cover layer 1105 is formed using the ink jet method, it can be selectively formed on the pixel portion.

Ex. 1005 (Yamazaki) at ¶[0178]

## Weaver's "Planarizing Layers"

[0052] Polymers can also be provided as planarizing layers in connection with a series of cooperative barrier layers, such as those discussed above in connection with the barrier layer 120. An embodiment of such a structure is shown in FIG. 6, which illustrates an additional barrier region 150 consisting of an alternating series of planarizing layers 151a-c and high-density layers 152a-c. In this embodiment, no adhesive region 130 is used, since sufficient bonding strength between the successive layers exists.

[0035] By "planarizing material" is meant a material that forms a smooth planar surface upon application, rather than forming a surface that reflects irregular contours of the underlying surface. A preferred material is one that, when deposited onto a surface, forms a non-conformal liquid. This could be, for example, a polyacrylate monomer (this material is then subjected to ultraviolet light, crosslinking the monomer to form a polyacrylate). Preferred planarizing

Ex. 1008 (Weaver) at ¶¶ [0052], [0035]

# Conception and Reduction to Practice

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First Petition, Claims 34-37, 40, 41, 46

# Conception Requires “Definite and Permanent Idea” of the Invention

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“Conception is the ‘formation in the mind of the inventor, of a definite and permanent idea of the complete and operative invention...’”

*Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1376 (Fed. Cir. 1986)

# Asserted Conception Evidence

- Patent Owner relies upon 1-page brainstorming discussion to assert conception of certain claims by 2/08/2001
- Theoretical and ongoing discussion insufficient to demonstrate a “definite and permanent idea”

Pichler Karl (ITC)

From: Pichler Karl (ITC)  
Sent: Thursday, February 08, 2001 4:28 PM  
To: Frischknecht Kyle (ITC)  
Cc: Proulx George (ITC); Pakbaz Hash (ITC)  
Subject: RE: Meeting with Dr. John Affinito

Hi Kyle,

YES, I believe there may be a combination technique with spin-coating that I believe should work (also discussed at FED and I have been considering filing a patent for a long time - lack of time). Spin-, roll- or whatever-coat, cross-link/cure and then sputter the dielectric barrier through a mask over the OLED area only, i.e. leave the contact pads, scribe lines, etc. free from the barrier and then stick the whole thing in, for example, a plasma asher and ash-off the organic where there is no dielectric barrier film. I have a patent from CDT-time (for a completely different purpose) that shows that just a few (say around 10 or more Angstroms) of good sputtered dielectric (e.g. AlOx) act as a perfectly good oxygen plasma ash barrier. Alternatively, I have been thinking if we could deposit the organic liquid layer (via flash-evaporation, spin- or roll-coat or whatever) and then do the UV cross-linking through a mask. The idea is that after this we may be able (don't know if this will work, never tried) to thermally evaporate or somehow spray/wash off the non-cross-linked molecular organic film and then sputter the dielectric also through a mask or alternatively make the contacts first and then sputter the dielectric. In addition, the non-cross-linked organic may be volatile enough so laser ablation becomes perfectly feasible - not sure. This may also have the advantage that the mask-cross-linking should provide a smooth transition from the regions with to those without the organic layer (instead of a sharper step). These are all just 'undeveloped' ideas without really having thought through them in detail to spot serious bottlenecks and certainly I have not done any practical trials whatsoever (other than the thin oxide as ash barrier). Just a note: the reason why I was originally thinking of spinning the layer was that this could very easily added on to e.g. a Satella via a separate spin-chamber without the need to custom-build a flash-evaporator for the organic.

I am looking forward to keep this discussion rolling.  
Charlie

-----Original Message-----

From: Frischknecht Kyle (ITC)  
Sent: Thursday, February 08, 2001 11:26 PM  
To: Pichler Karl (ITC)  
Cc: Proulx George (ITC)  
Subject: RE: Meeting with Dr. John Affinito

Hi Charlie:

I have also previously considered spin coating the acrylate layer; however, I haven't yet thought up a reasonable method for keeping the electrical pins free of the coating. Performing a subsequent laser ablation seems less than optimum. I anticipate that vapor deposition through a shadow mask will keep the pins free of the coating; therefore, I have been quite partial to the vapor deposition method. Also, I am not too sure if scribing through the multilayer is a good idea; therefore, I anticipate that masking the area for the scribe lines will be a good practice. Obviously, photolithography after cathode deposition (for a "lift-off" technique) doesn't look very promising. Although there will certainly be many equipment issues with PML, it very well may be that vapor deposition through a shadow mask is the easiest method for producing an array of small displays on a large plate of glass. If you are really opposed to the vapor/mask method, I guess we could consider printing techniques (Screen/Inkjet), but when you get down to the details, these methods will have their respective equipment issues as well. Any thoughts on masking for spin coating?

Kyle

-----Original Message-----

From: Pichler Karl (ITC)  
Sent: Thursday, February 08, 2001 1:28 AM  
To: Proulx George (ITC); Guenther Ewald; Antoniadis Homer (ITC); Pakbaz Hash (ITC); Frischknecht Kyle (ITC); Larson Otto (ITC); Allemant Pierre-Marc (ITC); Cumpston Brian (ITC); ZT - Wittmann Georg; ZT - Stoessel Matthias  
Subject: RE: Meeting with Dr. John Affinito

Hi all,

Just a small and CONFIDENTIAL point to be aware of in the future should we need it: While working with PML encapsulation at FED (eMagin) I and others there discussed and stressed that LML, i.e. spinning in inert conditions a carefully outgassed cross-linkable solution onto the 8" wafers with subsequent cross-linking and barrier layer sputtering should be perfectly feasible and avoid many equipment issues with PML. I do not know if this was actually tried there after I left and/or if a patent was filed. These discussions happened probably from around mid 1999 onwards.  
Charlie

Ex. 2006 at 1

# Theoretical and Ongoing Discussion Is Not a “Definite and Permanent Idea”



“An idea is definite and permanent when the inventor has a specific, settled idea, a particular solution to the problem at hand, not just a general goal or research plan he hopes to pursue.”

*Burroughs Wellcome Co. v. Barr Labs., Inc.*, 40 F.3d 1223, 1228 (Fed. Cir. 1994)



“[a] ‘preliminary’ statement about a ‘possibility’ or ‘potential use,’ alongside a recommendation for continued work and a ‘report back’ in the future, falls short”

*Dawson v. Dawson*, 710 F.3d 1347, 1353 (Fed. Cir. 2013)

*“I haven’t yet thought up a reasonable method for keeping the electrical pins free of the coating”*

*“we may be able (don’t know if this will work, never tried)”*

*“These are all just ‘undeveloped’ ideas without [sic] really having thought through them in detail to spot serious bottlenecks”*

*“certainly I have not done any practical trials whatsoever”*

*“I am looking forward to keep this discussion rolling.”*

Ex. 2006 at 1

# Patent Owner's Expert Acknowledged that the 2008 Email Chain Lacks Sufficient Detail

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12           Q     And this understanding that you're  
13 providing, is that how you believe a POSITA would  
14 interpret this email as well?

\* \* \*

4           So, but again I use the words "probably"  
5 because there isn't sufficient detail here to  
6 really be exactly sure what it is they're --  
7 they're trying to communicate back and forth.

Ex. 1035 (Humphrey Tr.), 31:12-32:7

8           A     I think those are two of the ideas  
9 that -- that Pichler is discussing. Although  
10 he -- you know, he qualifies all of the -- these  
11 various alternatives by stating these are just  
12 undeveloped ideas, without really having thought  
13 through them in detail.  
14                So I think he's leaving it open to, you  
15 know, continued development to define the -- you  
16 know, an optimal way of selectively depositing  
17 these materials, including the organic  
18 planarization layer.

Ex. 1035 (Humphrey Tr.), 58:22-59:18

# Email Chain Never Discusses Planarization Layer

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- Patent Owner relies upon reference to “PML encapsulation” without further description
- Patent Owner’s position stands in contrast to its analysis of prior art, where it argues layers described as “planarizing” (Weaver) or having “planarity” (Yamazaki) do not constitute “planarization layers”

Ex. 2006 at 1

See Reply at 2-7

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Demonstrative Exhibit – Not Evidence 14

# Email Chain Never Discusses Selectively Depositing Both Layers

YES, I believe there may be a combination technique with spin-coating that I believe should work (also discussed at FED and I have been considering filing a patent for a long time - lack of time). Spin-, roll- or whatever-coat, cross-link/cure and then sputter the dielectric barrier through a mask over the OLED area only, i.e. leave the contact pads, scribe lines, etc. free from the barrier and then stick the whole thing in, for example, a plasma asher and ash-off the organic where there is no dielectric barrier film. I have a patent from CDT-time (for a completely different purpose) that shows that just a few (say around 10 or more Angstroms) of good sputtered dielectric (e.g. AlOx) act as a perfectly good oxygen plasma ash barrier. Alternatively, I have been thinking if we could deposit the organic liquid layer (via flash-evaporation, spin- or roll-coat or whatever) and then do the UV cross-linking through a mask. The idea is that after this we may be able (don't know if this will work, never tried) to thermally evaporate or somehow spray/wash off the non-cross-linked molecular organic film and then sputter the dielectric also through a mask or alternatively make the contacts first and then sputter the dielectric. In addition, the non-cross-linked organic may be volatile enough so laser ablation becomes perfectly feasible - not sure. This may also have the advantage that the mask-cross-linking should provide a smooth transition from the regions with to those without the organic layer (instead of a sharper step). These are all just 'undeveloped' ideas without really having thought through them in detail to spot serious bottlenecks and certainly I have not done any practical trials whatsoever (other than the thin oxide as ash barrier). Just a note: the reason why I was originally thinking of spinning the layer was that this could very easily added on to e.g. a Satella via a separate spin-chamber without the need to custom-build a flash-evaporator for the organic.

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Pichler: selective deposition of dielectric barrier but not organic layer

Frischknecht: selective deposition of organic layer but not dielectric barrier

Ex. 2006 at 1

# Frischknecht Proposal

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Kyle

- Patent Owner argues that this message describes “selectively depositing an organic planarization layer of the PML, even though the term ‘planarization layer’ does not appear” (POR at 7)

Ex. 2006 at 1

# Pichler Counter-Proposal

## Pichler Karl (ITC)

**From:** Pichler Karl (ITC)  
**Sent:** Thursday, February 08, 2001 4:28 PM  
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Charlie

Ex. 1027 at 1

- Patent Owner argues that Pichler's message describes "selectively depositing the barrier layer over the planarization layer by sputtering the barrier layer through a mask to selected areas" (POR at 7)
- Mr. Humphrey admitted that Pichler's message does not describe selective deposition of the organic layer under the construction that Patent Owner seeks to apply (Reply at 6-7)

# Lack of Diligence in Reducing to Practice

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170. After the February 8, 2001 email exchange, Inventor Pichler continued to work on improving the encapsulation process, including by sketching out additional thoughts about ink-jetting processes on August 14 and 15, 2001. EX2006 at 40–41. As part of the invention disclosure process, he fleshed out the inventive ideas with detailed description, drawings and proposed claims on September 30, 2001. *Id.* at 8, 14–38. He further developed the invention on October 1 with drawings of Figure 6. *Id.* at 8.

Ex. 2046 (Humphrey Dec.) at ¶ 170

- No corroborating evidence of activity between February 2001 email and August 2001

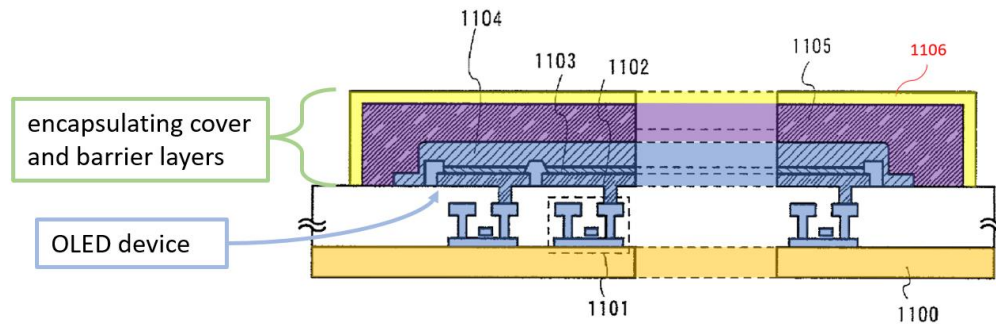
# Ground I – Yamazaki in View of Ghosh/AAPA

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First Petition, Claims 34, 35, 37, and 40

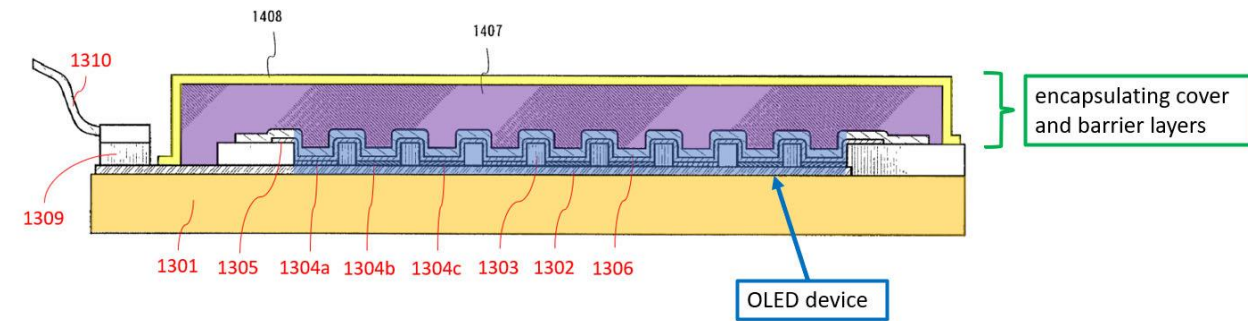
# Yamazaki Teaches Encapsulating an OLED Device via Selectively Deposited Cover and Barrier Layers

Fig.11



Ex. 1005 (Yamazaki) Fig. 11 (annotated)

Fig.14



Ex. 1005 (Yamazaki) Fig. 14 (annotated)

# Yamazaki's Cover Layer Is a "Planarization Layer"

Fig.11

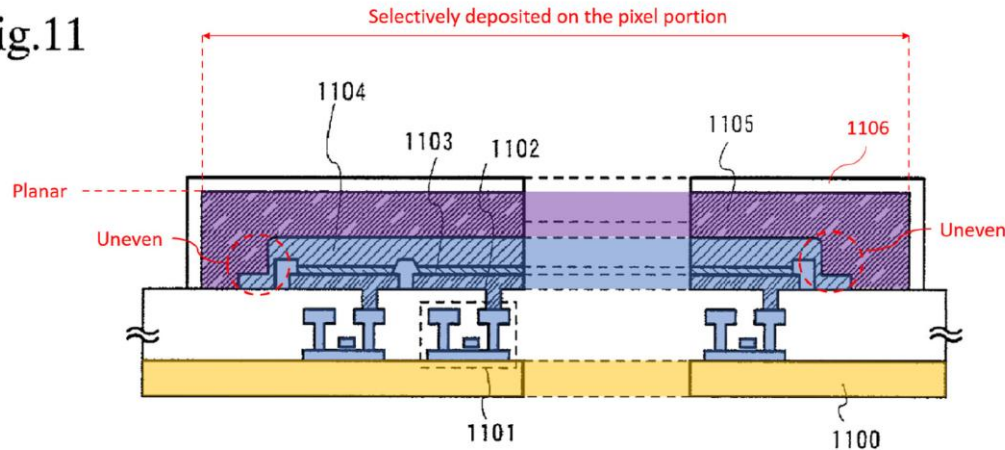
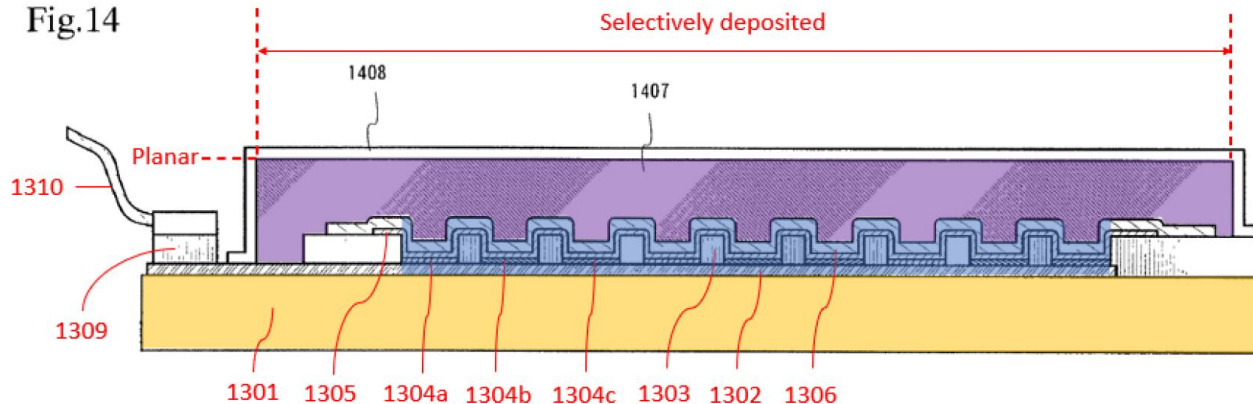


Fig.14



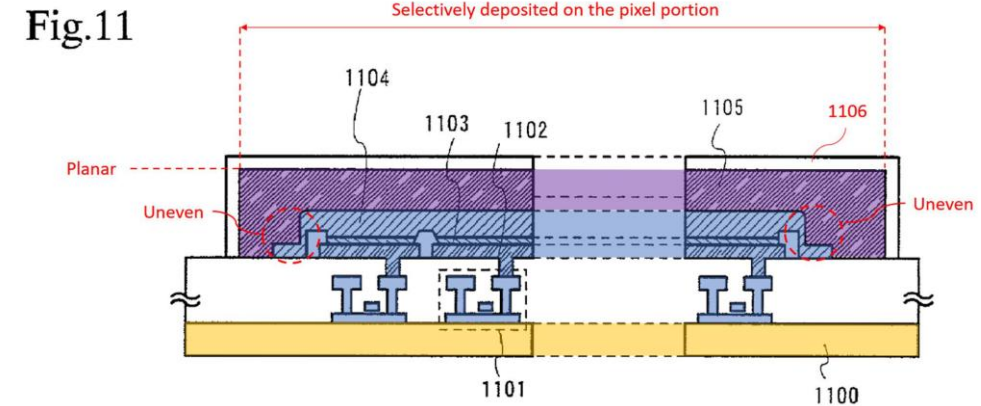
Ex. 1005 (Yamazaki) Figs. 11, 14 (annotated)

[0178] As a material for forming the cover layer 1105 made of an organic resin, it is appropriate to use a material that has a high degree of hardness, is unlikely to allow substances such as moisture and oxygen to permeate, and has planarity. To be more specific, organic resins such as epoxy resin, acrylic resin, polyimide, polyamide, and silicon resin are preferable. Because the cover layer 1105 is formed using the ink jet method, it can be selectively formed on the pixel portion.

Ex. 1005 (Yamazaki) at ¶[0178]

# Yamazaki's Cover Layer Satisfies District Court Construction of "Planarization Layer"

- First, Yamazaki shows that its cover layer "planarizes such that...the topography of the underlying layer is not reproduced"



Ex. 1005 (Yamazaki) Fig. 11 (annotated)

[0178] As a material for forming the cover layer 1105 made of an organic resin, it is appropriate to use a material that has a high degree of hardness, is unlikely to allow substances such as moisture and oxygen to permeate, and has planarity. To be more specific, organic resins such as epoxy resin, acrylic resin, polyimide, polyamide, and silicon resin are preferable. Because the cover layer 1105 is formed using the ink jet method, it can be selectively formed on the pixel portion.

Ex. 1005 (Yamazaki) at ¶[0178]

# Yamazaki's Cover Layer Satisfies District Court Construction of "Planarization Layer"

- Second, a POSITA would appreciate that Yamazaki's cover layer "planarizes such that the propagation of defects from one layer to another layer can be interrupted"
- It was known that defects are inevitably formed on OLED devices, and that an organic layer (like Yamazaki's cover) may be used to make a smooth surface

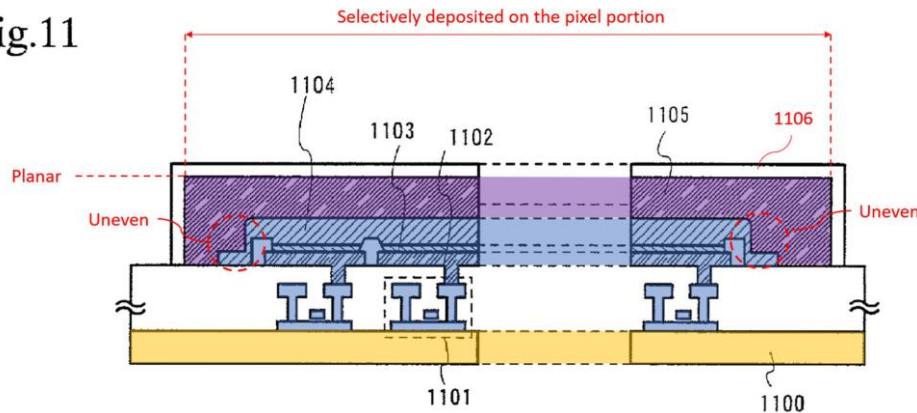
In the practice of the invention, a protective or sealing layer P is formed to cover the unit U therewith as shown in FIG. 1. The protective layer P includes two layers including an organic barrier layer 20 covering defects or pinholes inevitably formed particularly in the uppermost cathode layer 18, and an inorganic barrier layer 22. It will be noted that defects are mainly caused by foreign matter inevitably deposited on the electroluminescent unit U during the course of the fabrication thereof under very severely controlled conditions.

The organic barrier layer 20, which exhibits good affinity for the metal or alloy cathode, covers defects in the electroluminescent unit U therewith and makes a smooth surface on the relatively irregular surface of the cathode 18. Then, the inorganic barrier layer 22 is formed on the smooth surface of the organic barrier layer 20, thus ensuring the formation of the layer 22, which is substantially defect-free and dense. The thus formed double-layer structure can remarkably contribute to moisture proofing.

Ex. 1012 (Suzuki) at 5:49-67

# Dr. Subramanian Explains that Yamazaki's Cover Layer Would Be Made Sufficiently Thick

Fig.11



Ex. 1005 (Yamazaki) Fig. 11 (annotated)

application. That Suzuki used a thicker barrier layer does not mean that Yamazaki's cover layer is insufficient for its application. I also disagree with Mr. Humphrey's assertion that 500 nm is the minimum thickness required to interrupt defect propagation in all applications. This appears to be again based on Suzuki's stated preference for its barrier layer to be that thick. However, a POSITA would understand that different thicknesses may be appropriate depending on the materials and application at issue. Indeed, Yamazaki further teaches that its cover layer may be made thicker than the stated range. See, e.g., Yamazaki, [0090] ("it is possible to make the film thickness thereof thicker than the above stated range by repeating the application and drying processes."). It would have been well within the skill of a POSITA to repeat the application in this manner to form a thicker layer. Thus, at a minimum it would have been obvious to a POSITA to make the cover layer thick enough to prevent defect propagation, consistent with Yamazaki's teachings regarding the use of a material that "has planarity" for that reason. See, e.g., Yamazaki, [0178].

Ex. 1032 (Subramanian Dec.) ¶ 15

# Mr. Humphrey's Testimony Further Supports that Yamazaki's PML Includes a Planarization Layer

12 | A I think the Yamazaki disclosure satisfies  
13 | the broad definition of a PML structure.

Ex. 1035 (Humphrey Tr.) 108:11-13

22 | Q Does the -- do all PMLs include a  
1 | planarization layer that meets the construction in  
2 | Paragraph 19?

3 | MS. ZHONG: Objection. Form.

4 | A In conception I believe yes.

5 | Q Why is that?

6 | A Because that is known to be a function of  
7 | polymer multilayers, and in relation to thin-film  
8 | encapsulation.

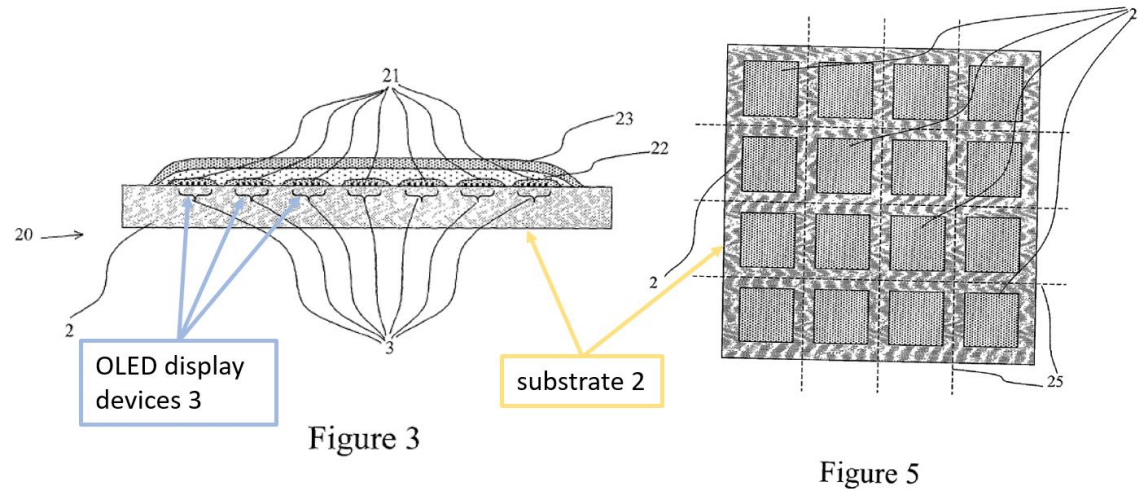
Ex. 1035 (Humphrey Tr.) 82:22-83:8

Of late, there has been some discussion in the art to provide a cheaper and better manner of encapsulation, called “direct thin-film” encapsulation. In this manner, thin film encapsulation is typically described as a “polymer multi-layer” (PML) comprising alternating and repeating layers of an organic (usually acrylate or the like) and a barrier layer. FIG. 1 depicts a typical PML structure **100** as is currently known in the art. A glass (or other suitable material) substrate **102** provides the support structure for OLED structure **104** formed on top of substrate **102** in any manner known in the art. Layers **102** and **104** form typically the structure that requires encapsulation—either by known techniques or by the encapsulation techniques of the present invention.

Typically, for PML structures, a planarization layer **106** is formed on top of OLED structure **104**. Planarization layer **106** typically is an organic layer (e.g. acrylate or the like) and is provided to give a planar surface for the deposition of the PML structure **112a**. PML structure **112a** typically comprises barrier layer **108** and another planarization layer **110**.

’389 Patent, 1:17-36

# Undisputed that Batch Manufacture of OLEDs Was Well-Known



Ex. 1006 (Ghosh) Figs. 3, 5 (annotated)

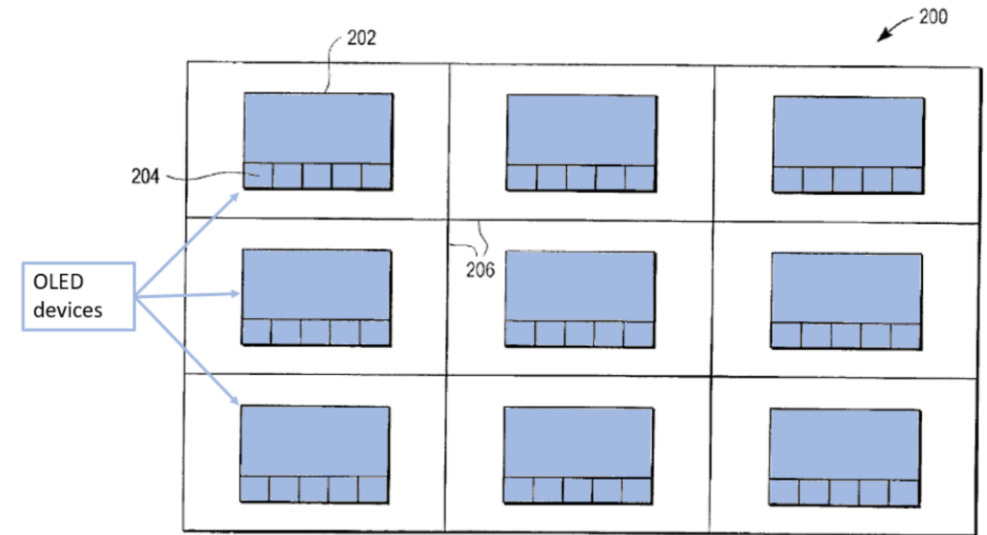
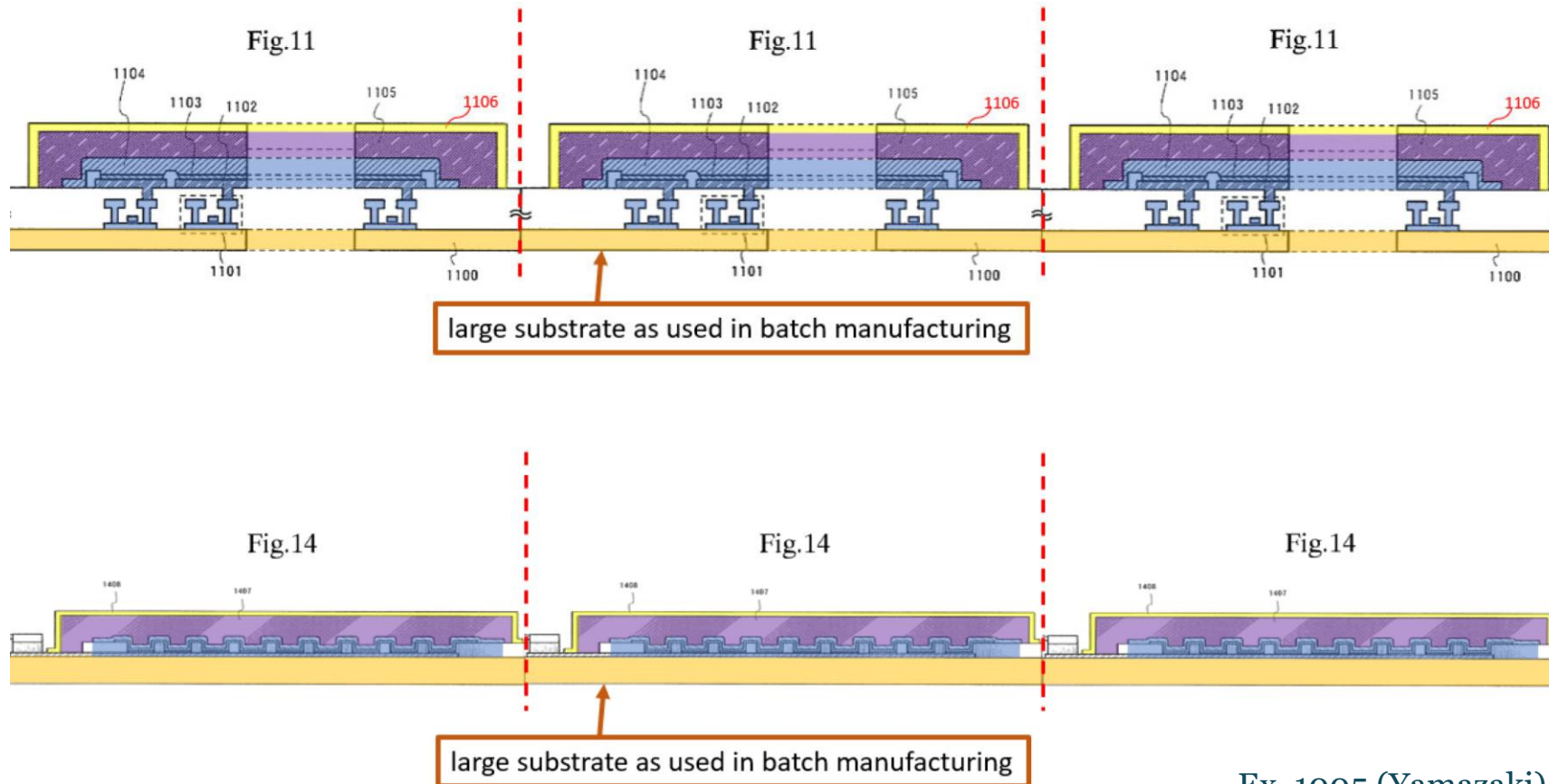


FIG. 2 (PRIOR ART)

# A POSITA Would Have Used Yamazaki's Method to Encapsulate a Plurality of Devices



Ex. 1005 (Yamazaki) Figs. 11 and 14  
(replicated and annotated)

# Patent Owner's Allegations of Inkjet Challenges Are Unfounded

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Dr. Subramanian explains why Yamazaki's inkjet method may be readily applied to multiple devices

- Coffee ring effect readily addressed
- Inkjet scales well to larger areas
- Known to use inkjet to print multiple devices on a glass substrate

Ex. 1032 (Subramanian Dec.) ¶¶27-28

'389 patent does not suggest any technical challenges in using inkjet printing

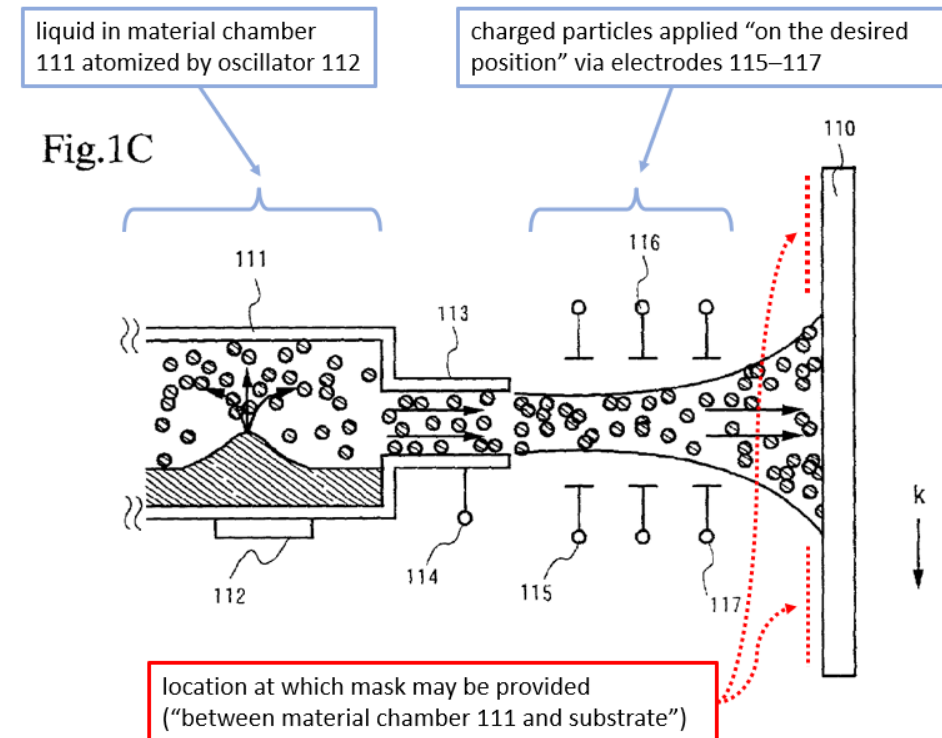
It will be appreciated that there are many manners of depositing this organic layer upon the OLED device. For example, the layer could be either evaporated or flash evaporated. Alternatively, a liquid organic layer could be spun coated, dip coated, roll coated, spray-coated or blade coated—as is well known in the art. Additionally, other suitable printing technology could be employed, in particular, screen-printing or ink-jet printing.

'389 Patent, 4:48-55

# Claim 37: Yamazaki Teaches Depositing Cover Layer Through a Shadow Mask

[0086] Further, although not used herein, 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 via the mask. It is to be noted that the material chamber 111 and the mask may be provided separately, or they may be integrated into the device.

Ex. 1005 (Yamazaki) ¶ [0086]



Ex. 1005 (Yamazaki) Fig. 1C (annotated)

# Ground II – Yamazaki in View of Ghosh/AAPA and Fujimori

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First Petition, Claims 41-46

# A POSITA Would Have Used Fujimori's Magnetic Mask for Selective Deposition in Yamazaki

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## Yamazaki Teaching Use of Mask for Selective Deposition

[0086] Further, although not used herein, 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 via the mask. It is to be noted that the material chamber 111 and the mask may be provided separately, or they may be integrated into the device.

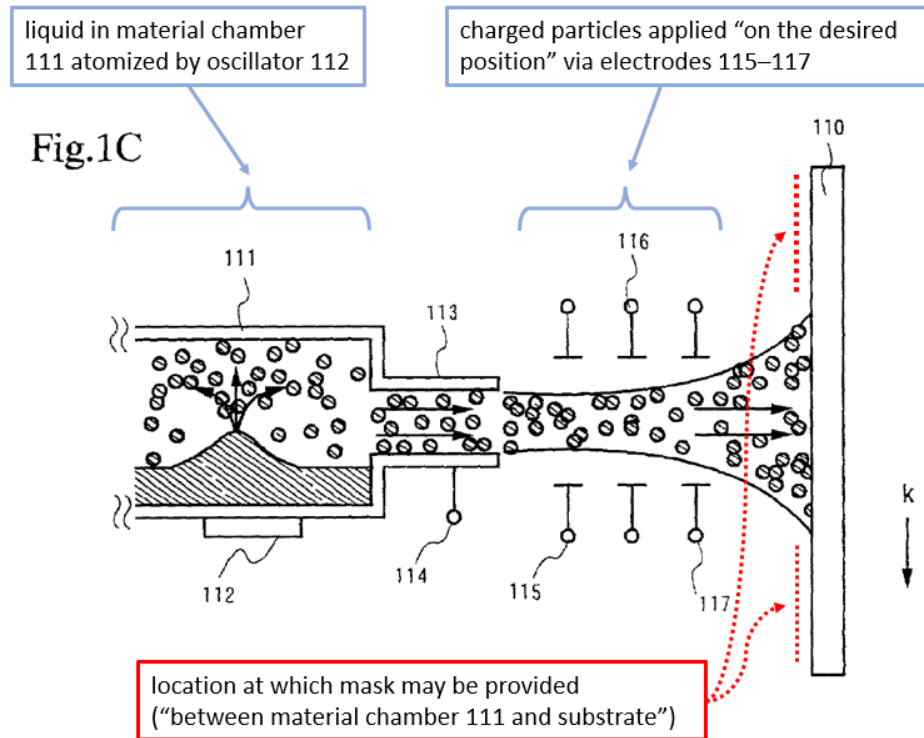
Ex. 1005 (Yamazaki) ¶ [0086]

## Fujimori Teaching Magnetic Mask to Improve Deposition Accuracy

(MEANS TO SOLVE THE PROBLEM) In order to solve the problem, the manufacturing method of the present invention is such that in “an organic electroluminescent element in which a light-emitting layer comprising an organic compound is present between a positive electrode and a negative electrode, ... a pattern processing portion contained in the element is formed through a mask attached to a substrate with magnetic force.”

Ex. 1014 (Fujimori) ¶ [0010]

# Patent Owner's Unsupported Particle Deviation Theory Fails



- Dr. Subramanian explains that any lateral particle deviation would be minimal
- Material deposited through mask opening only, thereby preventing any lateral deviation from impacting deposited layer (deviation will simply hit mask)

Ex. 1032 (Subramanian Dec.) ¶40

# Ground III – Weaver

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First Petition, Claims 34, 40

# Weaver Teaches Encapsulation via “Alternating Series of Planarizing Layers 151a-c and High-Density Layers 152a-c”

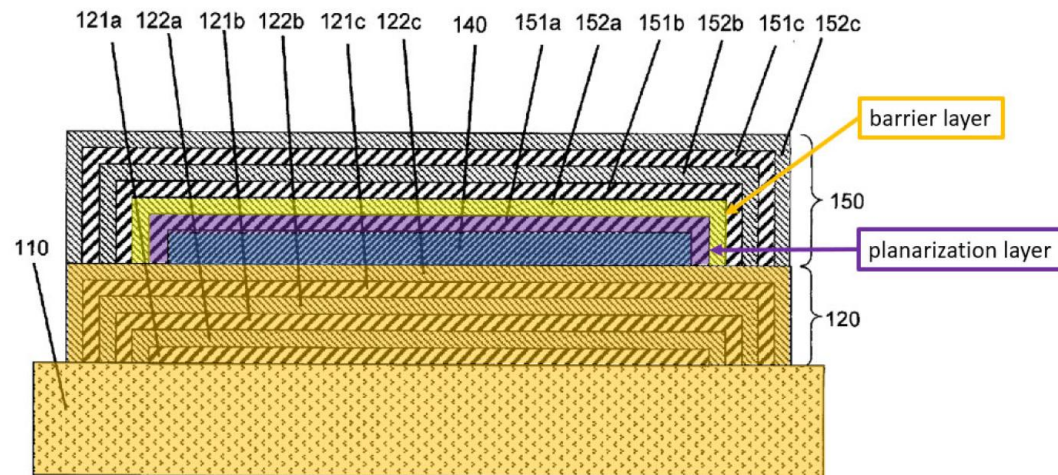


Fig. 6

Ex. 1008 (Weaver) Fig. 6 (annotated)

[0052] Polymers can also be provided as planarizing layers in connection with a series of cooperative barrier layers, such as those discussed above in connection with the barrier layer 120. An embodiment of such a structure is shown in FIG. 6, which illustrates an additional barrier region 150 consisting of an alternating series of planarizing layers 151a-c and high-density layers 152a-c. In this embodiment, no adhesive region 130 is used, since sufficient bonding strength between the successive layers exists.

Ex. 1008 (Weaver) at ¶[0052]

# Weaver's Planarizing Layers Are "Planarization Layers"

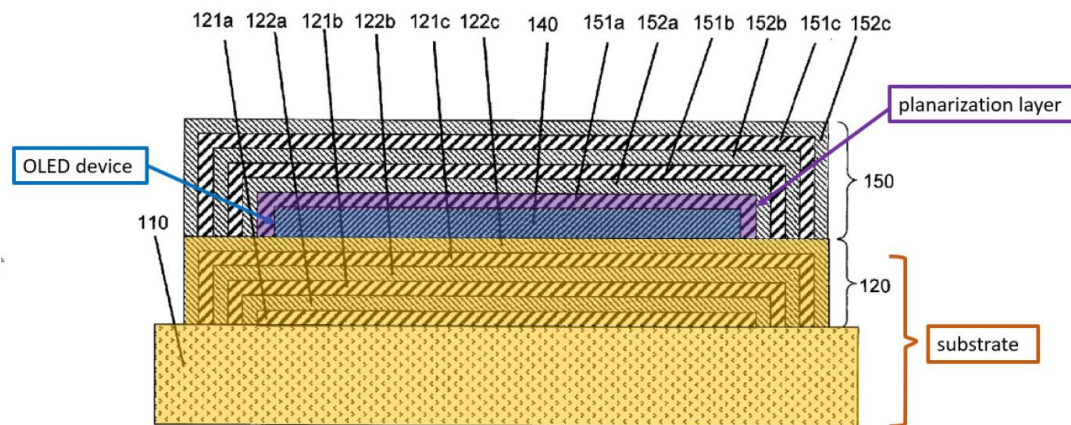


Fig. 6

Ex. 1008 (Weaver) Fig. 6 (annotated)

[0052] Polymers can also be provided as planarizing layers in connection with a series of cooperative barrier layers, such as those discussed above in connection with the barrier layer 120. An embodiment of such a structure is shown in FIG. 6, which illustrates an additional barrier region 150 consisting of an alternating series of planarizing layers 151a-c and high-density layers 152a-c. In this embodiment, no adhesive region 130 is used, since sufficient bonding strength between the successive layers exists.

Ex. 1008 (Weaver) at ¶[0052]

[0035] By "planarizing material" is meant a material that forms a smooth planar surface upon application, rather than forming a surface that reflects irregular contours of the underlying surface. A preferred material is one that, when deposited onto a surface, forms a non-conformal liquid. This could be, for example, a polyacrylate monomer (this material is then subjected to ultraviolet light, crosslinking the monomer to form a polyacrylate). Preferred planarizing

Ex. 1008 (Weaver) at ¶[0035]

# Weaver's Planarizing Layer Satisfies District Court

## Construction of "Planarization Layer"

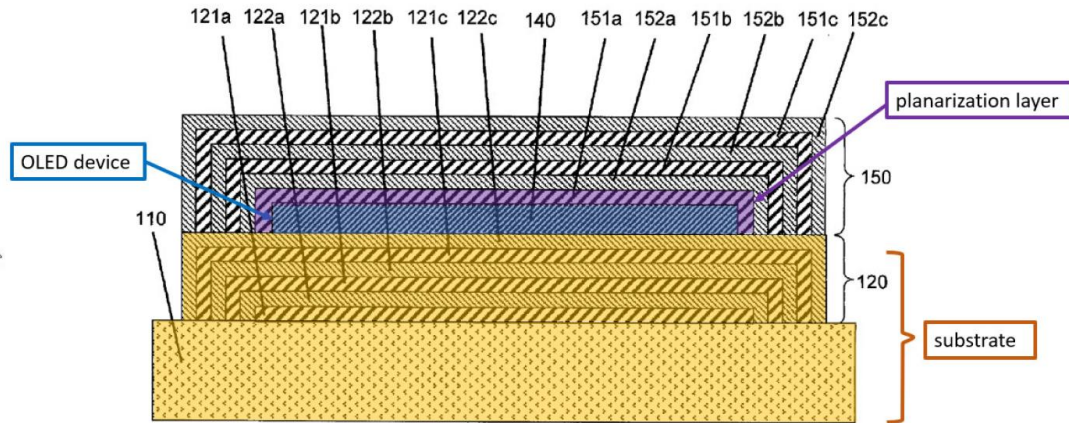


Fig. 6

Ex. 1008 (Weaver) Fig. 6 (annotated)

[0035] By “planarizing material” is meant a material that forms a smooth planar surface upon application, rather than forming a surface that reflects irregular contours of the underlying surface. A preferred material is one that, when deposited onto a surface, forms a non-conformal liquid. This could be, for example, a polyacrylate monomer (this material is then subjected to ultraviolet light, crosslinking the monomer to form a polyacrylate). Preferred planarizing

Ex. 1008 (Weaver) at ¶[0035]

- First, Weaver teaches that its planarizing layers “form[] a smooth planar surface” (i.e., such that...the topography of the underlying layer is not reproduced)
- Second, by smoothing out underlying contours, Weaver’s planarizing layers fill in or smooth out any underlying defects (i.e., such that the propagation of defects ... can be interrupted)

# Weaver Teaches “Selectively Depositing”

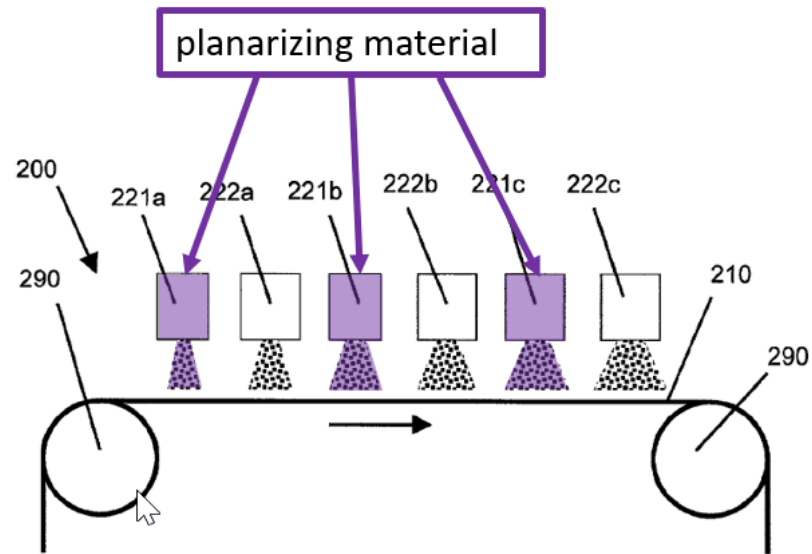


**Fig. 8**

Ex. 1008 (Weaver) Fig. 8 (annotated)

- Weaver’s deposition approach utilizes “deposition sources” with “apertures” used to selectively deposit its planarizing and high-density layers
- No discussion of subsequent etch step

[0059] In FIG. 8, each deposition source is provided with an aperture that is larger than that of the adjacent upstream source (i.e., the source to the left), 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).

Ex. 1008 (Weaver) ¶ [0059]

# Ground IV – Weaver in View of Palanisamy

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First Petition, Claims 35, 36

# Inkjet Was Suitable for Depositing Weaver's Planarizing Layers

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[0021] To overcome these and other problems, the passivation may be selectively applied. In other words, the passivation 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 28. One selective, passivation deposition technique, shown in FIG. 3, involves an ink jet printer 44 to selectively apply passivation to areas 42 while leaving areas 40 over the display panel 20 uncovered. The ink jet 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.

Ex. 1007 (Palanisamy) ¶ [0021]

- Weaver teaches its planarizing layers can be provided “using techniques known in the art” and “in a number of ways.”
- Palanisamy discloses selectively depositing passivation layers via inkjet and teaches benefits of that approach
- Inkjet was a known method as '389 Patent itself makes clear

Ex. 1032 (Subramanian Dec.) ¶¶47-48

# Ground V – Weaver in View of Burrows

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First Petition, Claim 37

# POSITA Would Have Used Burrows' Shadow Masks with Weaver

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- Weaver teaches its planarizing layers can be provided “using techniques known in the art” and “in a number of ways.”
- Petition describes known benefits of use of shadow masks, including more precise control

Ex. 1032 (Subramanian Dec.) ¶¶47-48, 51

# IPR2024-01223 (Second Petition)

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Asserting Prior Art Under Section 102(b)

# Instituted Grounds of Unpatentability

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Ground I: Kijima in view of Suzuki renders obvious claims 34, 37, and 40

Ground II: Kijima in view of Suzuki and Sturm renders obvious claim 35

Ground III: Kijima in view of Suzuki and Duthaler renders obvious claim 36

Ground IV: Kijima in view of Suzuki and Fujimori renders obvious claims 41, 42, 43, 44, 45 and 46

\* Independent claims underlined.

# Primary Issues in Dispute

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## ■ Ground I

- Whether Suzuki teaches a “planarization layer”
- Obviousness of adding Suzuki’s planarization layer to Kijima

## ■ Grounds II-IV

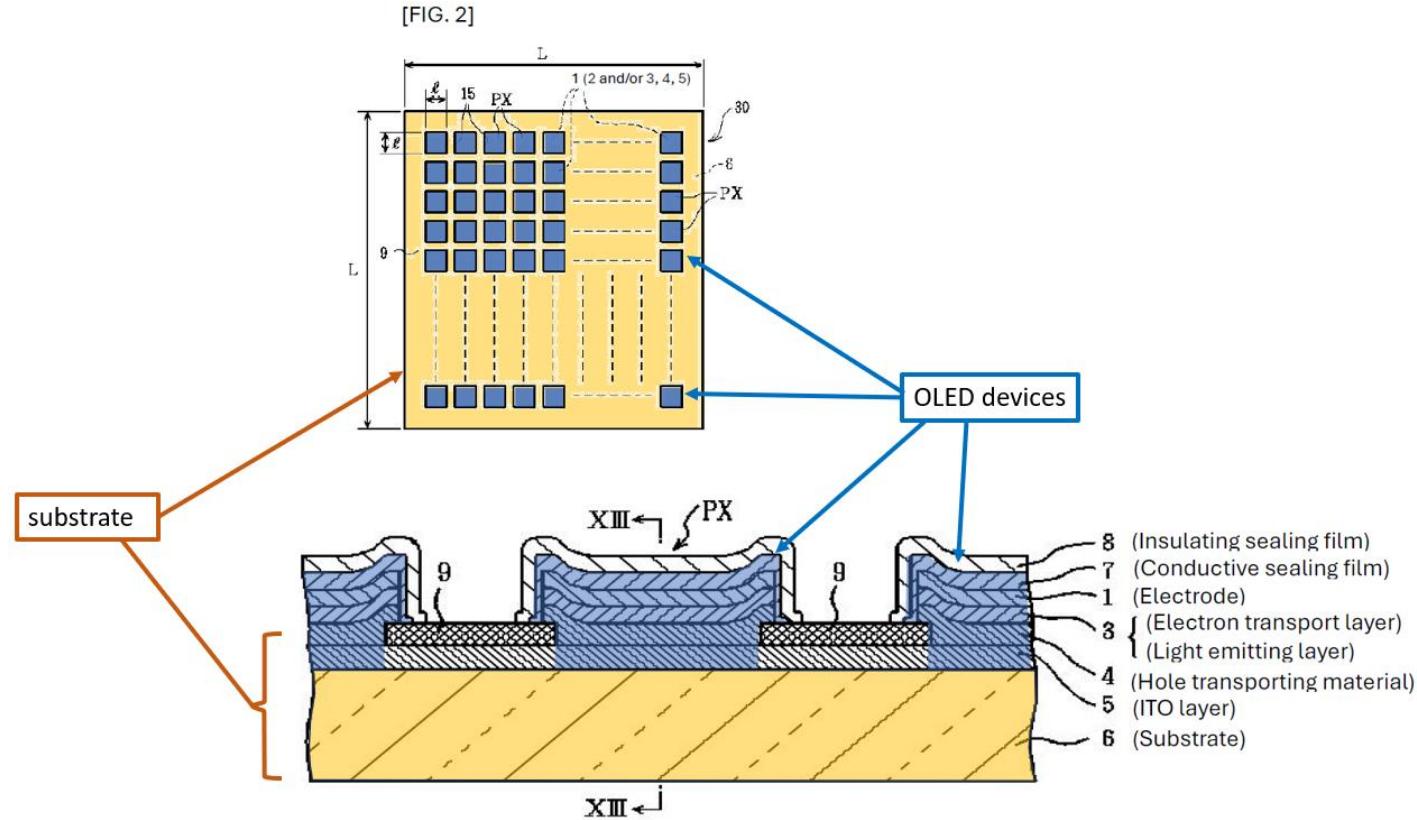
- Obviousness of using Sturm’s/Duthaler’s/Fujimori’s deposition methods to deposit planarization layer in device of Kijima + Suzuki

# Ground I – Kijima in View of Suzuki

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Second Petition, Claims 34, 37, and 40

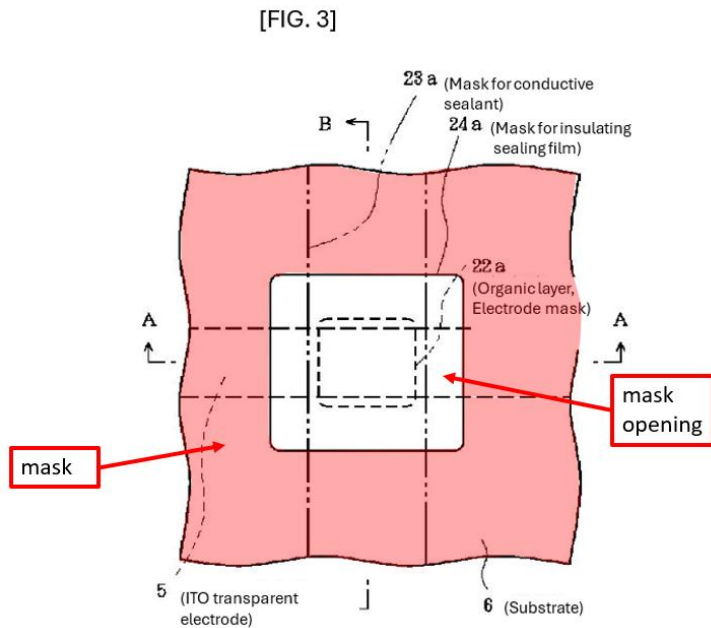
# Kijima Teaches Encapsulating a Plurality of OLED Devices Using an Insulating Sealing Film



Ex. 1010 (Kijima) Figs. 2, 12 (annotated)

# Kijima Teaches Selectively Depositing Its Insulating Sealing Film via Shadow Mask

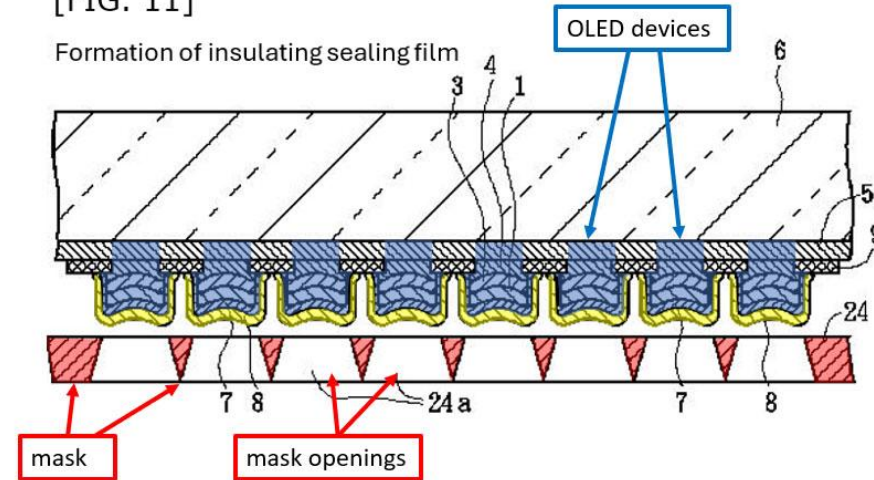
## Kijima's Shadow Mask



Kijima Fig. 3 (annotated)

[FIG. 11]

Formation of insulating sealing film

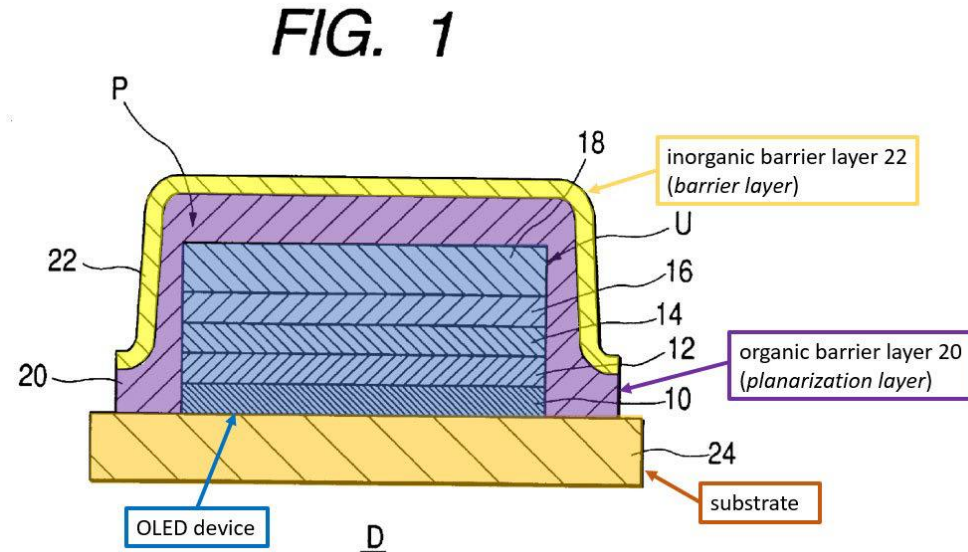


Kijima Fig. 11 (annotated)

[0051] Finally, as depicted in FIG. 11, the mask was changed to deposition mask 24, and  $\text{SiO}_2$  was deposited on the conductive sealing film 7 to a thickness of 2 kÅ (deposition rate: 50 to 60 Å/sec). As a result,  $\text{SiO}_2$  was deposited through the openings 24a of the mask 24 to form an insulating sealing film 8 covering the conductive sealing film 7, thereby producing an organic EL element 31 as depicted in FIG. 1.

Kijima at ¶ [0051]

# Suzuki's Organic Barrier Layer Is a “Planarization Layer”



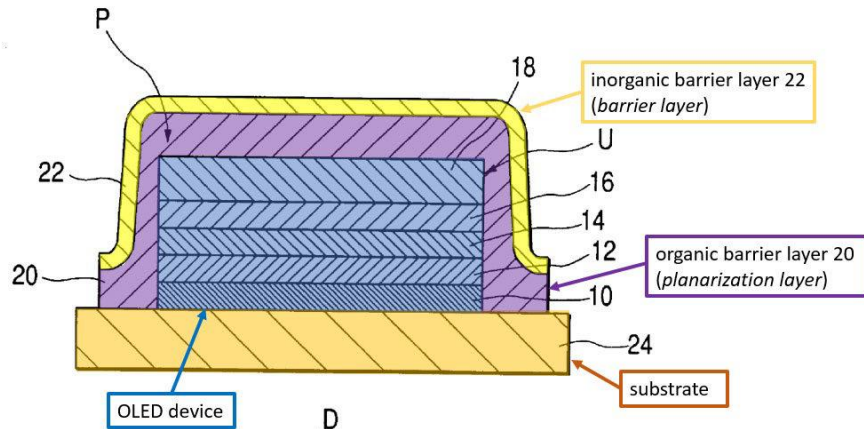
Ex. 1012 (Suzuki) Fig. 1 (annotated)

In the practice of the invention, a protective or sealing layer P is formed to cover the unit U therewith as shown in FIG. 1. The protective layer P includes two layers including an organic barrier layer 20 covering defects or pinholes inevitably formed particularly in the uppermost cathode layer 18, and an inorganic barrier layer 22. It will be noted that defects are mainly caused by foreign matter inevitably deposited on the electroluminescent unit U during the course of the fabrication thereof under very severely controlled conditions.

Ex. 1012 (Suzuki) at 5:49-58

# Suzuki's Organic Barrier Layer Satisfies District Court Construction of “Planarization Layer”

FIG. 1



Ex. 1012 (Suzuki) Fig. 1 (annotated)

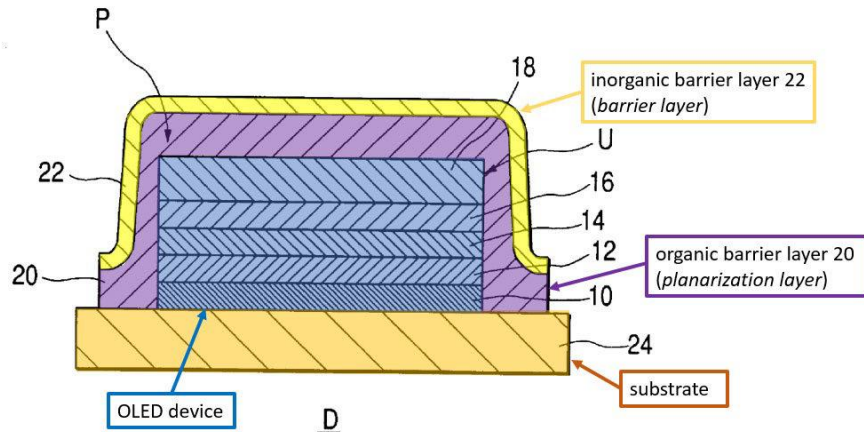
The organic barrier layer 20, which exhibits good affinity for the metal or alloy cathode, covers defects in the electroluminescent unit U therewith and makes a smooth surface on the relatively irregular surface of the cathode 18. Then, the inorganic barrier layer 22 is formed on the smooth surface of the organic barrier layer 20, thus ensuring the formation of the layer 22, which is substantially defect-free and dense. The thus formed double-layer structure can remarkably contribute to moisture proofing.

Ex. 1012 (Suzuki) at 5:59-67

- First, Suzuki teaches that its organic barrier layer “planarizes such that...the topography of the underlying layer is not reproduced” (i.e., makes a smooth surface)
- Figure 1 shows alteration of topography by organic barrier layer 20 (i.e., rounded corners)

# Suzuki's Organic Barrier Layer Satisfies District Court Construction of “Planarization Layer”

FIG. 1



Ex. 1012 (Suzuki) Fig. 1 (annotated)

In the practice of the invention, a protective or sealing layer P is formed to cover the unit U therewith as shown in FIG. 1. The protective layer P includes two layers including an organic barrier layer 20 covering defects or pinholes inevitably formed particularly in the uppermost cathode layer 18, and an inorganic barrier layer 22. It will be noted that defects are mainly caused by foreign matter inevitably deposited on the electroluminescent unit U during the course of the fabrication thereof under very severely controlled conditions.

Ex. 1012 (Suzuki) at 5:49-58

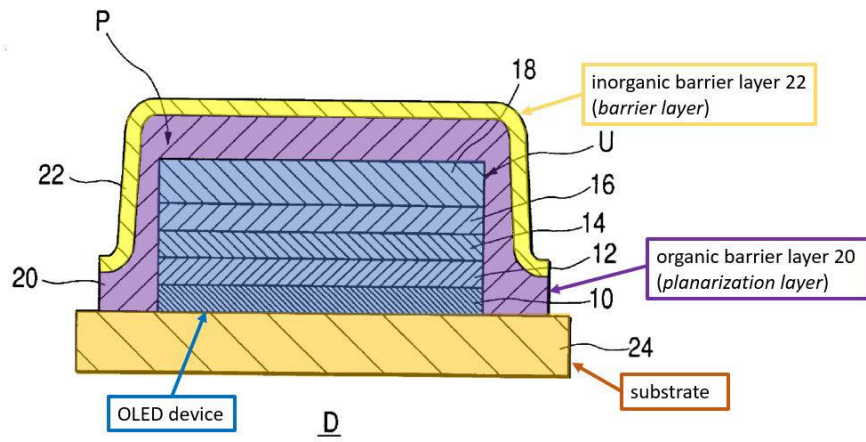
- Second, Suzuki teaches that its organic barrier layer “planarizes such that propagation of defects from one layer to another layer can be interrupted” (i.e., “covering defects”)

# A POSITA Would Have Added Suzuki's Organic Barrier Layer to Kijima

The organic barrier layer **20**, which exhibits good affinity for the metal or alloy cathode, covers defects in the electroluminescent unit **U** therewith and makes a smooth surface on the relatively irregular surface of the cathode **18**. Then, the inorganic barrier layer **22** is formed on the smooth surface of the organic barrier layer **20**, thus ensuring the formation of the layer **22**, which is substantially defect-free and dense. The thus formed double-layer structure can remarkably contribute to moisture proofing.

Ex. 1012 (Suzuki) at 5:59-67

**FIG. 1**



Ex. 1012 (Suzuki) Fig. 1 (annotated)

- Suzuki teaches that its double-layer structure provides strong encapsulation for underlying device
- Suzuki teaches that structure of organic barrier layer on top of device, with inorganic barrier layer on top of organic barrier layer, leads to “remarkabl[e]” protection
- Kijima’s device is ready for this improvement through addition of Suzuki’s organic barrier layer

# Kijima's Conductive Sealing Film 7 Does Not Fully Protect Against Degradation

---

- Kijima's conductive sealing film 7 protects against radiant heat during manufacturing

[0057] When the conductive sealing film 7 is made of a material with good thermal conductivity such as a metal, efficient dissipation of the radiant heat can be expected, which is considered to be advantageous in preventing degradation of the organic layer.

Ex. 1010 (Kijima) at [0057]

- Kijima's Comparative Example 3 shows that conductive sealing film 7 alone did not prevent degradation over time

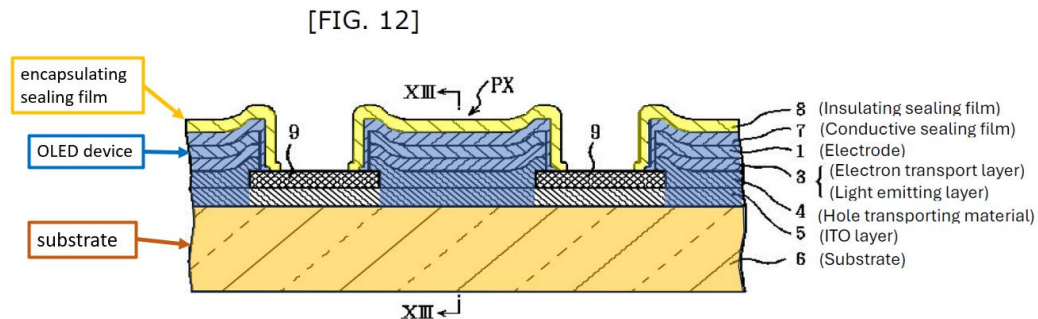
[0086] The organic EL element produced in this manner was left in air for one month after production, and then the properties of the element were measured. The luminance was found to be about 900 cd/m<sup>2</sup> at an applied voltage of 9 V, but these results were degraded from the result measured immediately after the element was produced. Furthermore, there was also an increase in dark spots.

Ex. 1010 (Kijima) at [0086]

# Kijima's Experiments Do Not Show Sustained Protection from Atmospheric Degradation (as in Suzuki)

## Kijima

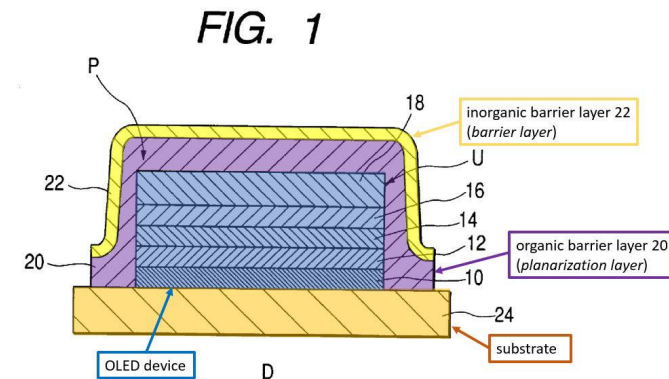
- Focused on oxidation by radiant heat during manufacture
- Experiments ran for 1 month



Ex. 1010 (Kijima) Fig. 12 (annotated)

## Suzuki

- Focused specifically on encapsulation for protection against atmosphere
- Experiments assessed protection in varied atmospheric conditions (e.g., temperature, humidity)



Ex. 1012 (Suzuki) Fig. 1 (annotated)

# Ground II – Kijima in View of Suzuki and Sturm

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Second Petition, Claim 35

# POSITA Would Have Used Inkjet for Selectively Depositing Planarization Layer in Kijima/Suzuki

A method of fabricating semiconductor devices using ink-jet printing is provided to directly deposit patterned polymer films to create OLED's and other semiconductor devices.

The luminescence of poly-vinylcarbazol (PVK) films, with dyes of coumarin 6 (C6), coumarin 47 (C47), and nile red was similar to that of films of the same composition deposited by spin-coating. Light emitting diodes with low turn-on voltages were also fabricated in PVK doped with C6 deposited by ink-jet printing.

Ex. 1013 (Sturm), Abstract

- Sturm describes advantages of inkjet and confirms suitability for variety of organic and inorganic elements (organic EL layers, patterned insulators, and electrodes)
- Inkjet was a known method for depositing organic layers (see, e.g., '389 Patent, 4:48-55)

Ex. 1033 (Subramanian Dec.) ¶¶41-52

# Inkjet Is Routinely Used Under Nitrogen to Prevent Exposure to Atmosphere During Deposition

8 Q. And do you apply the inkjet in a  
9 vacuum?

10 A. No.

11 But you can apply it under nitrogen.  
12 And in fact, it has routinely been used under  
13 nitrogen.

14 Q. So you take the device out of the  
15 vacuum chamber and into the nitrogen chamber?

16 A. In fact, the standard way that this  
17 is done -- and this has been done this way for  
18 decades in the OLED business, for example, by  
19 some of the -- you know, my lab does it this  
20 way, the labs at Princeton do it this way, the  
21 labs at MIT do it this way.

22 You have an evaporator that is  
23 connected to a glove box. That's pretty much  
24 standard tooling in the industry. And then you  
25 have an inkjet printer inside the glove box.

1 So there is no exposure to air in  
2 that process. You come out of the evaporator  
3 straight into the glove box, which is under  
4 nitrogen, and then the inkjet printer is under  
5 nitrogen.

6 It's very standard. Has been used  
7 this way for decades.

Ex. 2021 (Subramanian Tr.) 106:8-107:7

# Ground III – Kijima in View of Suzuki and Duthaler

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Second Petition, Claim 36

# POSITA Would Have Selectively Deposited via Screen Printing

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- Duthaler teaches specific benefits for screen-printing, including low cost and high throughput
- As with inkjet, Dr. Subramanian explained that it has long been known to deposit layers with screen-printing in a nitrogen environment

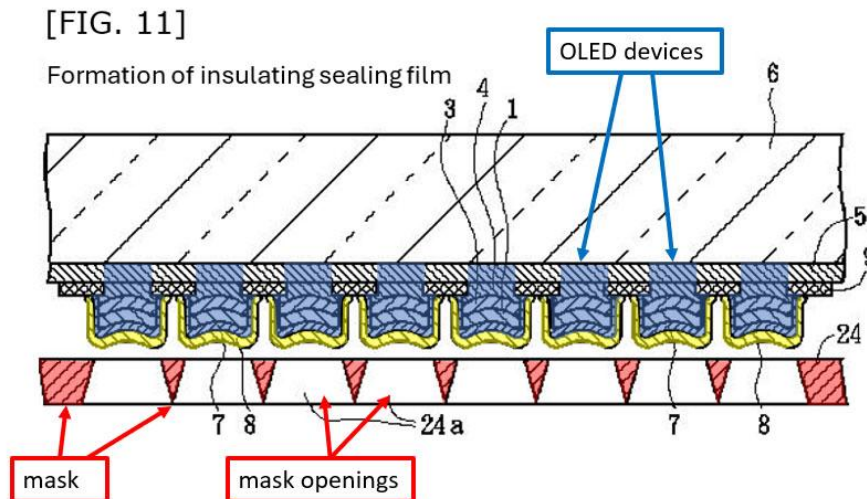
# Ground IV – Kijima in View of Suzuki and Fujimori

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Second Petition, Claims 41-46

# A POSITA Would Have Used Fujimori's Magnetic Mask for Selective Deposition in Kijima

## Kijima Teaching Use of Mask for Selective Deposition



Kijima Fig. 11 (annotated)

## Fujimori Teaching Magnetic Mask to Improve Deposition Accuracy

(MEANS TO SOLVE THE PROBLEM) In order to solve the problem, the manufacturing method of the present invention is such that in “an organic electroluminescent element in which a light-emitting layer comprising an organic compound is present between a positive electrode and a negative electrode, ... a pattern processing portion contained in the element is formed through a mask attached to a substrate with magnetic force.”

Ex. 1014 (Fujimori) ¶ [0010]

# Backup Slides

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## Second Petition

# Patent Owner Misreads Fujimori's Disclosures on Shadow Mask Limitations

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(PROBLEM TO BE SOLVED BY THE INVENTION)

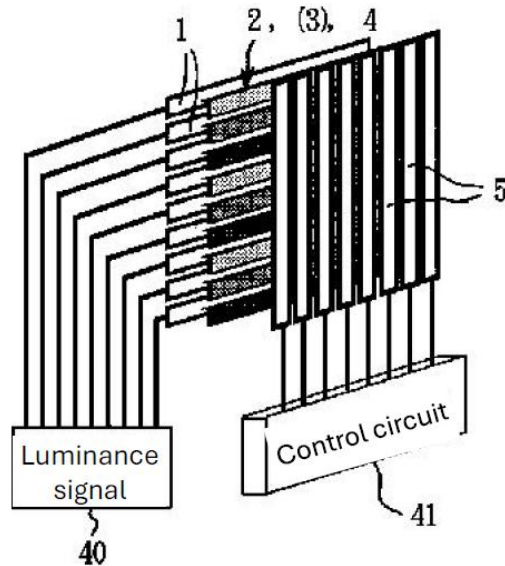
However, the mask must be made thin to accommodate a fine pattern. Since sufficient strength cannot be obtained, the adhesion between the substrate and mask deteriorates due to warping and other factors. Therefore, with conventional methods, the finer the pattern is, the more the position of the deposited material wrapping around the shadow of the mask cannot be ignored, making it difficult to pattern the element with adequate accuracy. This is a major problem that can cause a short in the elements and crosstalk due to increased leakage current. For example, according to Patent Appl. Publication No. JP H2-66873, a pattern pitch of less than 300  $\mu\text{m}$  is a much smaller pixel size than the range where pattern processing using a mask is possible.

Ex. 1014 (Fujimori) at [0008]

- Fujimori directed to “fine patterning”
- No suggestion that detrimental bleeding will occur with all shadow masks
- Mr. Humphrey admitted Fujimori's discussion of problems with shadow masks only directed to “a pattern pitch of less than 300  $\mu\text{m}$ ” (Ex. 1036 at 51:6-52:13)
- If anything, Fujimori's discussion would motivate POSITA to use Fujimori's mask

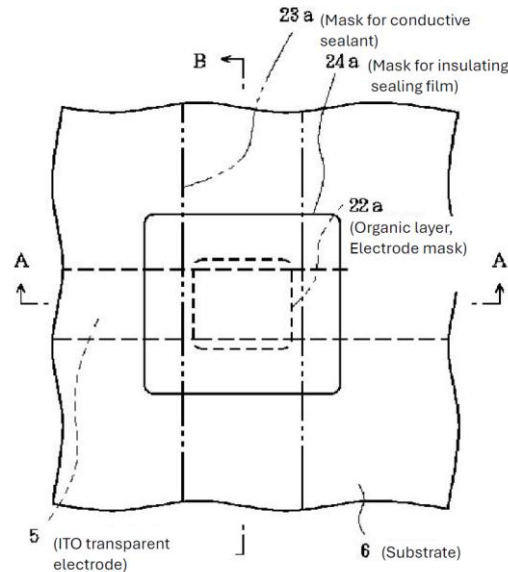
# Kijima's Conductive Sealing Film 7 Carries Charge

[FIG. 24]



Ex. 1010 (Kijima) Fig. 24

[FIG. 3]



Ex. 1010 (Kijima) Fig. 3

- Conductive film 7 functions together with electrode 1 to serve as negative electrode to drive OLED
- Conductive film 7 is formed as a stripe (using mask 23a in Fig. 3) and used to carry charge to electrode 1

# Ground II: Coffee-Ring Effect Does Not Render Inkjet Unsuitable

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- Ex. 2023 directed to deposition of gold conductor film, not organic planarization layer
- Ex. 2023 confirms that any coffee-ring effect can be eliminated by controlling the temperature of the substrate and the solvent used
- Dr. Subramanian confirms known OLED materials within temperature tolerances for eliminating coffee-ring effect

# Ground IV: Mask Is in Contact with Substrate Through the SiO<sub>2</sub> Film (claim 43)

