

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BOE TECHNOLOGY GROUP CO., LTD.,
Petitioner

v.

SAMSUNG DISPLAY CO., LTD.,
Patent Owner.

PTAB Case No. IPR2025-01481

U.S. Patent No. 10,013,088 B2

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,013,088 B2**

TABLE OF CONTENTS

[illegible]

14.	Claim 12	68
15.	Claim 13	68
B.	Ground 1B: Obviousness over Chen-Matsuo-Sano-Sakamoto (Claims 1-13).....	69
1.	Prior Art	69
2.	Motivation to Combine	69
3.	Claim 1	70
4.	Claim 2	83
5.	Claim 3	86
6.	Claim 4	86
7.	Claim 5	87
8.	Claim 6	87
9.	Claim 7	88
10.	Claim 8	89
11.	Claim 9	90
12.	Claim 10	90
13.	Claims 11-13	90
C.	Grounds 2A/2B: Obviousness over Imamura-Yang-Sakamoto and Imamura-Yang- Sakamoto-Chen (Claims 1-13)	90
1.	Prior Art	90
2.	Motivation to Combine	90
3.	Claim 1	93
4.	Claim 2	114
5.	Claim 3	119
6.	Claim 4	119
7.	Claim 5	120
8.	Claim 6	120
9.	Claim 7	121

10.	Claim 8	122
11.	Claim 9	123
12.	Claim 10	123
13.	Claim 11	123
14.	Claim 12	125
15.	Claim 13	125
VIII.	CONCLUSION.....	126
IX.	MANDATORY NOTICES	127
A.	Real Party in Interest.....	127
B.	Related Matters.....	127
C.	Notice of Counsel and Service Information.....	128
D.	Power of Attorney	129

EXHIBIT LIST

No.	Exhibit
1001	U.S. Patent No. 10,013,088
1002	File History of the '088 patent
1003	Declaration of Richard Flasck
1004	Curriculum Vitae of Richard Flasck
1005	U.S. Patent No. 8,723,413 (“ <i>Chen</i> ”)
1006	U.S. Publication No. 2010/0007616 (“ <i>Jang</i> ”)
1007	U.S. Publication No. 2005/0156513 (“ <i>Sano</i> ”)
1008	English Translation and Certification of Japanese Unexamined Patent Application Publication No. JP2003317943 (“ <i>Sakamoto</i> ”)
1009	Original of Japanese Unexamined Patent Application Publication No. JP2003317943
1010	U.S. Publication No. 2008/0309635 (“ <i>Matsuo</i> ”)
1011	U.S. Publication No. 2003/0164674 (“ <i>Imamura</i> ”)
1012	U.S. Publication No. 2009/0085891 (“ <i>Yang</i> ”)
1013	U.S. Patent No. 8,598,787 (“ <i>Bouten</i> ”)
1014	U.S. Patent No. 6,879,319 (“ <i>Cok</i> ”)
1015	U.S. Publication No. 2010/0156810 (“ <i>Barbier</i> ”)
1016	English Translation and Certification of Japanese Unexamined Patent Application Publication No. JP2001007257 (“ <i>Akaboshi</i> ”)
1017	Original Japanese Unexamined Patent Application Publication No. JP2001007257

Petition for *Inter Partes* Review of U.S. Patent No. 10,013,088 B2
PTAB Case No. IPR2025-01481

No.	Exhibit
1018	U.S. Publication No. 2009/0096757 (“ <i>Hotelling</i> ”)
1019	U.S. Publication No. 2010/0207519 (“ <i>Hayashi</i> ”)
1020	U.S. Patent No. 6,268,695 (“ <i>Affinito</i> ”)
1021	U.S. Patent No. 6,413,645 (“ <i>Graff</i> ”)
1022	U.S. Patent No. 8,552,541 (“ <i>Lim</i> ”)
1023	U.S. Patent No. 8,063,489 (“ <i>Shigihara</i> ”)
1024	U.S. Patent No. 7,969,009 (“ <i>Chandrasekaran</i> ”)
1025	U.S. Publication No. 2006/0192299 (“ <i>Hashimoto</i> ”)
1026	U.S. Publication No. 2009/0207560 (“ <i>Lee ’560</i> ”)
1027	U.S. Publication No. 2009/0160824 (“ <i>Chih-Yung</i> ”)
1028	Complaint, <i>Samsung Display Co. v. BOE Technology Group Co.</i> , Case No. 2:25-cv-00412-JRG (E.D. Tex.), ECF No. 1
1029	U.S. Publication No. 2010/0134426 (“ <i>Lee ’426</i> ”)
1030	Willem den Boer, <i>Active Matrix Liquid Crystal Displays</i> (“ <i>den Boer</i> ”)
1031	Teruhiko Yamazaki, et al., <i>Color TFT Liquid Crystal Displays</i> (“ <i>Yamazaki Displays</i> ”)
1032	U.S. Patent No. 5,575,549 (“ <i>Ishikawa</i> ”)
1033	JPH06230378 Machine English and Original (“ <i>Kisoo</i> ”)
1034	Gary Barrett & Ryomei Omote, <i>Projected-Capacitive Touch Technology</i> (“ <i>Barrett</i> ”)
1035	JP2003187605A Machine English and Original (“ <i>Saizo</i> ”)
1036	U.S. Patent No. 5,499,120 (“ <i>Hansen</i> ”)

Petition for *Inter Partes* Review of U.S. Patent No. 10,013,088 B2
PTAB Case No. IPR2025-01481

No.	Exhibit
1037	U.S. Patent No. 6,007,209 (“ <i>Pelka</i> ”)
1038	Fumiaki Yamada, et al., <i>52:2: Invited Paper: Color Sequential LCD Based on OCB with an LED Backlight</i> (“ <i>Yamada</i> ”)
1039	U.S. Publication 2010/0182250A1 to Kang, et al. (“ <i>Kang</i> ”)
1040	U.S. Publication 2010/0214247 to Tang, et al. (“ <i>Tang</i> ”)
1041	JP2009110790A Machine English and Original (“ <i>Kaneko</i> ”)
1042	Toshinari Yamazaki, et al, <i>Pattern Formation of Sputtered Films by Deposition through Mask</i> (“ <i>Yamazaki Mask</i> ”)
1043	U.S. Publication 2010/0110041A1 to Jang, et al. (“ <i>Jang '041</i> ”)
1044	English Translation and Certification of Japanese Unexamined Patent Application Publication No. JP2008216996A (“ <i>Kiyose</i> ”)
1045	Original of Japanese Unexamined Patent Application Publication No. JP2008216996A
1046	U.S. Patent No. 7,960,914 (“ <i>Hara</i> ”)
1047	Z.W. Zhong, <i>Wire bonding using insulated wire and new challenges in wire bonding</i> (“ <i>Zhong</i> ”)
1048	Y.F. Yao, et al., <i>Improving the Deflection of Wire Bonds in Stacked Chip Scale Package (CSP)</i> (“ <i>Yao</i> ”)
1049	Dimitrios Velenis, et al., <i>Impact of 3D Design Choices on Manufacturing Cost</i> (“ <i>Velenis</i> ”)
1050	K.N. Tu, <i>Reliability challenges in 3D IC packaging technology</i> (“ <i>Tu</i> ”)
1051	U.S. Publication No. 2009/0179566 to Imamura, et al. (“ <i>Imamura '566</i> ”)

LISTING OF CHALLENGED CLAIMS

U.S. Patent No. 10,013,088 B2
Claim 1 (Cl.1)
1[pre] A display comprising:
1[a] a substrate including a first area having a pixel area and a second area adjacent to the first area;
1[b] a plurality of pixels in the pixel area of the substrate;
1[c] a sealing thin film covering the first area of the substrate and including an inclined surface at an end of the sealing thin film to inhibit infiltration of oxygen or moisture into the pixels;
1[d] a plurality of sensing cells formed over a top surface of the sealing thin film to sense a touch;
1[e] a plurality of sensing lines coupled to the sensing cells, the sensing lines comprising a first portion and a second portion;
1[f] a driving circuit electrically connected to the sensing cells via the sensing lines; and
1[g] an insulating layer,
1[h] wherein the inclined surface of the sealing thin film is formed to be inclined downwardly toward the driving circuit,
1[i] wherein the sensing lines include inclined portion along the inclined surface of the sealing thin film,
1[j] wherein the sensing lines are formed over the top surface of the sealing thin film in the first portion and formed over the substrate in the second portion, and the sensing lines extend from the sensing cells along the inclined surface of the sealing thin film to the second area of the substrate, wherein the sensing lines are electrically connected to the driving circuit,

1[k] wherein the sensing cells include a plurality of first sensing cells connected along a first direction by first connection patterns and a plurality of second sensing cells connected along a second direction by second connection patterns, and

1[l] wherein the insulating layer is interposed between the first connection patterns and the second connection patterns.

Claim 2 (Cl.2)

2. The display according to claim 1, wherein the first portion is located on the sealing thin film and the second portion is located on the second area of the substrate, and wherein first portions of the sensing lines are located on a same layer.

Claim 3 (Cl.3)

3. The display according to claim 2, wherein second portions of the sensing lines are located on a different layer from the first portions of the sensing lines.

Claim 4 (Cl.4)

4. The display according to claim 1, wherein a first distance between first portions of the sensing lines and the substrate is greater than a second distance between second portions of the sensing lines and the substrate.

Claim 5 (Cl.5)

5. The display according to claim 1, wherein the sensing lines are electrically connected to the driving circuit through wiring lines.

Claim 6 (Cl.6)

6. The display according to claim 1, wherein the sensing lines include a different material from the sensing cells.

Claim 7 (Cl.7)

7. The display according to claim 1, wherein the driving circuit is located on the second area of the substrate.

Claim 8 (Cl.8)
8. The display according to claim 7, further comprising a flexible printed circuit board (FPCB) attached to the second area of the substrate.
Claim 9 (Cl.9)
9. The display according to claim 8, wherein the sensing lines are electrically connected to the driving circuit through the FPCB.
Claim 10 (Cl.10)
10. The display according to claim 1, wherein the sensing lines are arranged outside the pixel area.
Claim 11 (Cl.11)
11. The display according to claim 1, wherein the first area has a greater area than the second area.
Claim 12 (Cl.12)
12. The display according to claim 1, wherein the sealing thin film includes at least one organic layer and at least one inorganic layer.
Claim 13 (Cl.13)
13. The display according to claim 1, wherein the first connection patterns are respectively patterned to have independent patterns in upper or lower layers of the first sensing cells so that the first connection patterns are electrically connected to the first sensing cells at upper or lower portions of the first sensing cells.

BOE Technology Group Co., Ltd. (“BOE” or “Petitioner”) petitions for *inter partes* review (“IPR”) of claims 1-13 (“Challenged Claims”) of U.S. Patent No. 10,013,088 B2 (“’088 patent”; Ex-1001).

I. GROUNDS FOR STANDING

Petitioner certifies the ’088 patent is available for IPR, and Petitioner is not barred or estopped from requesting IPR on the grounds herein. Petitioner files this Petition within one year of service of Patent Owner Samsung Display Co., Ltd. (“PO”) district court complaint. Ex-1028.

II. IDENTIFICATION OF CHALLENGE

A. Prior Art

Petitioner respectfully requests cancellation of the Challenged Claims over:

Prior Art¹
Chen, U.S. Patent 8,723,413 filed February 3, 2010; issued May 13, 2014; qualifies per §102(e) (Ex-1005)
Jang, U.S. Pub. 2010/0007616 filed January 7, 2009; published January 14, 2010; qualifies per §§102(a),(e) (Ex-1006)
Imamura, U.S. Pub. 2003/0164674 filed January 14, 2003; published September 4, 2003; qualifies per §§102(a),(b),(e) (Ex-1011)
Matsuo, U.S. Pub. 2008/0309635 filed March 28, 2008; published December 18, 2008; qualifies per §§102(a),(e) (Ex-1010)

¹ Pre-AIA 35 U.S.C. §102. Jang, Imamura, Matsuo, Sano, and Yang qualify per AIA §§102(a)(1), (a)(2); Chen per §102(a)(2); Sakamoto per §102(a)(1).

Sano, U.S. Pub. 2005/0156513 filed November 24, 2004; published July 21, 2005; qualifies per §§102(a),(b),(e) (Ex-1007)
Sakamoto, Japanese Pub. JP2003317943 filed April 24, 2002; published November 7, 2003; qualifies per §§102(a),(b) (Ex-1008)
Yang, U.S. Pub. 2009/0085891 filed September 29, 2008; published April 2, 2009; qualifies per §§102(a),(b),(e) (Ex-1012)

B. Grounds for Challenge

Grounds under 35 U.S.C. § 103	Claims	Prior Art
1A	1-13	Chen, Jang, Sano, Sakamoto
1B	1-13	Chen, Matsuo, Sano, Sakamoto
2A	1-13	Imamura, Yang, Sakamoto
2B	1-13	Imamura, Yang, Sakamoto, Chen

III. TECHNOLOGY OVERVIEW

Touchscreen display devices have evolved over the years. Ex-1003 (“*Flasck*”), ¶¶43-91. Many touchscreen displays included two primary components: an organic light-emitting diode (OLED) display panel and a capacitive touch panel enabling enables user interaction with the display. *Flasck*, ¶92; *Bouten*, 1:11-17. Touchscreen displays generally required conductive signal lines to connect the display and touch panels to controllers or other components typically housed in non-display areas.

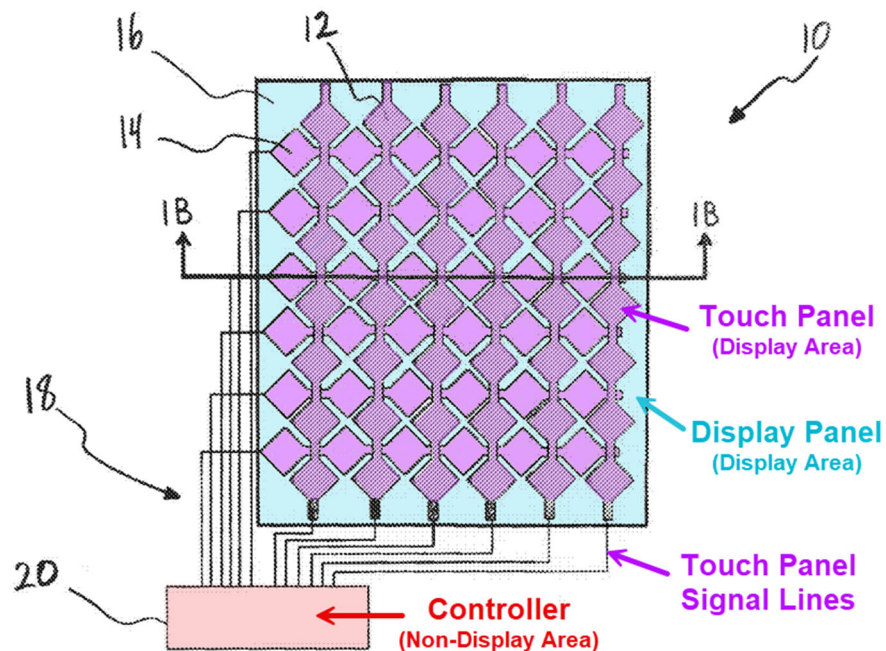


Figure 1A (Prior Art)

Barbier, Figs. 1A,² 1B, 2, 3A-B, 4, Abstract, ¶¶1-3, 16, 17-19; *Flasck*, ¶92.

OLED display panels typically included: a base substrate; OLED pixels; circuits routing electrical signals to the display's OLED pixels; and protective, buffer, and/or sealing/encapsulation layers. *Flasck*, ¶93; *Bouten*, 1:23-57. Top-level sealing/encapsulation layers protected the OLEDs from moisture and/or oxygen that may degrade the organic OLED materials. *Id.*

Conventional encapsulating layer designs deposited larger inorganic layers (films) over smaller organic layers, often producing a stepped incline along the edge of the layered stack. *See, e.g., Sano*, Fig. 6; *Imamura*, Fig. 4. The topmost inorganic

² All emphasis and annotations added unless noted otherwise.

layer of the stack was often deposited by a plasma enhanced chemical vapor deposition (PECVD) process that incorporated masks to control where material was deposited, which naturally produced an incline at the edge of the display. *Flasck*, ¶¶94-96.

IV. '088 PATENT OVERVIEW

A. Specification

The '088 patent is entitled “Flat Panel Display with Integrated Touch Screen Panel” and was filed April 20, 2016, with alleged priority to September 14, 2010. Ex-1001, Cover; *Flasck*, ¶97.

The '088 patent describes a display with an integrated touch panel formed on a “sealing thin film” (200) or an encapsulation layer of an OLED display panel. *Id.*, Abstract, 1:59-2:28, 3:13-38, 5:7-53; Ex-1002, 15-20. The '088 patent depicts the OLED touch panel stack as follows:

FIG. 3

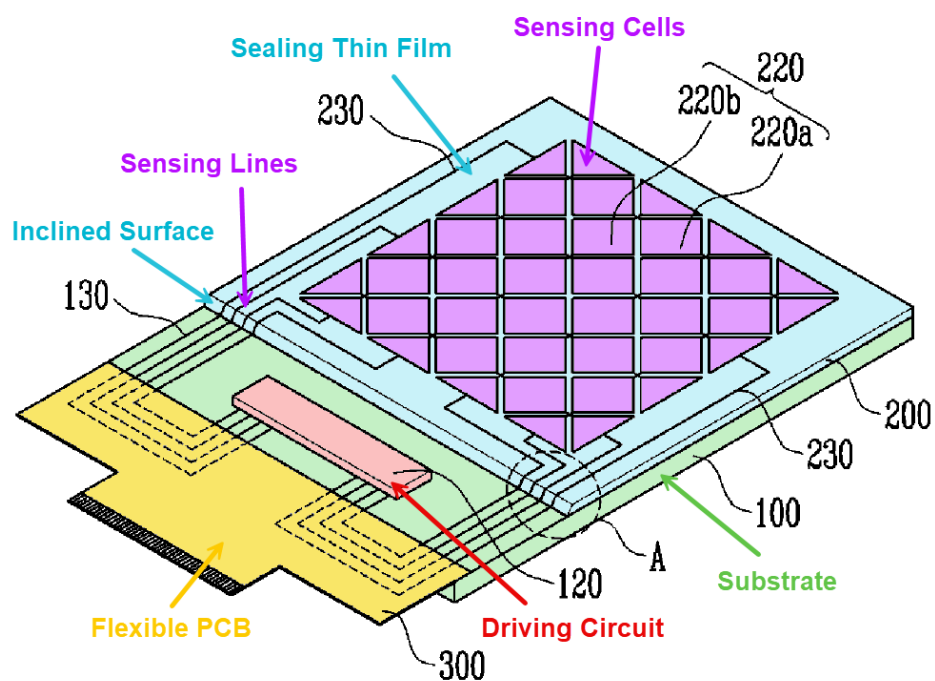
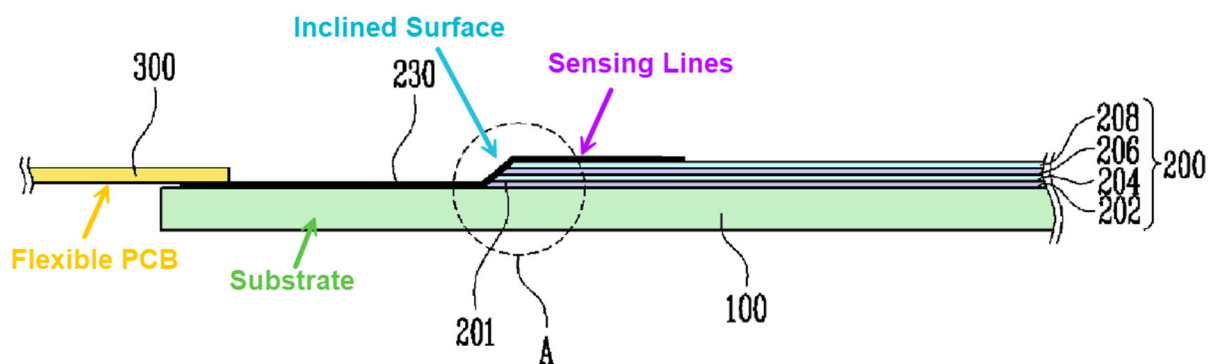
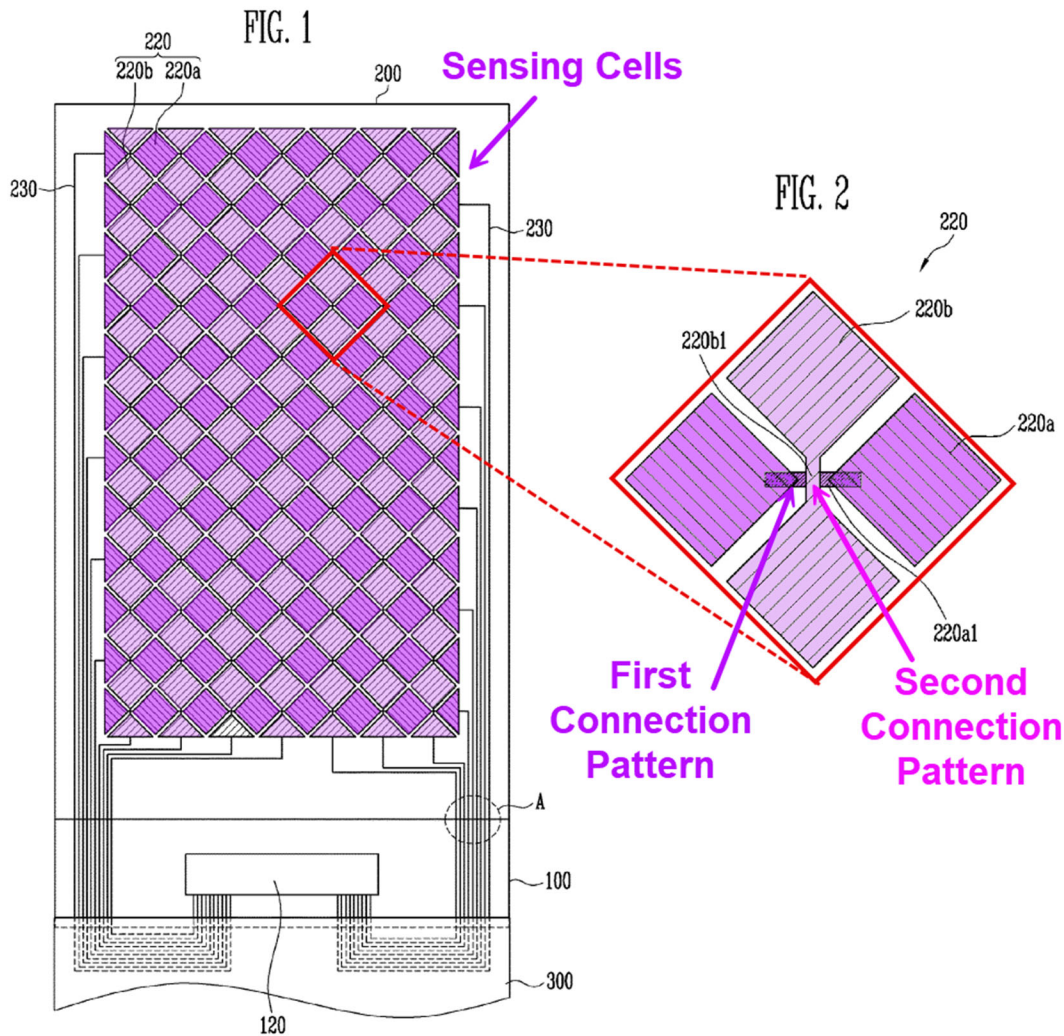


FIG. 4





Ex-1001, Figs. 1–4 (combined); *Flasck*, ¶¶98-99.

B. Prosecution History

The '088 patent is a continuation of U.S. application No. 13/021,581 (“’581 application”) filed February 4, 2011, and issued as U.S. Patent No. 9,323,400. Ex-1001, Cover. The '088 patent claims priority to Korean patent application No. KR10-2010-0089955 filed Sep. 14, 2010. *Id.*; *Flasck*, ¶¶100-01.

During prosecution, the Examiner primarily relied upon Jang (Ex-1002, 110-13), but Jang had a different configuration of layers than the '088 patent (Ex-1001, 151-53). *Flasck*, ¶102. Once the Applicant amended the claims to provide more details about the intended configuration of layers, the Examiner allowed the claims to issue. Ex-1002, 278-80 (amendments), 365 (allowance); *Flasck*, ¶¶102-04.

V. LEVEL OF ORDINARY SKILL

As of September 2010 (the earliest possible effective date), a person of ordinary skill in the art (“POSITA”) of the subject matter in the '088 patent would have had a bachelor’s degree in electrical engineering, physics, materials science or engineering, or a related field and at least four years of experience with design or development of touchscreen displays, or the equivalent. Additional education could substitute for industry experience and vice versa. *Flasck*, ¶22.

Mr. Flasck was at least a POSITA in the field as of September 2010 and is qualified to offer opinions here. *Id.*, ¶¶1-21, 23-42.

VI. CLAIM CONSTRUCTION

Petitioner does not believe claim constructions are necessary to resolve the issues presented in this Petition. *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019); *Flasck*, ¶105. Petitioner is unaware of any prior claim construction determination related to the '088 Patent. 37 C.F.R. §42.100(b).

VII. DETAILED EXPLANATION OF GROUNDS

A. Ground 1A: Obviousness over Chen-Jang-Sano-Sakamoto (Claims 1-13)

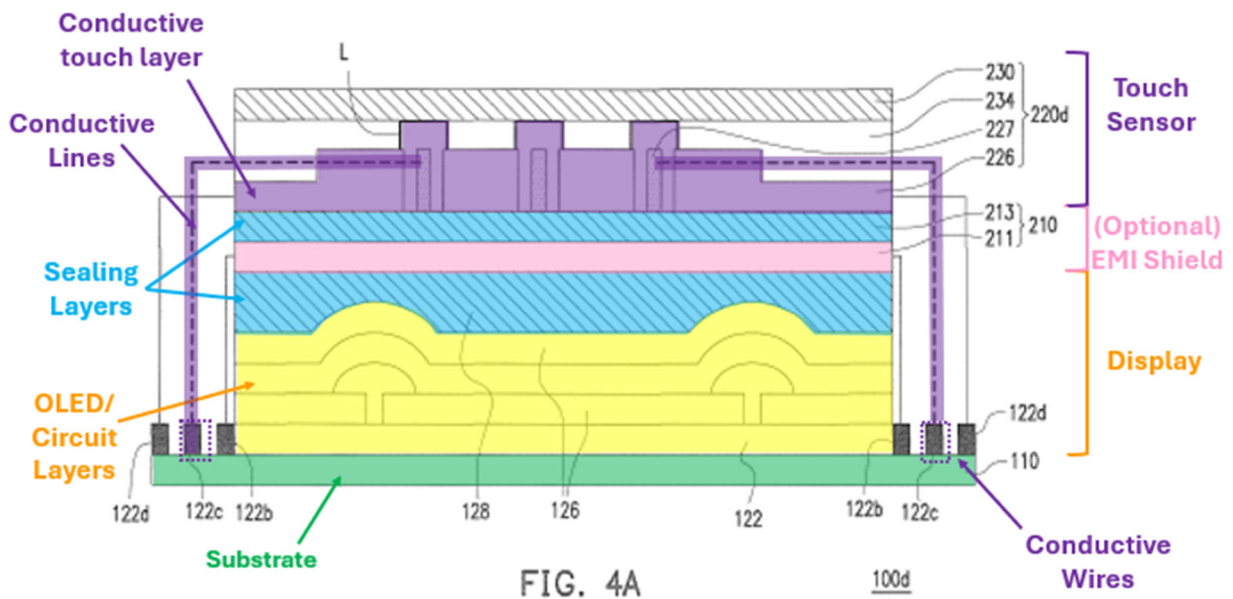
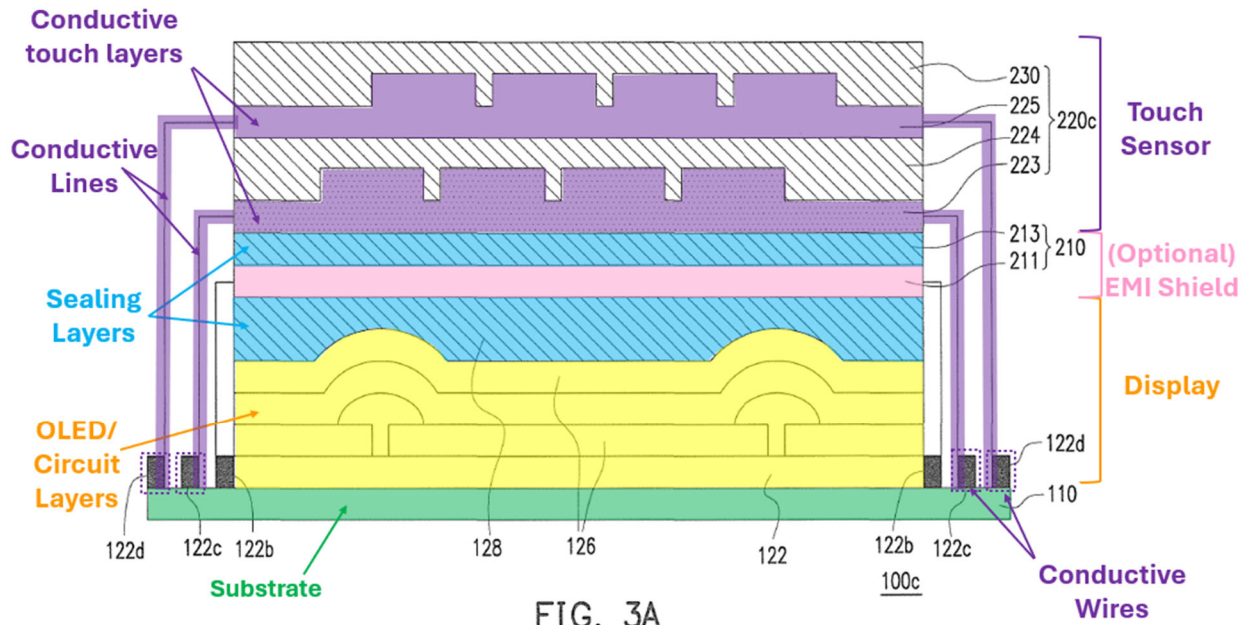
1. Prior Art

POSITAs would have recognized Chen , Jang, Sano, and Sakamoto all teach critical operational features and design aspects of OLED touch panel display devices (*Flasck*, ¶¶106-17) and constitute analogous art (*id.*, ¶¶118-20).

2. Motivation to Combine

a. Combining Chen with Sano, Jang, and Sakamoto

Chen discloses OLED touchscreen components including an OLED-display protected by a water/oxygen barrier (sealing) layer, a touch-sensor panel formed on top of the sealing layer, and wiring formed on the substrate to transmit signals from the touch-sensor panel. *Chen*, 1:61-29; *Flasck*, ¶¶107-11. Chen describes the layers of an “OLED touch-sensing display apparatus” but does not detail its practical, physical layout, motivating POSITAs to look at other prior art to implement Chen’s design in practice, such as: how the sealing layers are formed and shaped, how the conductive wires (122c, d) are arranged on the substrate (100), or how the conductive lines connect the touch sensors (223, 225) on the OLED panel’s sealing layer to the conductive wires (122c, d) connected to drive circuitry. *Chen*, 1:16-56; *Flasck*, ¶121.



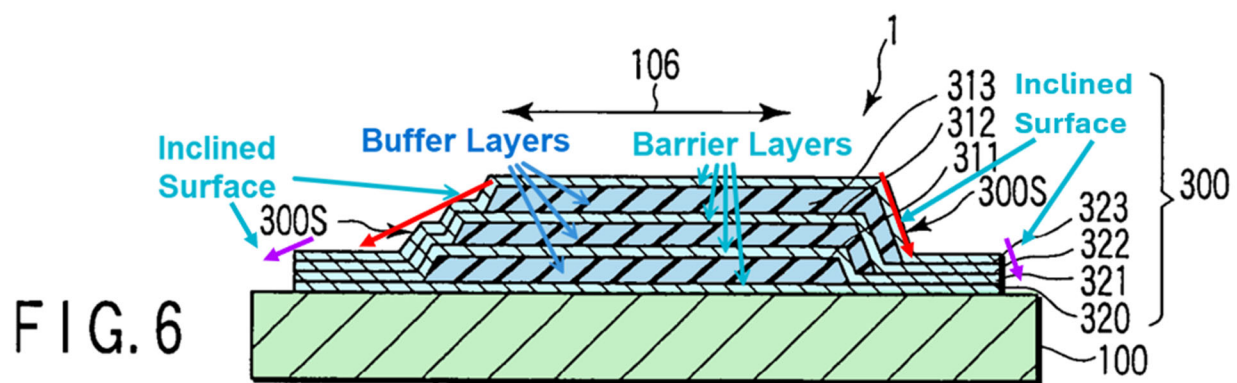
Chen, Figs. 3A, 4A. *Flasck*, ¶121. Specifically, *Chen* discloses a step difference between touch-sensing structure 200 and its associated second and third conductive wires (122c, d) formed on substrate 110. To traverse the step, *Chen* depicts conductive lines that extend downwardly from touch-sensing structure 200 above

and over the top of OLED display layer 120 to second and third conductive wires 122c-d on substrate 110. *Chen*, 7:17-8:26, Figs. 3A, 4A. POSITAs would have understood that some portion of the conductive lines passes over sealing layer 128. *Flasck*, ¶121. Yet *Chen* does not explain exactly how these conductive lines are formed. *Id.*

POSITAs would have therefore looked to other prior art to understand how to implement these details—e.g., how to form a protective sealing layer, how conductive wires 122c-d should be arranged on the substrate, and how they should be connected. *Flasck*, ¶122. Given *Chen*’s recognition of the step difference and downward wiring due to this step difference, POSITAs would have recognized that *Chen*’s conductive wires 122c-d—formed together with active array device 122 on substrate 110—would have required routing the electrical connections of the higher layers back down to the drive circuitry on the lowest substrate to communicate with and operate the multilayer OLED/touch panel display. *Chen*, 5:42-52; *Flasck*, ¶122.

POSITAs implementing *Chen*’s sealing layer would have consulted *Sano*, which teaches forming a sealing layer from stacked layers of alternating (organic) buffer and (inorganic) barrier materials to inhibit oxygen and moisture from degrading the OLEDs. *Sano*, Fig. 6, ¶¶7, 172, 178; *Flasck*, ¶123. Providing a multilayered, alternating sealing layer was common, because any individual barrier layer may contain defects that would otherwise allow degradants to pass through

(see *Sano*, ¶8; *Flasck*, ¶123); stacking barrier layers separated by buffer layers inhibited degradants much better than a single-layer barrier structure. *Flasck*, ¶123; see, e.g., *Hayashi*, ¶¶6-10; *Affinito*, Abstract, 2:54-3:19; *Graff*, 3:16-43, 3:51-4:5. Chen envisions sealing layer (128) “can be an inorganic thin film, an organic thin film, **or a combination thereof.**” *Chen*, 3:37-6:61. Sano also teaches multiple barrier layers; each barrier layer is larger than its underlying buffer layer so that the barrier layer coats (seals) even the edges of the buffer layers to create a complete seal, producing an inclined surface (red) at the edge of the buffer and inorganic layers. Additionally, and as discussed further below, inorganic barrier layers were conventionally deposited using a mask—a structure with opening to control where material is deposited—in a PECVD process that was known to produce inclined surfaces (purple) at the edge of the top inorganic layer:



Sano, Fig. 6, ¶¶71-72, 106-09, 133, 158, 171, 173, 215; §III; *Flasck*, ¶123.

POSITAs would have been motivated to modify Chen in view of Sano to provide a complete sealing layer that would inhibit degradants from reaching the OLEDs. *Flasck*, ¶124. Chen's OLED-sealing layer stacks on top of the OLEDs, leaving the sides unsealed and exposed (black dashed boxes):

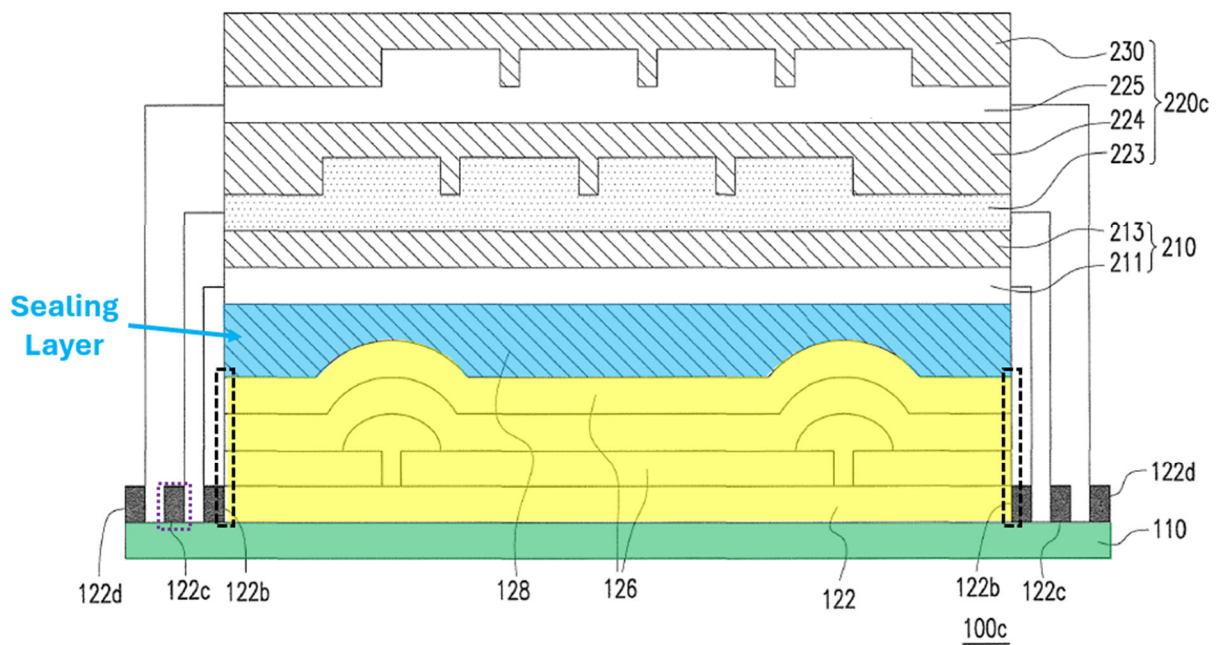


FIG. 3A

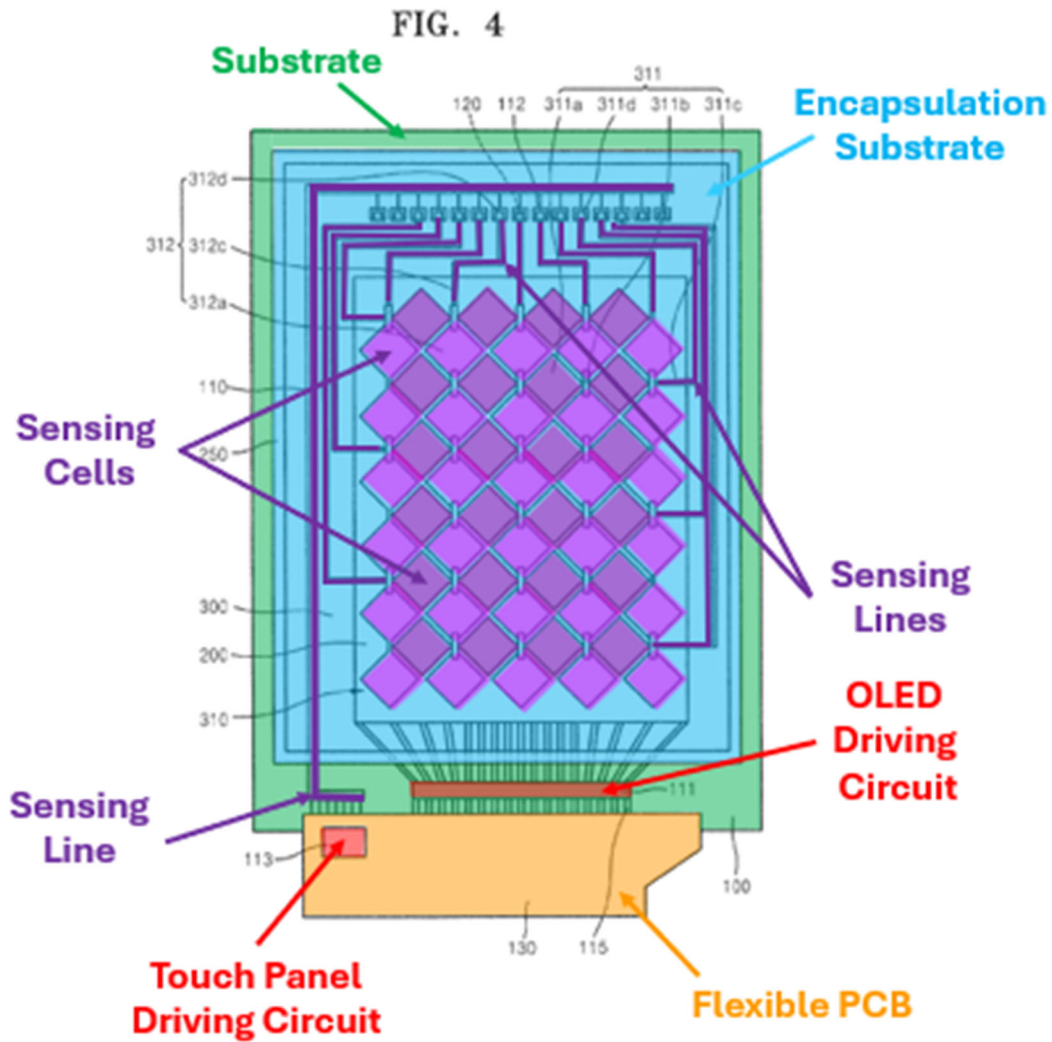
POSITAs would have been motivated to implement Chen's sealing layer (water/oxygen barrier layer 128) as a multilayered structure of alternating buffering and barrier layers—as Sano evidences was well-known in the art—to ensure degradants would not reach the OLEDs. *Id.*, ¶125.

POSITAs would have had a reasonable expectation of success making this modification because Chen already teaches a sealing layer for protecting the OLEDs from moisture and oxygen, which need only be extended to completely cover the

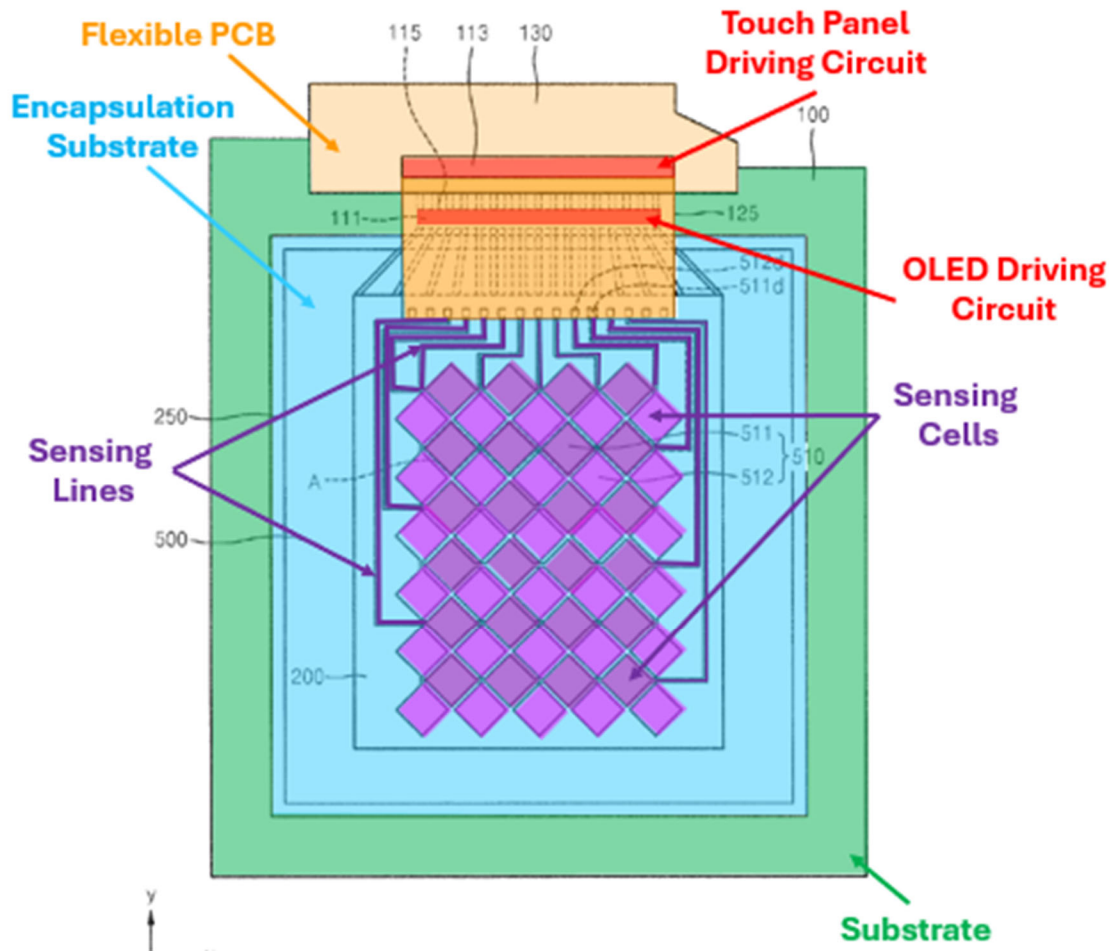
OLEDs in view of Sano. *Id.*, ¶126. Moreover, Sano expressly teaches alternating buffer and barrier structures—as well as the processes to layer them—to form an increasingly impenetrable sealing layer. *Id.*

To implement Chen’s touch structure, POSITAs would have understood that typical touch sensors include touch areas (on the display) with electrodes that sensing lines connect to peripheral areas (off the display) to connect the touch sensor electrode to a driving circuit typically formed on a substrate or flexible printed circuit. *Id.*, ¶127. POSITAs would have consulted Jang, for instance, which expressly discloses a layout of these elements: how sensing lines are arranged for a touch-sensor panel, what other components those lines are connected to, and that the touch sensor electrodes require connection to sensing lines continuing toward the periphery of the touch panel for further connection to controlling drive circuitry. *Id.*, ¶127.

Specifically, Jang teaches electrically-conductive lines (“sensing lines”) that connect the on-display touch-sensor components to terminals at the periphery of the touch panel and further to a conventional flexible PCB and driving circuit located away from the display to drive the touch sensors to analyze the signals in response to a user’s touch. *Jang*, Fig. 4, ¶¶71-72, 83-87; *Flasck*, ¶127.



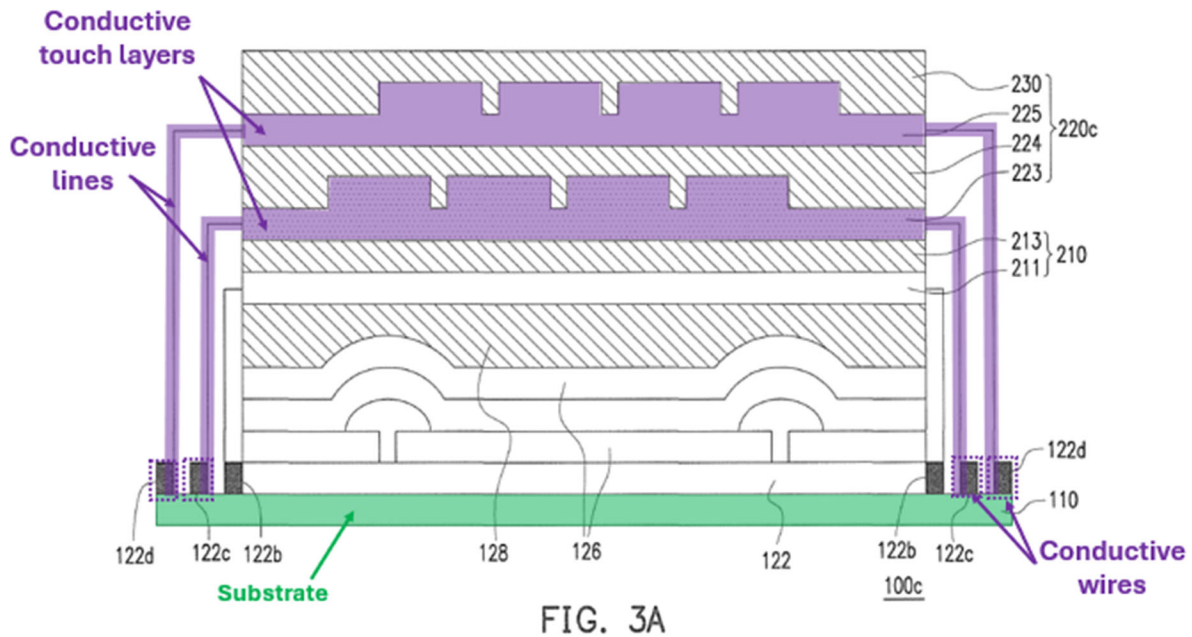
See also Jang '041, Fig. 9, ¶¶120-24; Flasck, ¶¶113-16, 127.



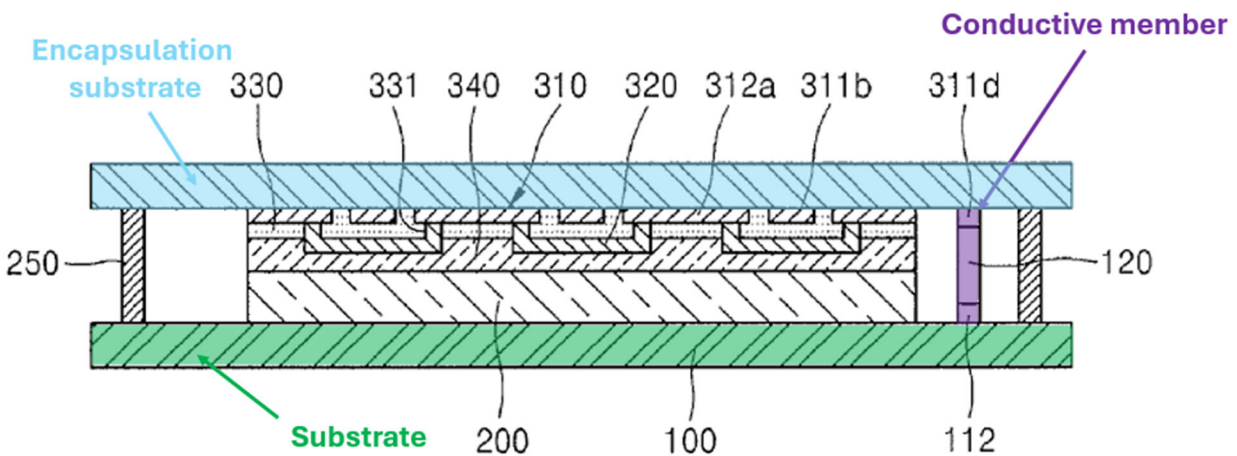
Jang teaches a flexible PCB “provide[s] an integrated interface for enabling a touch panel function,” “effectively reduce[s] manufacturing costs, and...improve[s] the ease of manufacture and the user’s convenience.” *Jang*, ¶¶87-88; *Flasck*, ¶128. POSITAs would have been motivated to implement Chen’s device according to Jang’s layout because it was known that touch-sensor lines typically connect on-display touch sensors through off-display terminals to lower substrate terminals which serve as a conductive connection interface to a driving circuit to process touch signals and drive the display. *Flasck*, ¶128.

POSITAs would have had a reasonable expectation of success modifying Chen in view of Jang because Jang provides an express disclosure of what POSITAs would have understood is implicit in Chen—on-display touch electrodes (which are formed above the OLED sealing layer) are connected to off-display conductive wires (formed on a lower substrate) to connect to the touch-sensor’s driving circuitry. *Flasck*, ¶129.

But POSITAs would have understood that neither Chen nor Jang resolves how the touch panel sensing lines on the substrate at one elevation are connected—over a step—to the touch-sensor components on the sealing layer at a different elevation. *Flasck*, ¶130. Chen discloses a conductive line extending over a step between the touch-sensing structure 200 at a high elevation and its associated second and third conductive wires 122c and 122d on the substrate 110 at a lower elevation.



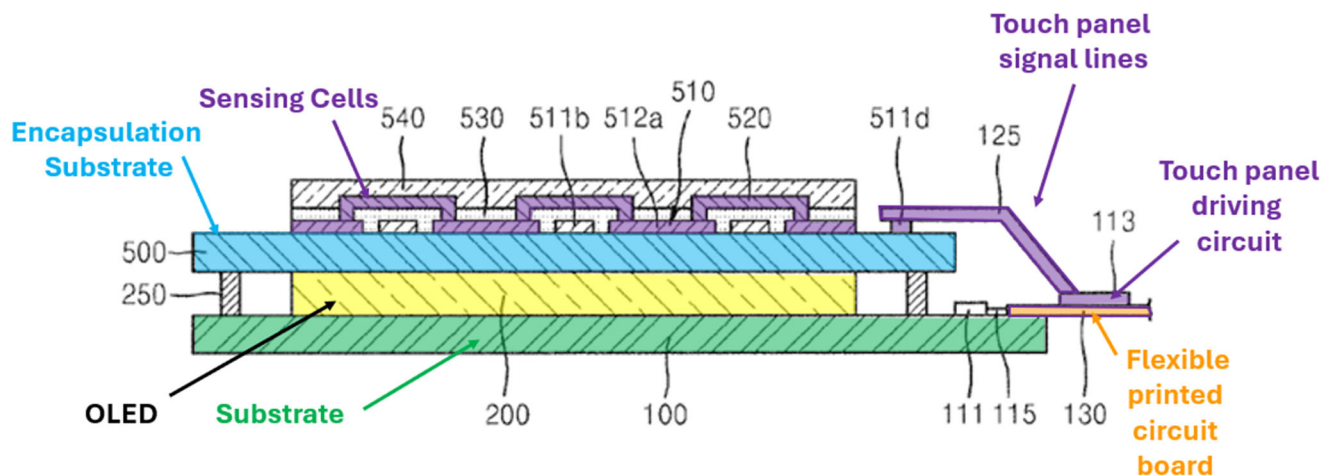
Chen, Figs. 3A, 4A. And *Jang* requires a conductive member 120 to electrically connect touch electrodes contact units (e.g., 311b) through data line 110 to substrate contact units 112 through conductive member 120:



Jang, Fig. 5 (above), ¶¶69-72, 82 *see also id.*, Figs. 3A-E, 4-5; *Flasck*, ¶130. *Jang*'s data line 110 further connects to flexible PCB 130. *Id.* POSITAs would have understood these Fig. 5 sensing line connections would not have applied to *Chen*'s

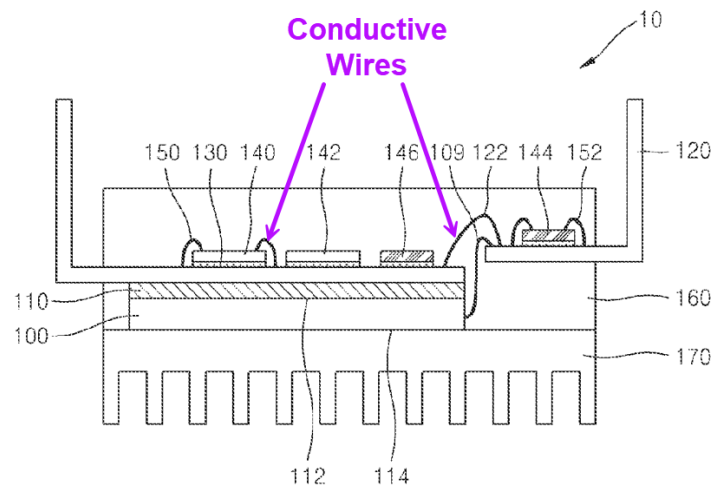
structure because they are formed differently, and therefore would have sought another known method to complete the connection. *Id.*

POSITAs would have recognized three primary ways to connect Chen's sensing lines on two different, vertically-spaced horizontal layers at different elevations. *Flasck*, ¶¶131-33. First, the conductive elements, e.g., conductive wires 122c-d on the substrate (which further connect to the drive circuit) may be wire-bonded to the touch sensors (e.g., connecting by a loose wire). *Jang '041*, Fig. 10, ¶¶122-26:

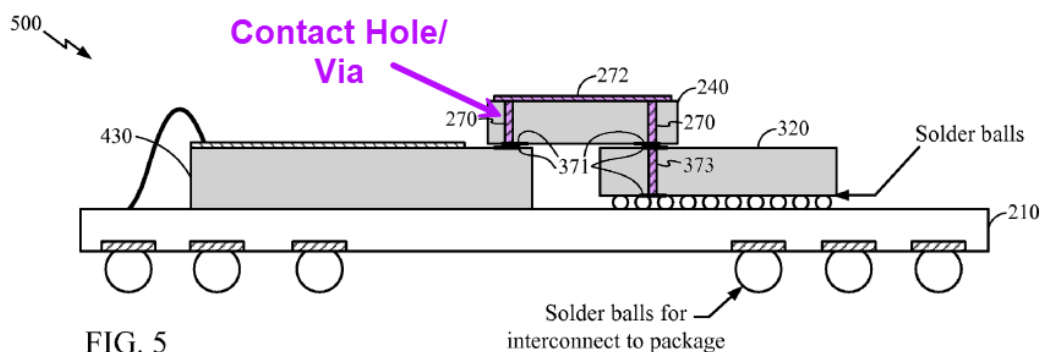


See also *Shigihara*, 15:11-15, 16:17-21, Figs. 12, 14; *Lim*, 10:59-62, Fig. 4D, and Fig. 1:

FIG. 1

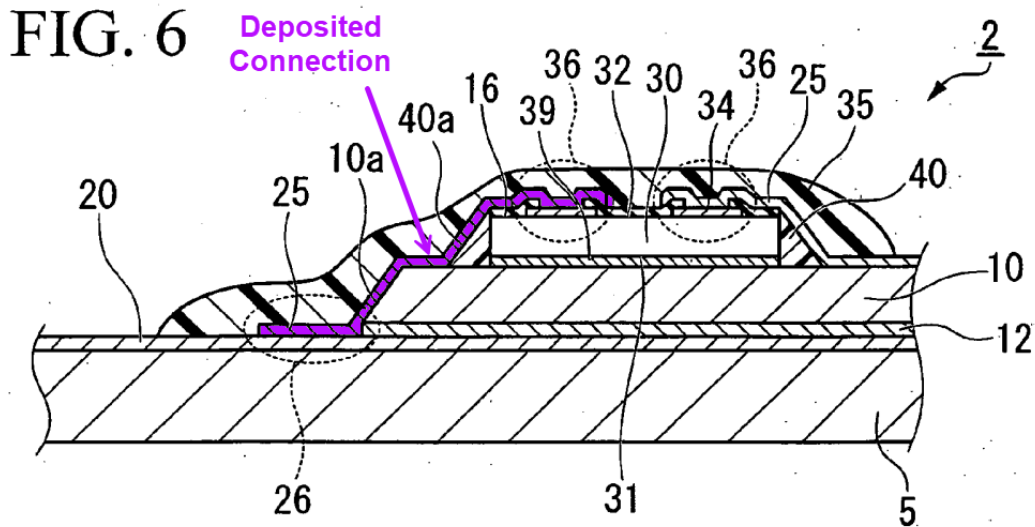


Second, the lower layer conductive elements, e.g., conductive wires 122c-d on the substrate may use a vertical contact hole/via through an insulating layer filled with conductive material to connect to the touch sensors formed on a different, higher horizontal layer. See, e.g., *Chandrasekaran*, 4:48-59, Fig. 5:



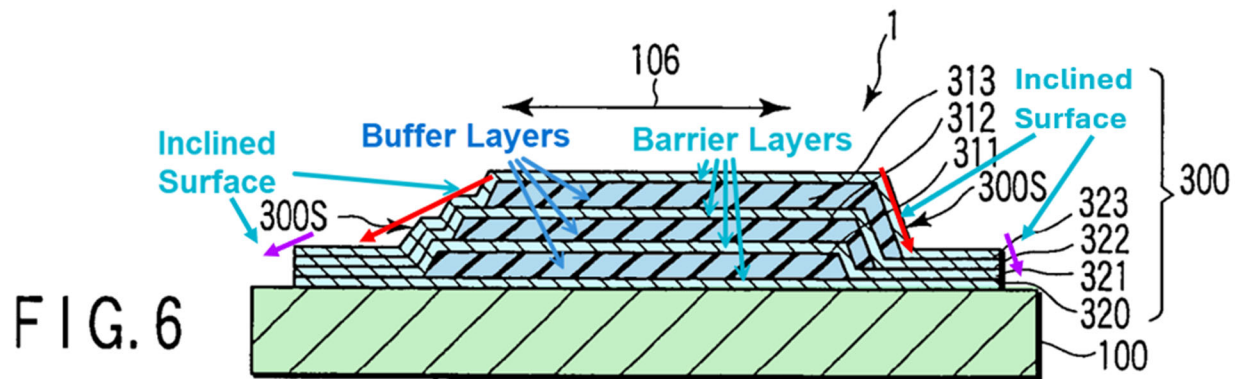
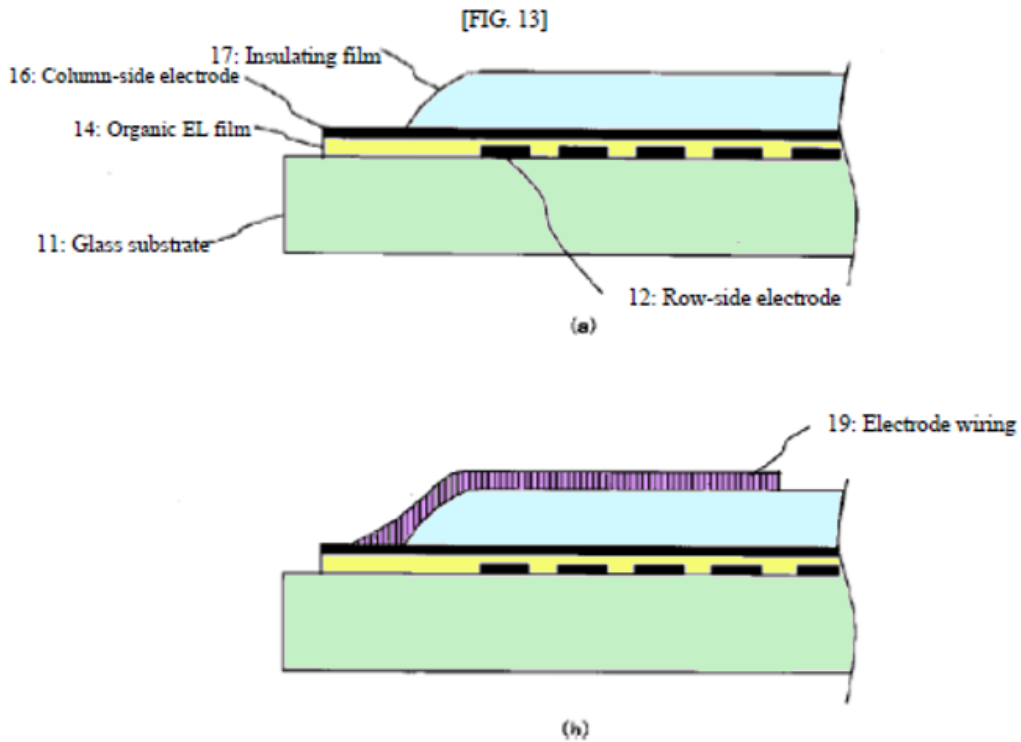
Third, the sensing lines may simply be deposited on the side or end surfaces of the layers between the conductive elements (e.g., Chen's conductive wires 122c-d in Fig. 3A) and touch sensors (e.g., Chen's conductive layers 223, 225 in Fig. 3A) to provide connections between components at different elevations where the

1, 7, ¶¶10-12; *Hashimoto*, ¶101, Fig. 7, Fig. 6:



Flasck, ¶¶131-33.

lines along the side-slope of an intervening insulating layer, therefore connecting a first portion at a higher elevation to a second portion at a lower elevation. *See Sakamoto*, Figs. 13a-b (top), ¶¶8, 23; *Sano*, Fig. 6 (bottom), ¶¶71-72, 106-09, 133, 158, 171, 173, 215; *Chen*, 5:53-6:61; §III.



Flasck, ¶133.

Because there were a limited number of suitable, known, and routine options to connect conductive elements at different elevations, POSITAs implementing Chen's touchscreen display (e.g., Fig. 3A), would have found any of these options

obvious to try because POSITAs would have recognized a need to connect Chen's conducting wires on the substrate to the touch sensors on the sealing layer using sensing lines, using well-known, straightforward connection options. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 421 (2007); *Cardiovalve Ltd. v. Edwards Lifesciences Corp.*, No. 2022-2230, 2024 WL 1208638, at *3 (Fed. Cir. Mar. 21, 2024); *Flasck*, ¶134.

However, POSITAs would have been especially motivated to deposit a sensing line along the surface of the sealing layer when implementing Chen's invention with a multilayer encapsulation layer as taught by Sano. Specifically, of the known options, wire-bonding was an older process that required more physical space for the wires, required dedicated bonding and alignment tools limiting scalability and device density, and precluded sealing thin films (which may crack easily under the pressure of bonding) because bonded wires require a thicker encapsulation substrate for support. *Jang '041*, Fig. 10 (125); *Flasck*, ¶135. And conductive via connections would require more space for the non-conductive planarizing layer for a conductive connection to pass through, and would also require a multi-step patterning such as etching, gap-filling, and trench-deposition process to form the conductive via connection that would penetrate the encapsulation layer (defeating its sealing purpose). *Flasck*, ¶135.

POSITAs would have recognized that depositing a sensing line on the inclined surface of an encapsulation layer like Sano's would have been the most straightforward and streamlined fabrication method, improving scalability and manufacturing costs over the other two approaches as described above. *Flasck*, ¶136. Sano expressly teaches sizing each buffer and barrier layer in a way that produced a "moderate" inclined surface further including another inclined surface at the end of the inorganic encapsulation layer resulting from a known deposition process to ensure that subsequent material layers would be deposited without breaks, meaning POSITAs would have understood that Sano's inclined surface would enable depositing an uninterrupted, uniform thickness sensing line along the incline. *Chen*, 5:53-6:61 (describing CVD- and PECVD-based layer formation); *Sano*, ¶133; *Kiyose*, ¶¶65-66; *Flasck*, ¶136. Sakamoto teaches such a deposition process had been used in OLED displays to connect conductive elements at different elevations. *Sakamoto*, Fig. 13, ¶¶8, 23; *Flasck*, ¶136; *see also Jiawei Tech. (HK) Ltd. v. Simon Nicholas Richmond*, IPR2014-00936, Paper 67, 27-28 (Dec. 15, 2015).

POSITAs would have had a reasonable expectation of success directly depositing a conductive line between Chen's conductive wires on the substrate and the touch-sensor components on the sealing layer because depositing conductive lines on the surfaces of intervening layers was well-known, and Sano's sealing layer allows deposition of an uninterrupted connection. *Flasck*, ¶137.

POSITAs would have also recognized that Chen's fabrication method is predisposed to deposition over the sealing layer because Chen forms the drive circuit-connected conductive members that further connect to "conductive wires" 122b-c "during formation of the active array device 122 on the substrate 110," or "in advance" of forming the touch panel conductive layers. *Chen*, 7:38-55. Further, Jang discloses that the sensing lines are coplanar with the sensing cells. *Jang*, Fig. 4 (connecting 311a to 311c, 312a to 312c); *Jang '041*, Fig. 4 (showing same). POSITAs would have understood that Chen's conductive wires (122c, d) on substrate 110 were made before the intervening encapsulation layers and sensing cells of the touch structure 200a formed above at the higher elevation relative to substrate 110, and Jang connects the touch sensing lines to touch sensing cells on the same layer at the higher elevation. *Flasck*, ¶139. Facing a need to provide electrical connections across an elevation difference, POSITAs would have found it obvious to simply connect the two different layer elevation points by depositing the sensing lines over the intervening barrier layers because Sano and Sakamoto evidence that it was a well-known technique. *Id.*, ¶¶138-41.

b. Combining Sano with Chen, Jang, and Sakamoto

Additionally, or alternatively, given Chen's step difference and the needed downward wiring for connections over it, POSITAs would have been motivated to start with Sano and modify it in view of Chen, Jang, and Sakamoto.

Sano seals an OLED display from environmental degradants, but does not provide any user input to the display. Sano's display either has no user input, or relies upon external inputs (e.g., keyboard/mouse). *Flasck*, ¶142. However, touch-panel displays were growing in popularity as of 2010, and POSITAs would have been motivated to modify Sano to incorporate a touch panel into Sano's display to provide a direct form of user input. *Flasck*, ¶142.

POSITAs would have turned to Chen, Jang, and Sakomoto to identify the structures of the touch panel (e.g., Chen) and how they should be integrated into the display (e.g., Chen, Jang, Sakomoto). *Flasck*, ¶143. Chen expressly teaches that its touch panel is intended to be formed on the encapsulation layers of an OLED display panel—like Sano's—to create an integrated structure where “production costs can be reduced, and the manufacturing process can be simplified.” *Chen*, 8:49-51; *Flasck*, ¶143.

POSITAs would have consulted Jang and Sakomoto to provide the details to implement Chen's downward wiring for connecting, over the step difference in Chen, on-display touch-sensor panel to off-display driving circuits—including by forming the touch-sensing lines to traverse the inclined surface of Sano's encapsulation layer, for the same reasons discussed above when starting with Chen to provide an encapsulation layer with an inclined surface. *Flasck*, ¶143.

Finally, POSITAs would have had a reasonable expectation of success in making this modification because the modification merely involved forming additional touch-panel-related layers on Sano's display, Chen taught the layers required, and Jang and Sakamoto explain how to implement Chen's touch sensors. *Flasck*, ¶144. Integrating a touch-sensor panel into a display was a routine and well-known process by 2010. *Id.*

3. Claim 1

a. 1[pre]

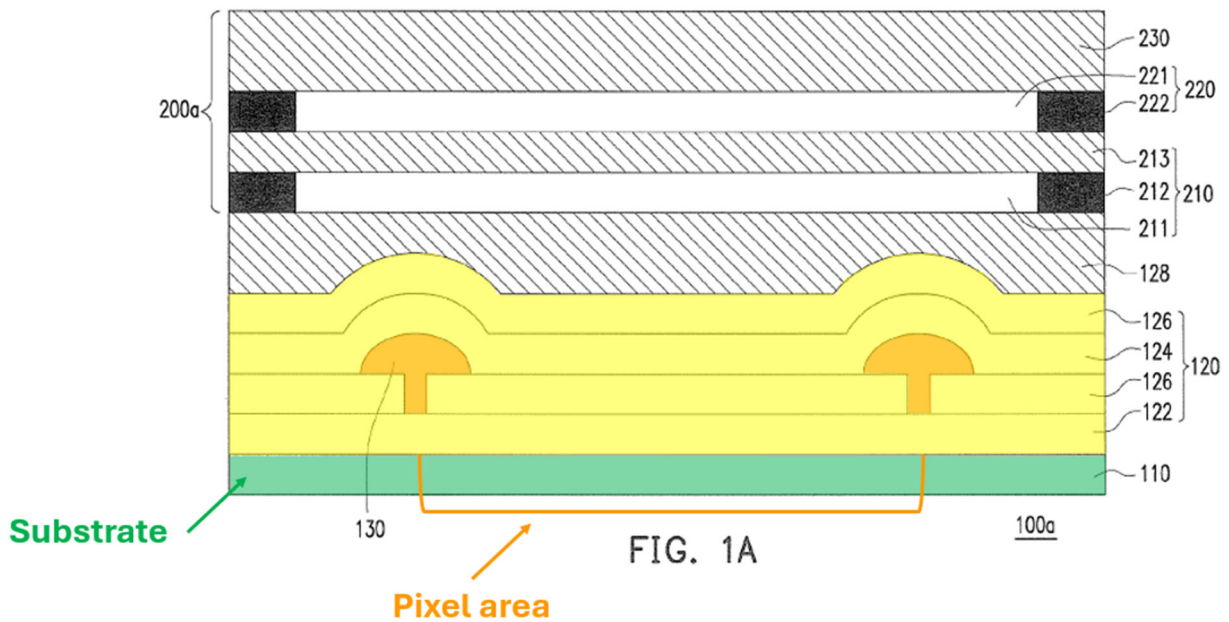
If limiting, Chen discloses 1[pre]. *Flasck*, ¶¶145-46.

Chen discloses “[a] touch-sensing display apparatus.” *Chen*, Abstract, 1:16-21, 1:61-2:24, 2:64-3:36.

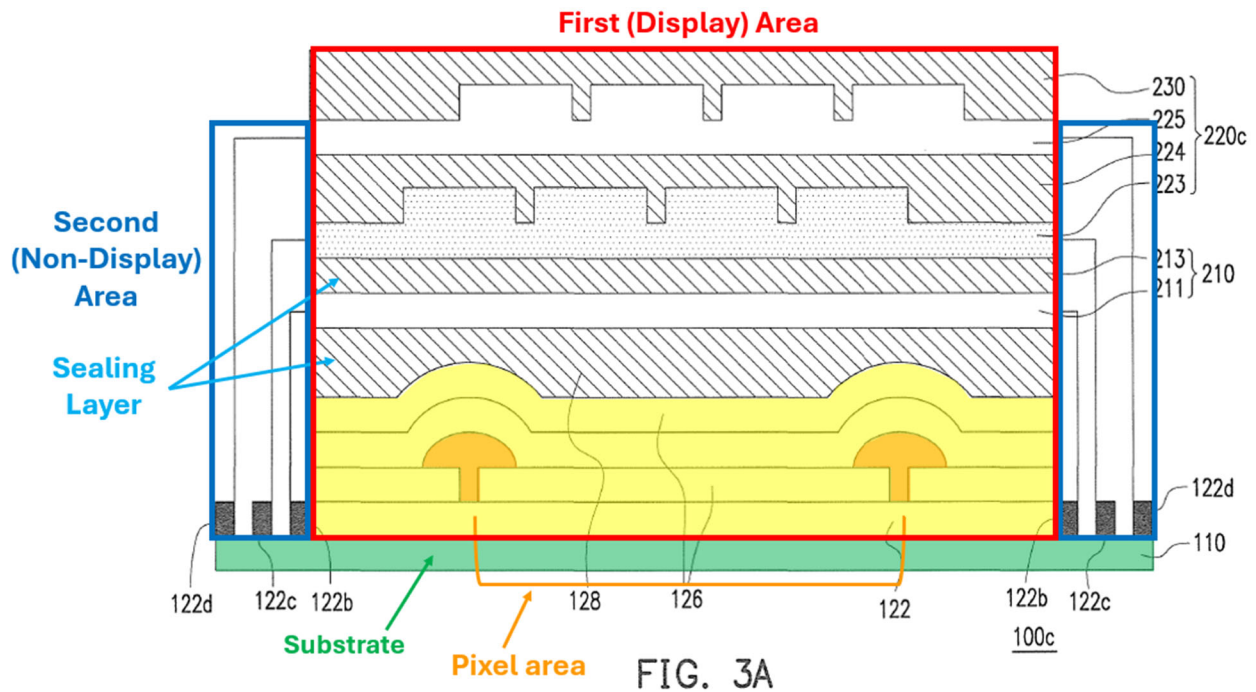
b. 1[a]

Chen or Chen-Jang teaches 1[a]. *Flasck*, ¶¶147-51.

Chen discloses that the display includes substrate (110) with “OLED display layer 120...disposed on the substrate 110,” and “OLED display layer 120 further includes a pixel defining layer 130” and shows a plurality of OLED pixels for the OLED display. *Chen*, 2:66-3:26, Fig. 1A. Each pixel area of the display device in FIG. 1A includes an organic light emitting layer 124 between the two and bottom OLED electrode layers 126 to emit light for display images. *Id.* Chen therefore discloses a substrate that includes a first area having a pixel area. *Flasck*, ¶148.

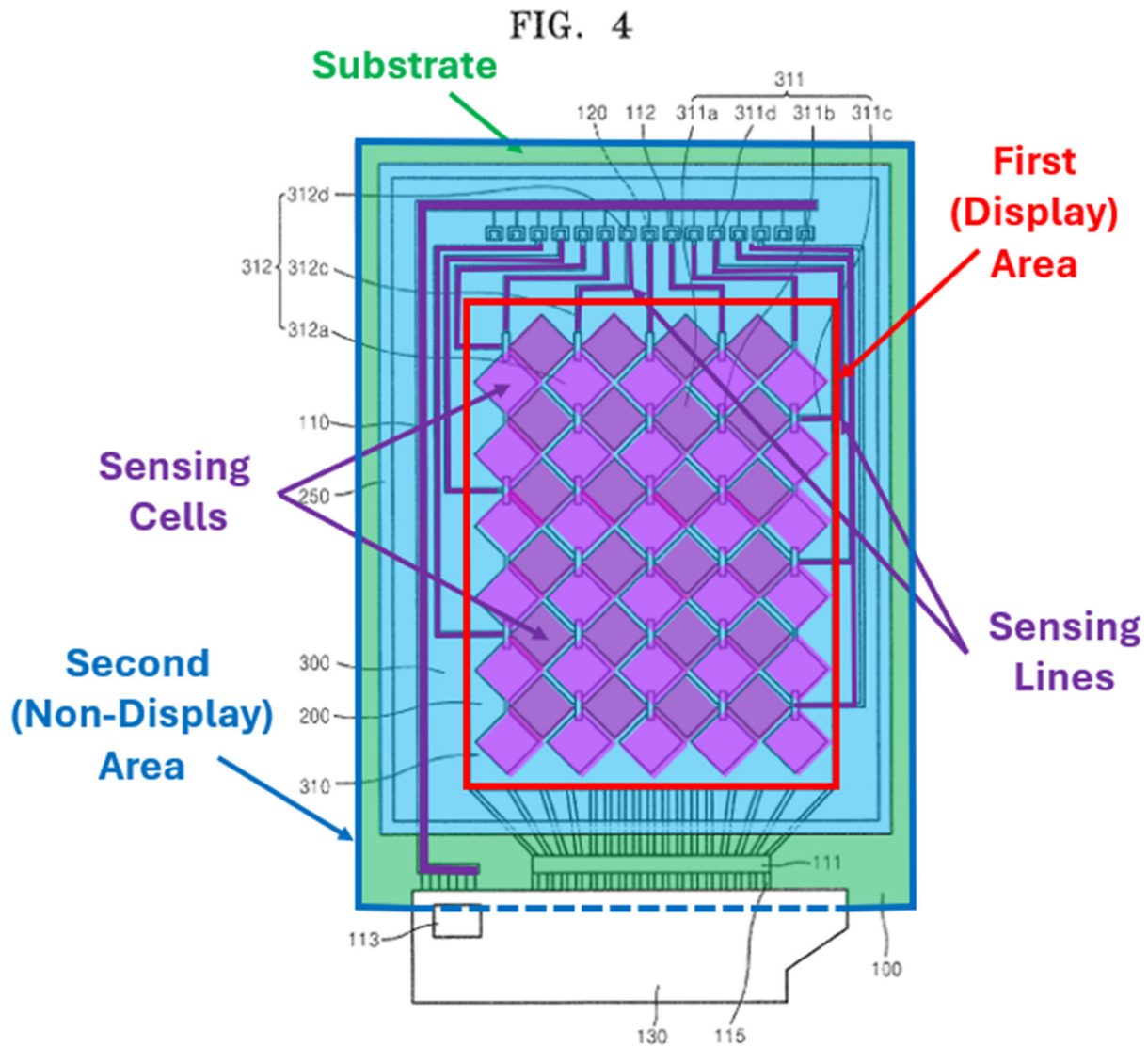


Chen's conductive wires (122c, d) are "formed on the substrate 110" in a non-display area (the "second area" as claimed) that is different from—but adjacent to—the display area (the claimed "first area"). *Chen*, Fig. 3A, 7:13-55.



Although disclosed in a different embodiment, POSITAs would have understood that each of Chen's embodiments would have conductive lines to attach the conductive touch-sensor components to processor components in a non-display area to process touch-sensor signals. *Flasck*, ¶149.

Jang confirms this is how POSITAs would have understood Chen’s arrangement. *Flasck*, ¶150; §VII.A.2. Unlike Chen’s cross-sectional views, Jang provides a top-down view that shows touch sensing lines (311c, 312c) connecting on-display touch sensors to off-display processors located on a lower substrate. *Jang*, Fig. 4; *Flasck*, ¶150.



POSITAs would have understood that Chen's display would have a first display area with the display and touch-sensor components, and a second non-display area adjacent the first display area with the processing elements and conductive lines connecting the on-display and off-display components, consistent with Jang. *Flasck*, ¶151; §VII.A.2.

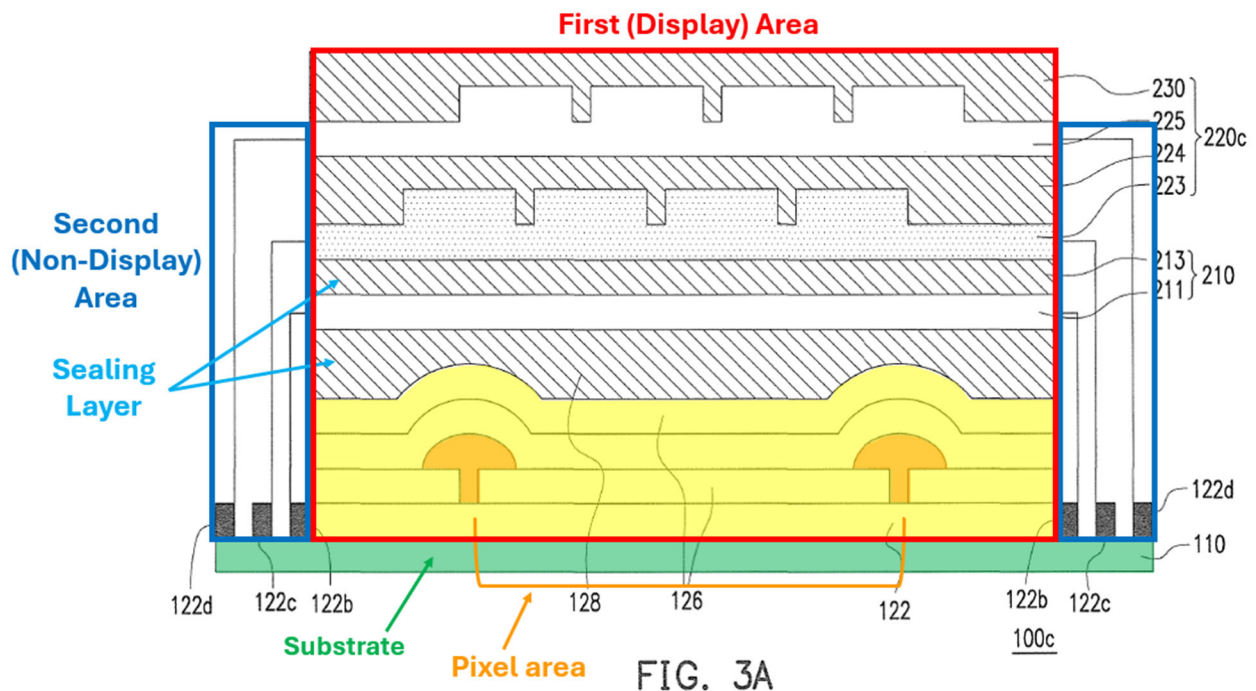
c. 1[b]

Chen or Chen-Jang teaches 1[b] for the reasons above. §VII.A.3.b(1[a]); *Flasck*, ¶152.

d. 1[c]

Chen-Sano teaches 1[c]. *Flasck*, ¶¶153-60.

Chen discloses “a first water/oxygen barrier layer 128 can be disposed on the OLED display layer 120”—e.g., in the “first area of the substrate,” as claimed—“to prevent oxygen and moisture from entering into the OLED display layer 120.” *Chen*, Fig. 3A, 3:9-26, 3:46-51, Fig. 4A.



“Preferably” the device can include an EMI layer, and the “barrier layer 128 and the EMI shielding layer 210 can be individually disposed or be disposed in a

reverse manner,” meaning Chen provides only one or the other, or reverses their arrangement. *Chen*, 3:43-65. POSITAs would have understood that when forming a display without the EMI shielding layer, Chen’s sensing-circuit layer (220c) would be formed directly on top of a top surface of barrier layer (128). *Flasck*, ¶154. When reversing the stacking order of barrier layer (128) and EMI shielding layer (210), POSITAs would have understood that Chen’s sensing-circuit layer (220c) would be formed directly on top of a top surface of barrier layer (128). *Id.*

POSITAs guided by Chen’s sealing layer structure would have recognized Chen depicts the edges of the OLED layers (Fig. 3A in yellow) as uncovered by the sealing layer (128) and would have consulted Sano to understand how to implement Chen’s sealing layer structure to fully protect the underlying OLED structure. *Flasck*, ¶155; §VII.A.2.

Sano teaches forming sealing layer (300) like Chen’s water/oxygen barrier layer (128) as a plurality of alternating buffer layers (e.g., 311-13) and barrier layers (e.g., 321-23); the latter “are patterns larger in formation area than the buffer layers and cover the respective buffer layers to shield them from the open air,” including the peripheral edges (“end[s]”) of the buffer layers. *Sano*, Figs. 3, 6, ¶¶71-72, 106-09, 133, 158, 171, 173, 215. Sano’s arrangement produces a “sealer” with a “moderately inclined” edge:

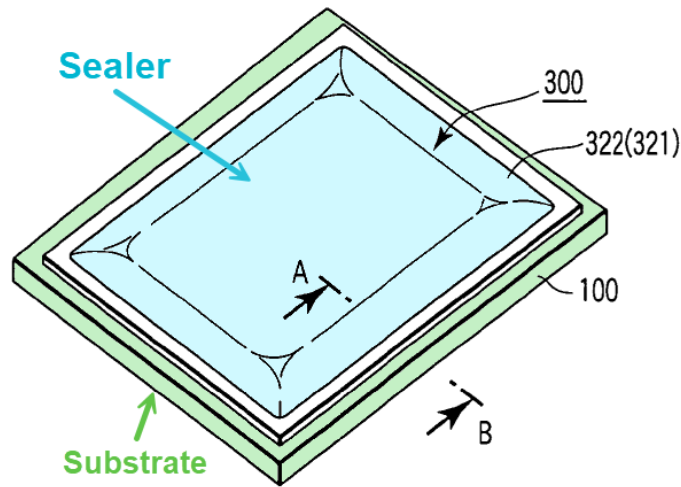


FIG. 3

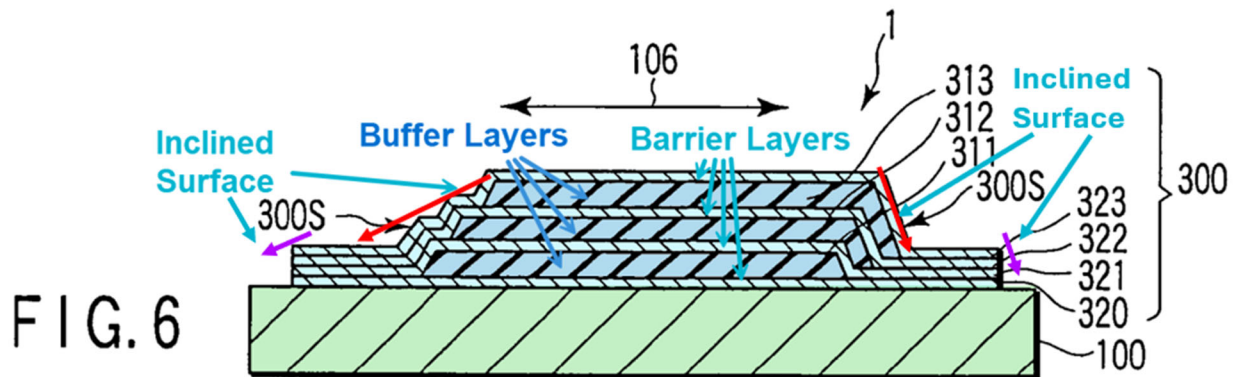
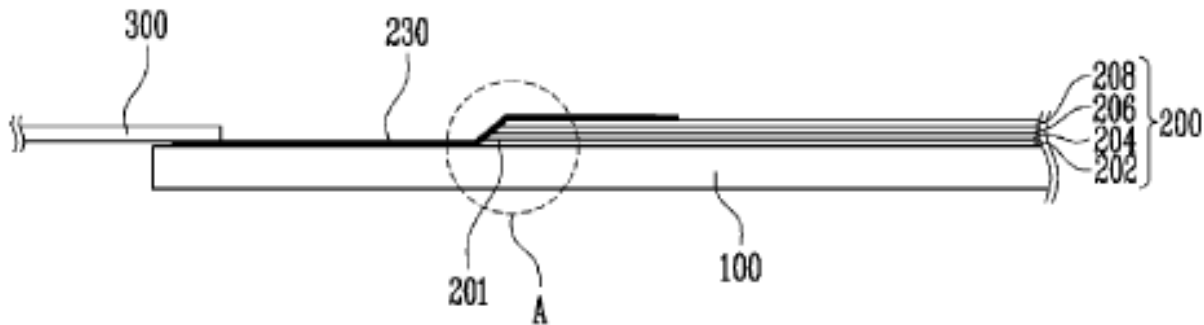


FIG. 6

Id.; *Flasck*, ¶156.

Limitation 1[c] recites the claimed “sealing thin film covering the first area of the substrate and including an inclined surface at an end” which is somehow “to inhibit infiltration of oxygen or moisture into the pixels.” *Ex-1001*, cl. 1. Adding ambiguity, the ’088 patent discloses the end is located relative to “portion A” for an altogether different purpose: “to prevent the sensing lines passing through the end portion from being broken.” *Id.*, Fig. 4, 2:44-45, 4:46-51, 5:31-35; *Flasck*, ¶157.



POSITAs would have understood that both ends of Sano’s sealer (300) have an “inclined surface 300S” to ensure “the periphery of each buffer layer can be reliably covered, thus preventing the occurrence of a coverage failure, which can in turn prevent moisture, oxygen, and the like from entering each organic EL element.” *Sano*, ¶¶108, 172; *Flasck*, ¶158. POSITAs would have recognized Sano’s sealer ends in inclines to achieve the intended purpose of the claimed design: preventing water and oxygen infiltration and avoiding disconnection of an upper conductive layer. *Flasck*, ¶158. See also *Smith & Nephew, Inc. v. Rea*, 721 F.3d 1371, 1380-81 (Fed. Cir. 2013) (citing *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007)) (finding a design modification to known prior art elements obvious where the elements were used predictably according to their established functions for an intended purpose).

POSITAs would have also recognized that Sano’s sealer barrier layers 321-23 end with inclines because the inorganic layers are formed using masks that create inclined *edges* during fabrication. *Sano*, ¶¶14-15; 71, 83-84; *Flasck*, ¶159.

POSITAs would have understood that—when implementing Chen’s device in view of Sano—Chen’s sealing layer (128) would cover the OLEDs completely to protect the edges of the OLEDs from degradants. *Flasck*, ¶160; §VII.A.2. POSITAs would have also been motivated to form Chen’s sealing layer (128) from a plurality of alternating buffer and barrier layers in which the barrier layers are deposited to cover even the edges of the buffer layers, consistent with Sano. *Flasck*, ¶160; §VII.A.2. POSITAs would have understood that sealing layer (128) would have an inclined surface at the ends of its barrier and buffer layers, consistent with Sano. *Flasck*, ¶160; §VII.A.2.

e. 1[d]

Chen teaches 1[d]. *Flasck*, ¶¶161-63.

Chen’s touch sensing structure (sensing-circuit layer (220c)) includes first (top) and second (bottom) patterned conductive layers (223, 225), each of which has a plurality of sensing cells in the form of touch sensor pads (223b, 225b) that are connected by a series of touch electrodes (223a, 225a) along two different directions D1, D2. *Chen*, Abstract, Figs. 3A-B, Fig. 4A, 7:17-37. Chen’s sensing-circuit layer (220c) is formed over (e.g., above) a top surface of water/oxygen barrier layer (128):

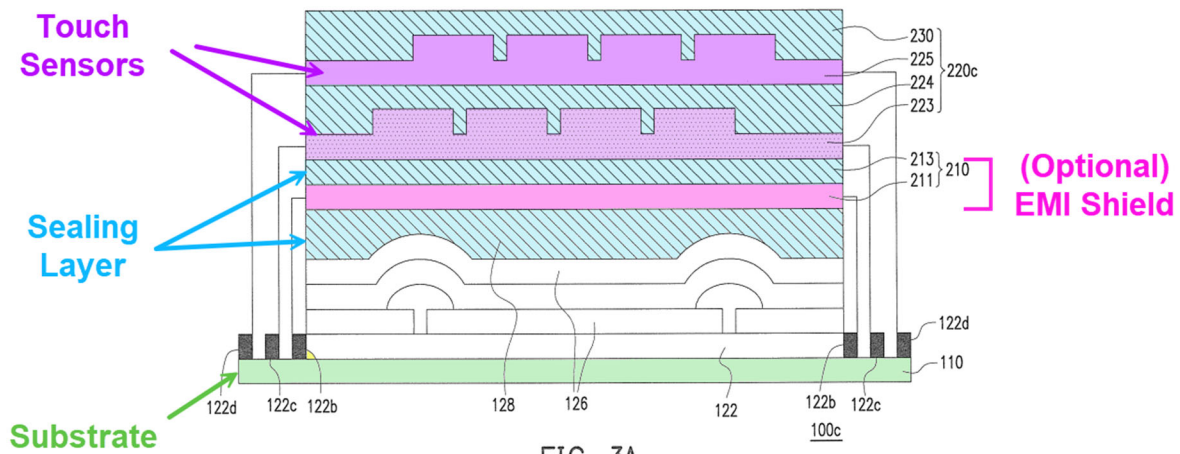


FIG. 3A

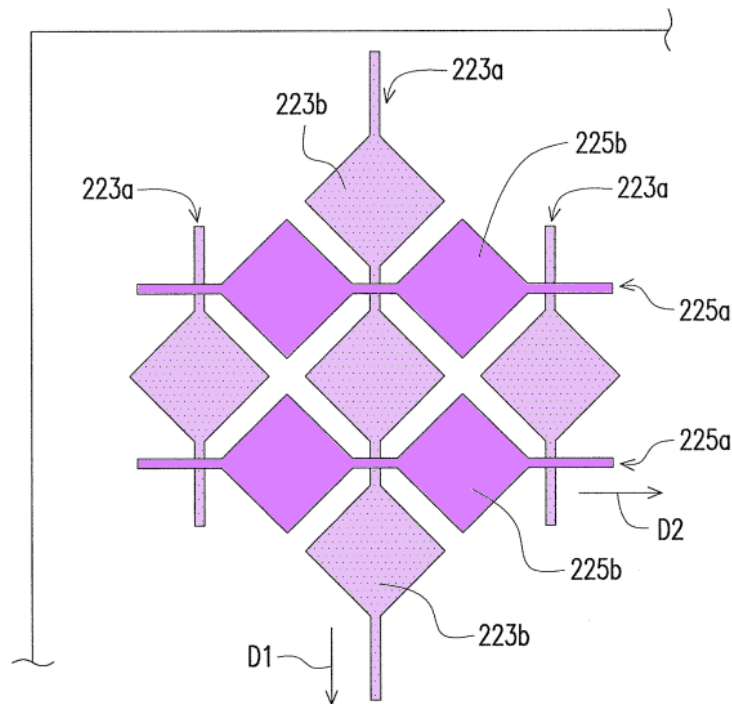


FIG. 3B

Id., Figs. 3A-B, 7:13-55; *Flasck*, ¶¶162-63.

To the extent 1[d] may be construed to mean forming sensing-circuit layer (220c) directly on top of a top surface of barrier layer (128), Chen’s “barrier layer

128 and EMI shielding layer 210 can be individually disposed or be disposed in a reverse manner,” meaning only one or the other may be provided, or their arrangement may be reversed. *Chen*, 3:62-65. POSITAs would have understood that when forming a display without the EMI shielding layer, Chen’s sensing-circuit layer (220c) would be formed directly on top of a top surface of barrier layer (128). *Flasck*, ¶162. When reversing the stacking order of barrier layer (128) and EMI shielding layer (210), POSITAs would have understood that Chen’s sensing-circuit layer (220c) would be formed directly on top of a top surface of barrier layer (128). *Id.*, ¶163.

f. 1[e]

Chen or Chen-Jang teaches 1[e]. *Flasck*, ¶¶164-69.

Referring to 1[a] and 1[d], Chen’s first touch electrodes (223a) and second touch electrodes (225a) extend along first and second directions (D1, D2) to electrically connect to first touchpads (223b) and second touchpads (225b) as touch sensing cells along directions D1 and D2, respectively. *Chen*, Figs. 3A-B, 7:1-55. First touch electrodes (223a) and second touch electrodes (225a) at the periphery of the touch area in Chen are part of the claimed sensing lines to be coupled to the sensing cells defined by first touchpads (223b) and second touchpads (225b). *Id.*; *Flasck*, ¶164.

Chen teaches first and second patterned conductive layers (223, 225) coupled to a plurality of conductive lines (or “sensing lines,” as claimed) that are connected to touch electrodes further extended and connected to “conductive wires” (122c, d) formed on substrate (110). *Chen*, 7:13-8:38, Figs. 3A, 3B. POSITAs would have understood Chen’s conductive lines have at least two portions: one portion (223a, 225a) at the end of the series of touch sensor pads (223b, 225b) as a first portion in the conductive layers (223, 225), and another second portion (shown as solid lines on left and right sides of the multilayer stack for the touch sensing structure and OLED structure in Fig. 3A) formed over the substrate as an extension of the first portion that includes a part to bridge over the step difference between conductive layers (223, 225) and substrate (110) to reach conductive wires (122c-d) formed on substrate (110):

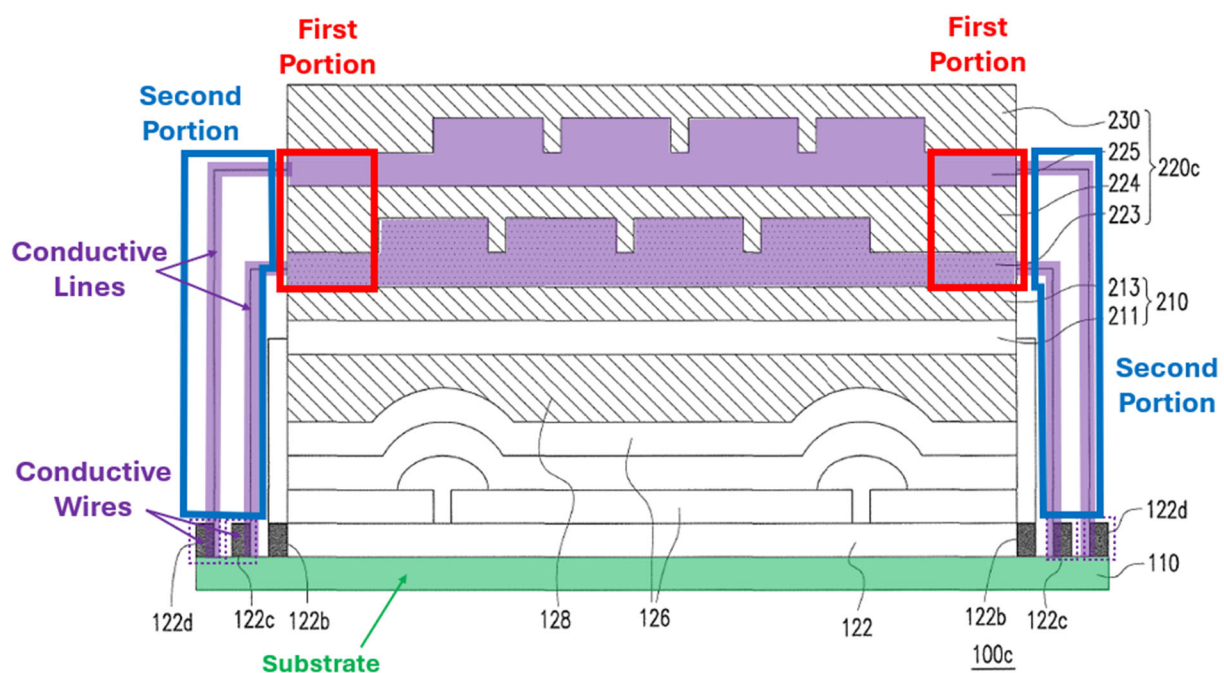


FIG. 3A

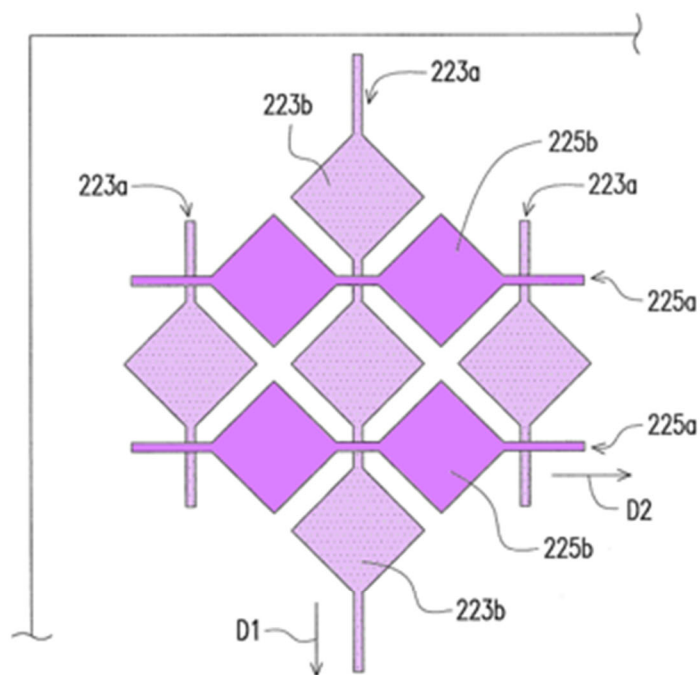
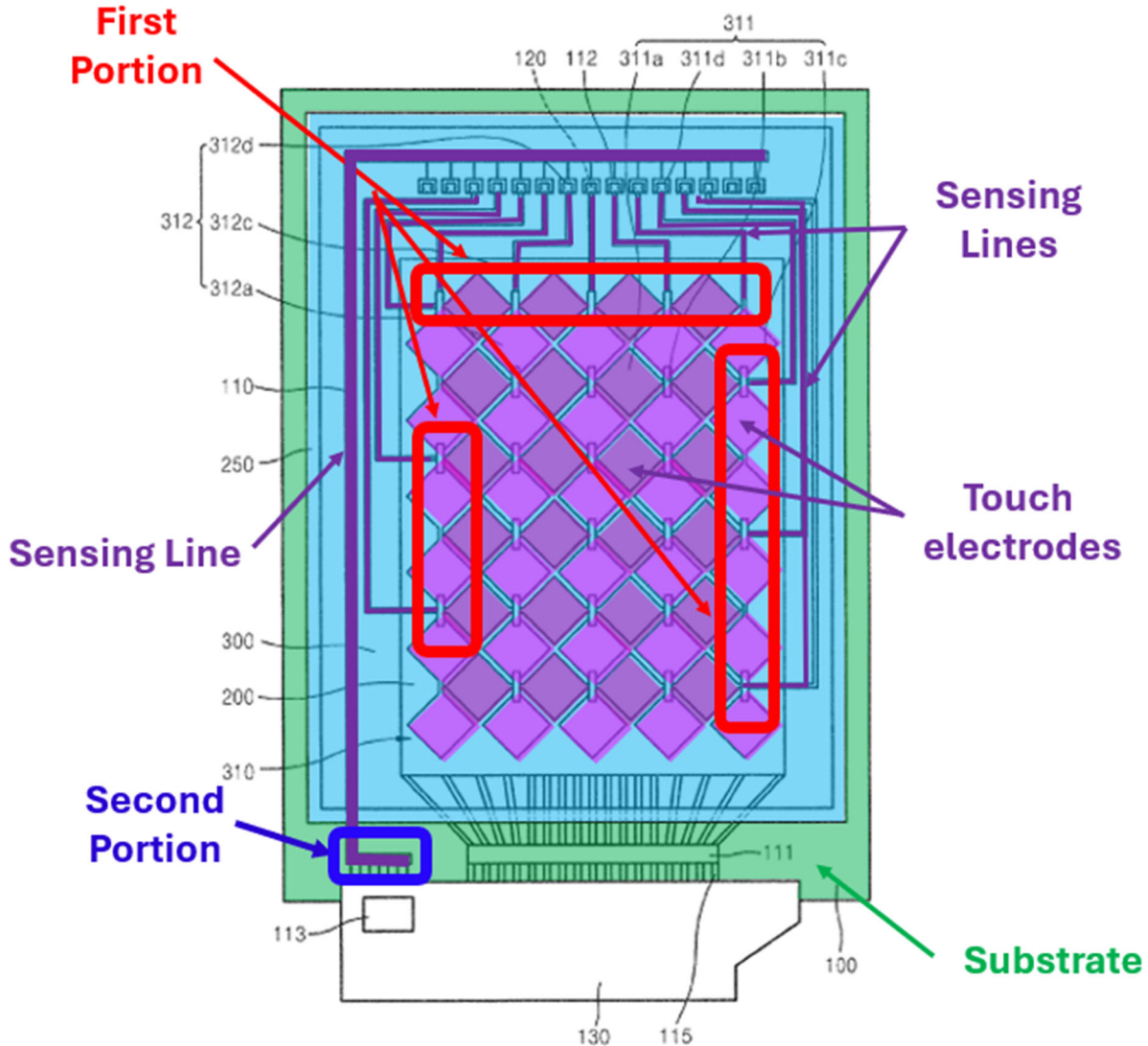


FIG. 3B

Chen, Figs. 3A-3B, 7:13-55; *Flasck*, ¶165. POSITAs would have understood the first portion of the sensing line is located over the top of the sealing layer to connect to the touch electrodes or touch sensing cells over the top of the sealing layer and the second portion of the sensing line would be over the substrate in order to provide electrical connections to the substrate, e.g., by conductive wires (122c, d) on substrate 110 as *Chen*'s layers depict. *Chen*, Fig. 3A, Fig. 4A; *Flasck*, ¶¶165-66.

Jang would have confirmed POSITAs understanding of how *Chen* connects the on-display elements of the touch panel at a higher elevation to the off-display sensing lines and driving circuit at a lower different elevation. *Flasck*, ¶167; §VII.A.2. Specifically, Jang provides a top-down view depicting sensing lines (311c, 312c, 110)—like *Chen*'s conductive lines—connecting to touch sensors (“first portion,” 311c, 312c) formed in a same layer as the touch sensors and another portion (“second portion”) (e.g., 110) routed over the substrate to connect to a PCB.

FIG. 4



Jang, Fig. 4, ¶¶72, 82; Flasck, ¶167.

POSITAs would have understood Chen's conductive lines have at least two portions: one connecting to the conductive layers 223, 225 ("first portion"), and another that traverses over the substrate to connect to conductive wires (122c, d) and off-display processing components ("second portion"), consistent with Jang. *Flasck*, ¶168; §VII.A.2. POSITAs would have further recognized that Chen forms active

array device (122) and conductive wires (122c, d) on substrate 110 and forms additional layers above, which requires fabricating some type of structure to route the electrical connections of the higher layers back down to the drive circuitry on the lowest substrate to control the entirety of the multilayer OLED/touch panel display.

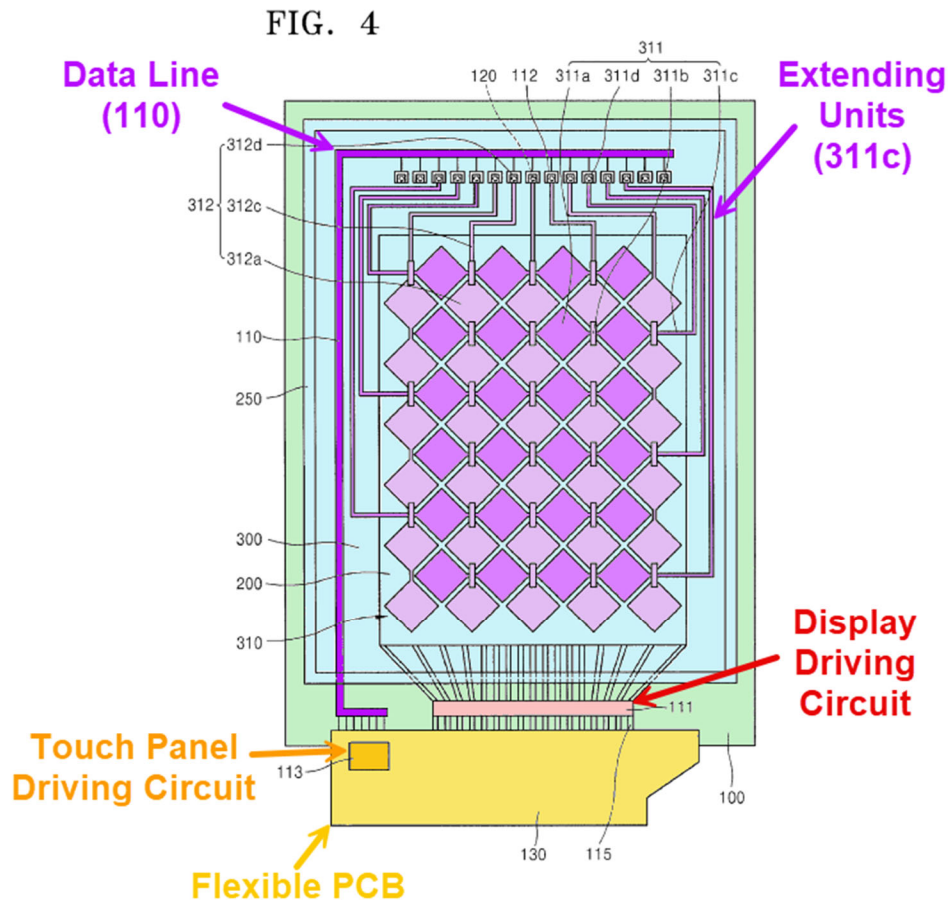
Chen, 5:42-52; *Flasck*, ¶169; §VII.A.2.

g. 1[f]

Chen-Jang teaches 1[f]. *Flasck*, ¶¶170-73.

Although Chen does not expressly explain what the conductive wires (122c, d) and conductive lines are connected to, POSITAs would have understood that they are connected to driving and/or processing circuitry to deliver electricity to the touch sensors and evaluate electrical signals in response to a user's touch. *Flasck*, ¶171.

Jang teaches that conductive lines connect to two driving circuits: (1) display-drive integrated circuit (111, "DDI") connected to flexible PCB (130) to "drive the display unit 200" by input/output lines (115); and (2) sensing lines connected to touch-panel-drive integrated circuit (113, "TDI") that is "configured to receive the electrical signals to drive and control the touch panel" disposed on flexible PCB (130):



Jang, Fig. 4, ¶¶83-86. *Jang*'s touch sensors are connected by data line (110) to either a separate TDI (113), or the TDI may be integrated with DDI (111) to consolidate and receive all touch sensing and display signals in a single driver circuit. *Id.*, ¶88; *Flasck*, ¶172.

POSITAs implementing *Chen*'s device would have been motivated to connect *Chen*'s touch sensor conductive lines connected to conductive wires (122c, d) which are further connected to a driving circuit—whether a touch-panel-drive integrated circuit located on a separate PCB, or one integrated with a display driver on the

substrate—to drive the touch sensors and respond to a user’s touch. *Flasck*, ¶173; §VII.A.2. POSITAs would have been motivated to integrate the touch-panel-drive integrated circuit with the display-drive integrated circuit to “further reduce the manufacturing costs” and improve both the steps for “manufacture and user’s convenience.” *Jang*, ¶88; *see also Cok*, 2:47-51; *Flasck*, ¶173.

h. 1[g]

Chen teaches 1[g]. *Flasck*, ¶¶174-75. *See also* §VII.A.3.m (1[l], below).

Chen’s display includes an insulating layer—which may also act as another a water/oxygen barrier layer (first water/oxygen barrier insulation layer 224)—positioned between first and second patterned conductive layers (223, 225):

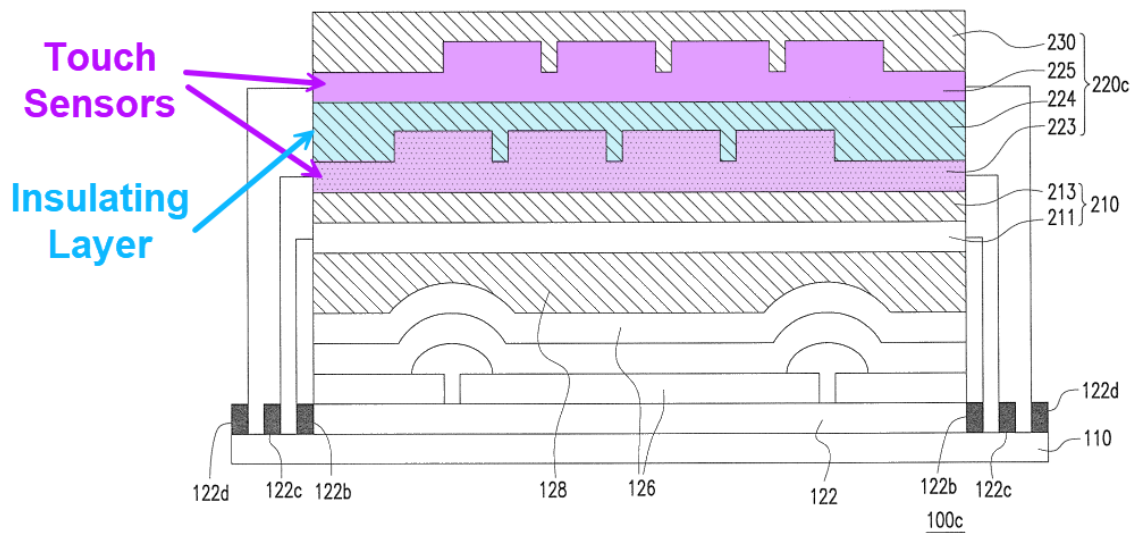


FIG. 3A

Chen, Fig. 3A, 7:13-55, Fig. 4A (water/oxygen barrier insulation layer 234); *Flasck*, ¶175.

i. 1[h]

Chen-Sano-Jang teaches 1[h]. *Flasck*, ¶¶176-79.

The Chen-Sano combination forms Chen's barrier layer (128) as Sano's multi-layered sealing layer, which produces a sealing layer with an inclined surface, as explained in 1[c]. §VII.A.3.d (1[c]); *Flasck*, ¶177. Chen combined with Jang teaches connecting Chen's conductive lines downwardly from the touch sensing layers at higher elevations to a driving circuit either directly on the lower-elevation substrate, or connected to the substrate through a flexible PCB, as explained in 1[f]. §VII.A.3.g (1[f]); *Flasck*, ¶177.

POSITAs would have understood—consistent with Sano—that when forming Chen's barrier layer (128) as a multi-layered sealing layer that has an inclined surface, the series of buffer and barrier layers cover the OLED-display elements to prevent degradants from reaching the display, and the edges of the sealing layer then taper or incline outwardly but would not have extended as far as a driving circuit:

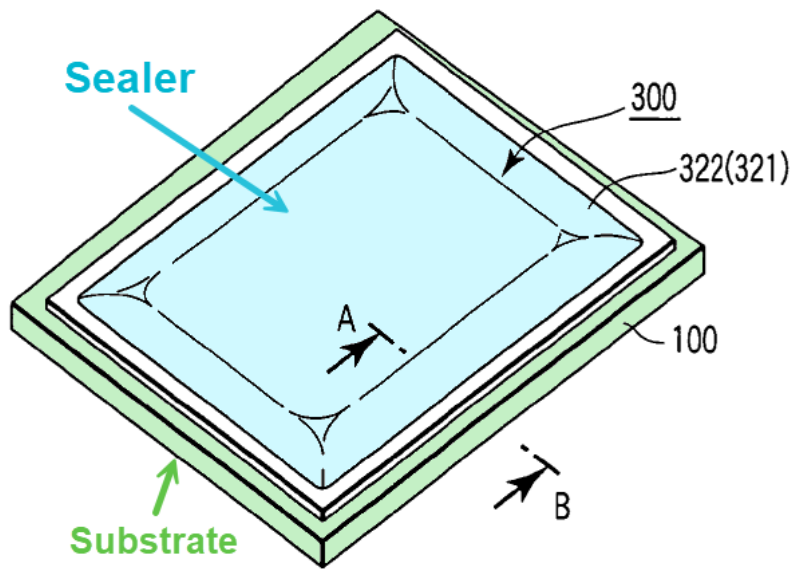


FIG. 3

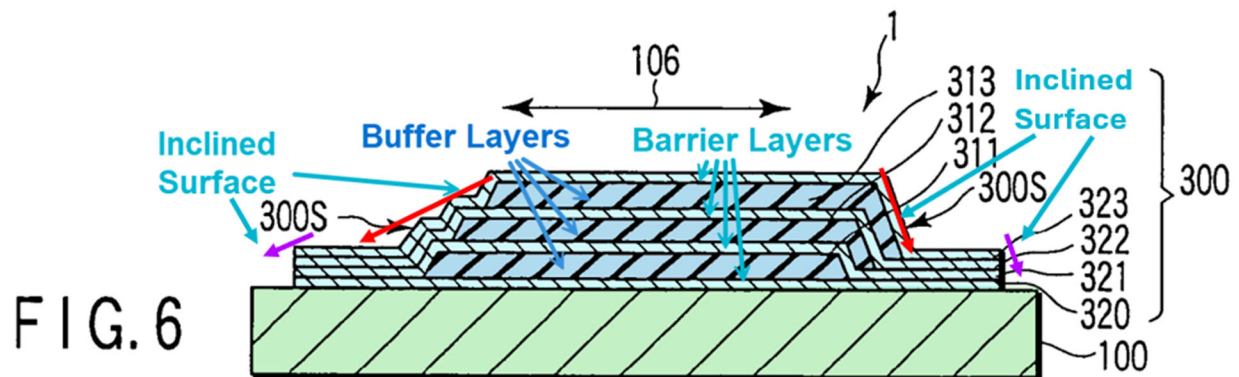
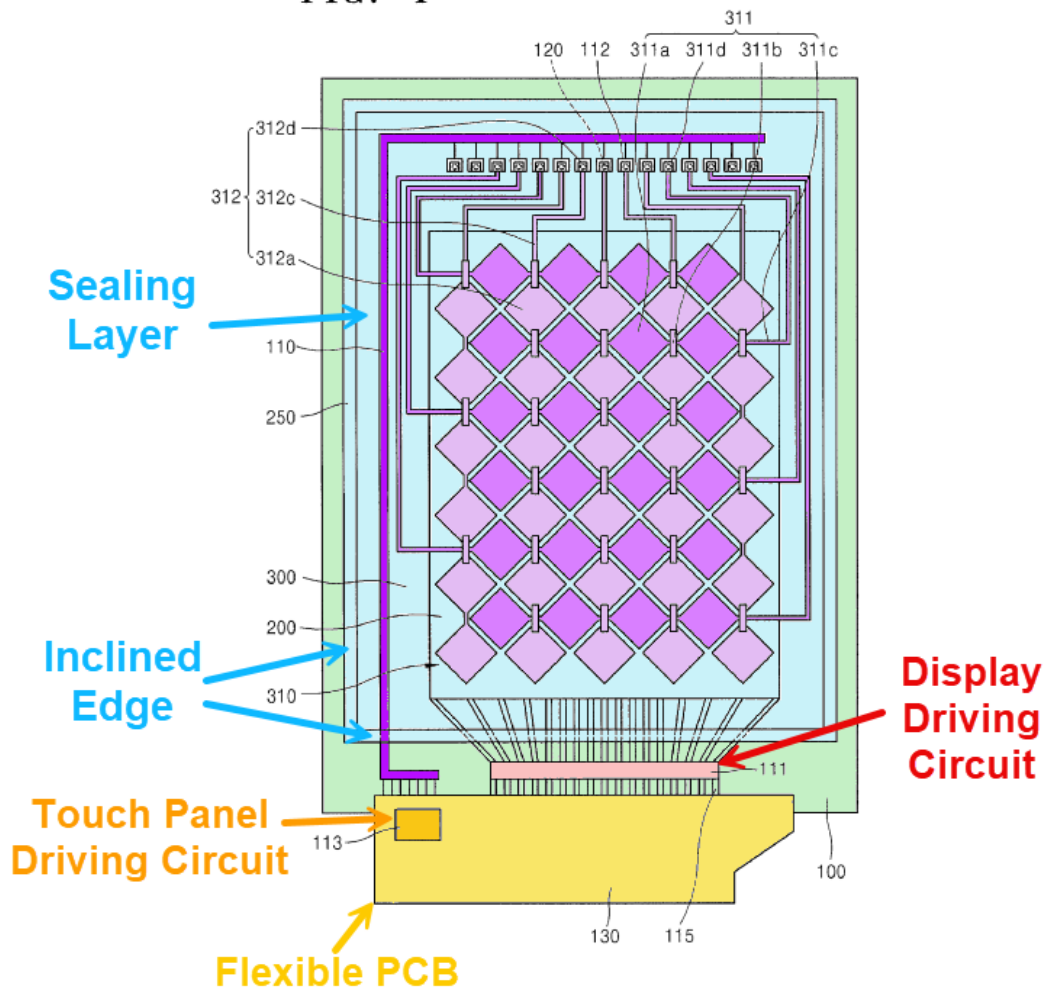


FIG. 6

Sano, Figs. 3, 6, ¶¶107-08, 133, 158, 171, 173, 215; *Flasck*, ¶178. Because Jang shows a driver circuit (TDI or a TDI integrated with a DDI) sitting *outside* of the display area, POSITAs would have appreciated that a sealing layer (128) formed consistent with Chen and Sano would be inclined downwardly towards the driving circuit that sits outside of the display area. *Flasck*, ¶178. Using Jang's Figure 4 to

depict this arrangement (because, unlike Chen, Jang provides a top-down view), POSITAs would have understood that the peripheral edge of the Chen and Sano's sealing layer would have a downward incline towards the substrate, and thus towards the driving circuit.

FIG. 4



Flasck, ¶178.³

j. 1[i]

Chen-Jang-Sano-Sakamoto teaches 1[i]. *Flasck*, ¶¶180-84.

Chen's conductive lines are connected to conductive wires (122c, d) formed on the substrate (110), and Chen depicts regions of the conductive lines as being outside of the sealing layer (128) and extending the length of a height differential or a step difference due to the thickness of the display's layers. POSITAs considering Chen's first portion and second portion of the sensing lines in 1[e] would have understood that there will be another portion in the sensing lines between the first portion of the sensing lines on the top of the thin sealing film and the second portion of the sensing lines over the substrate to pass through an edge of the thin sealing film in light of the common elevation difference in routing the sensing lines in both Chen and Sano. *Flasck*, ¶181.

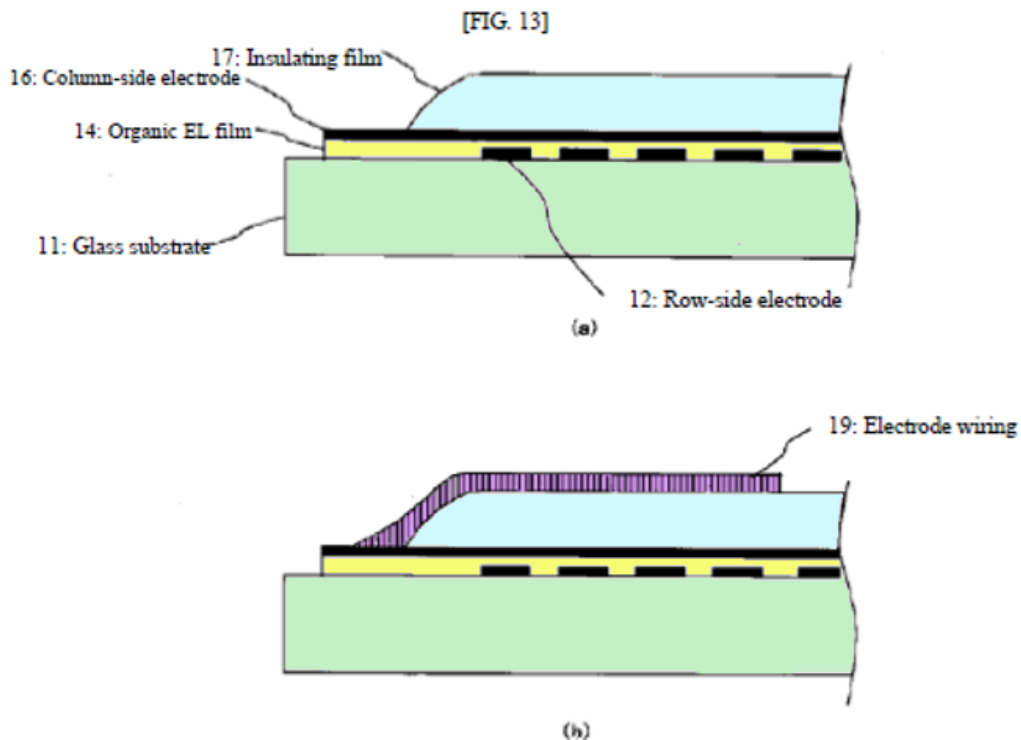
³ Although Jang discloses and depicts an encapsulation substrate (300) intended to cover both the display elements *and* touch-sensor elements, POSITAs would have understood that a sealing layer intended to protect only the OLED display elements—such as Chen's barrier layer (128)—would be made smaller to cover only the OLED region (e.g., the region that Jang depicts as box 200). *Flasck*, ¶179.



Chen, 7:13-55, Fig. 3A.

When modifying Chen's barrier layer (128) to have a multi-layered sealing layer with an inclined edge—consistent with Sano (§VII.A.3.d (1[c]))—POSITAs would have understood that Chen's conductive lines would traverse the height differential caused by the intervening layers between the touch conductive layers (223, 225) to connect to conductive wires (122c-d) fabricated on substrate (110). *Flasck*, ¶182. In doing so, the conductive lines would pass over the inclined surface of the sealing thin film, as taught by Sano—both at inclined surface (300S), and the inclined side at the end of each barrier layer. *Id.*

Although a few ways were known to make that connection, POSITAs would have understood one as the most obvious and straightforward option: form part of Chen's conductive lines to include an inclined portion to run along the inclined surface of the sealing layer (128)—as taught by Sakamoto and others—to connect the first-formed conductive element, e.g., conductive wires on the substrate (e.g., Chen's conductive wires 122c-d) to the touch panel sensors (i.e., electrodes 225) formed after and above this layer. §VII.A.2; *Flasck*, ¶182.



Sakamoto, Figs. 13a-b, ¶23.

POSITAs would have understood this as an obvious design variant of common incline-shaped interconnection methods traversing a common OLED

display and touch panel layer-mandated height differential using a known design and materials. *Flasck*, ¶¶183-84 (explaining *Jang '041* and *Hara*).

k. **1[j]**

Chen-Jang-Sano-Sakamoto teaches 1[j]. *Flasck*, ¶¶185-87.

Chen's conductive lines ("sensing lines") have a first portion (e.g., connected to the touch sensors formed on top of the barrier layer (128), and a second portion formed over the substrate that provides connection from the first portion to the conductive wires on the substrate. §§VII.A.3.e-VII.A.3.f (1[d]-[e]).

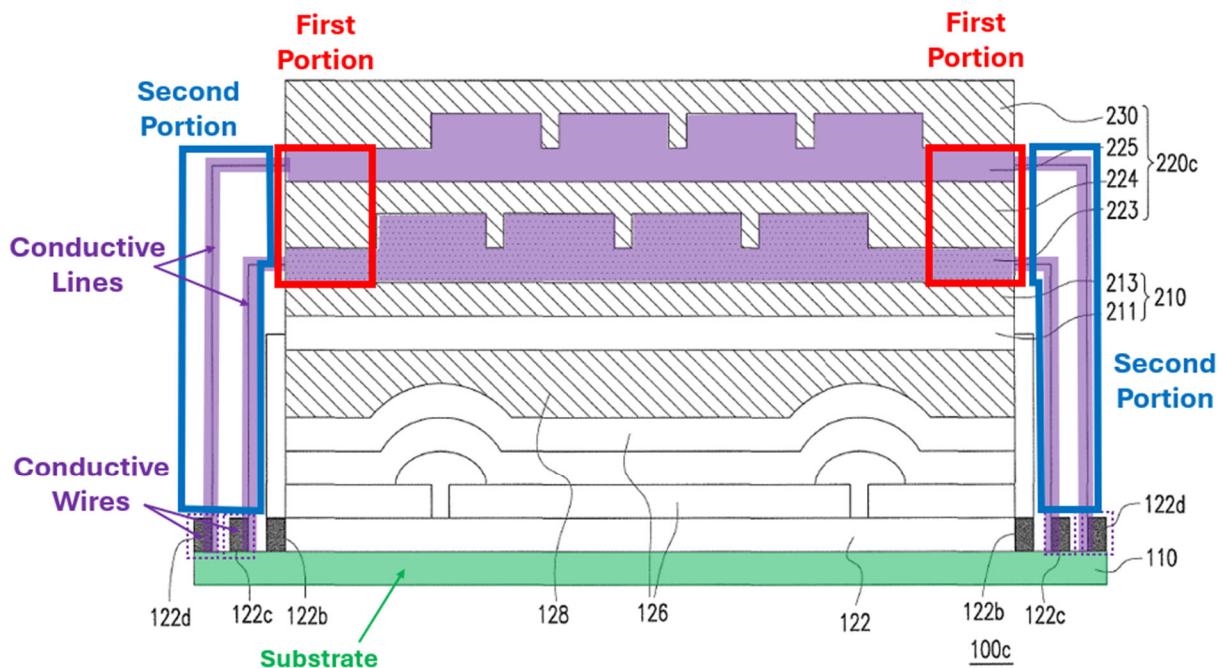
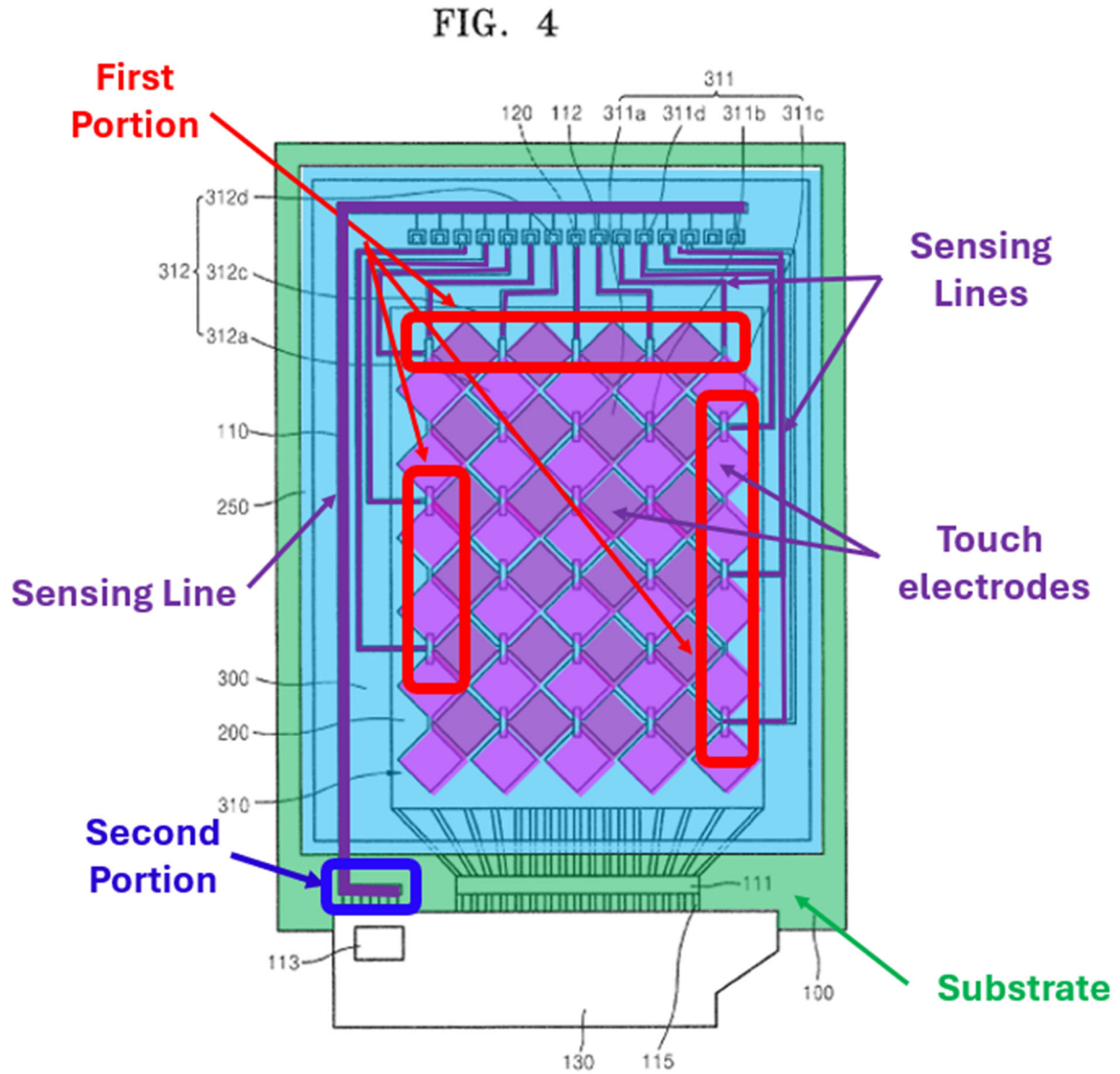


FIG. 3A

Chen, Fig. 3A, 7:17-26; *Flasck*, ¶186. Jang provides an exemplary top-down view of a similar arrangement, showing a first portion connected to the touch sensors, and

a second portion that runs along the substrate and connects to a driving circuit.

§VII.A.3.f (1[e]).



Jang, Fig. 4.

When modifying Chen’s barrier layer (128) to have a multi-layered sealing layer with an inclined edge—consistent with Sano (§VII.A.3.d (1[c]))—POSITAs would have understood that Chen’s conductive lines (“sensing lines”) have a first portion formed over the top surface of the barrier layer (128) and downwardly connect to another second portion connected to conductive wires (122c, d) already formed on substrate (110)—similar to Jang’s top-down depiction—and the conductive lines extend from the touch sensors along the inclined edge of the barrier layer (128) (i.e., Sano’s moderately inclined surface 300S and inorganic barrier layer taper at its end) to the second area of the substrate as taught by Sakamoto for connecting to the conductive wire and driving circuit. §§VII.A.3.g (1[f]), VII.A.3.j (1[i]); *Flasck*, ¶187.

I. 1[k]

Chen teaches 1[k]. *Flasck*, ¶¶188-89.

Chen’s touch sensor has two conductive layers (223, 225) with corresponding touch sensor pads (223b, 225b) constituting “sensing cells” for touch sensing—as claimed—with connection patterns (223a, 225a) to create arrays of touch sensor pads oriented in two directions (223a, b in direction D1; 225a, b in direction D2):

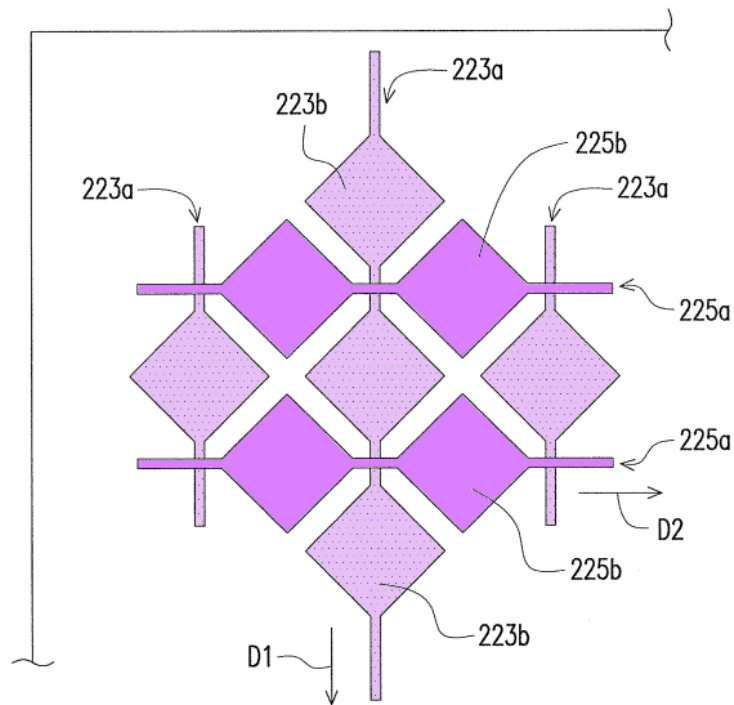


FIG. 3B

Chen, Fig. 3B, 4B, 7:17-8:39, §§VII.A.3.e-VII.A.3.f (1[d]-1[e], above); *Flasck*, ¶189.

m. 1[l]

Chen teaches 1[l] as described above. §VII.A.3.h(1[g]); *Flasck*, ¶190.

4. Claim 2

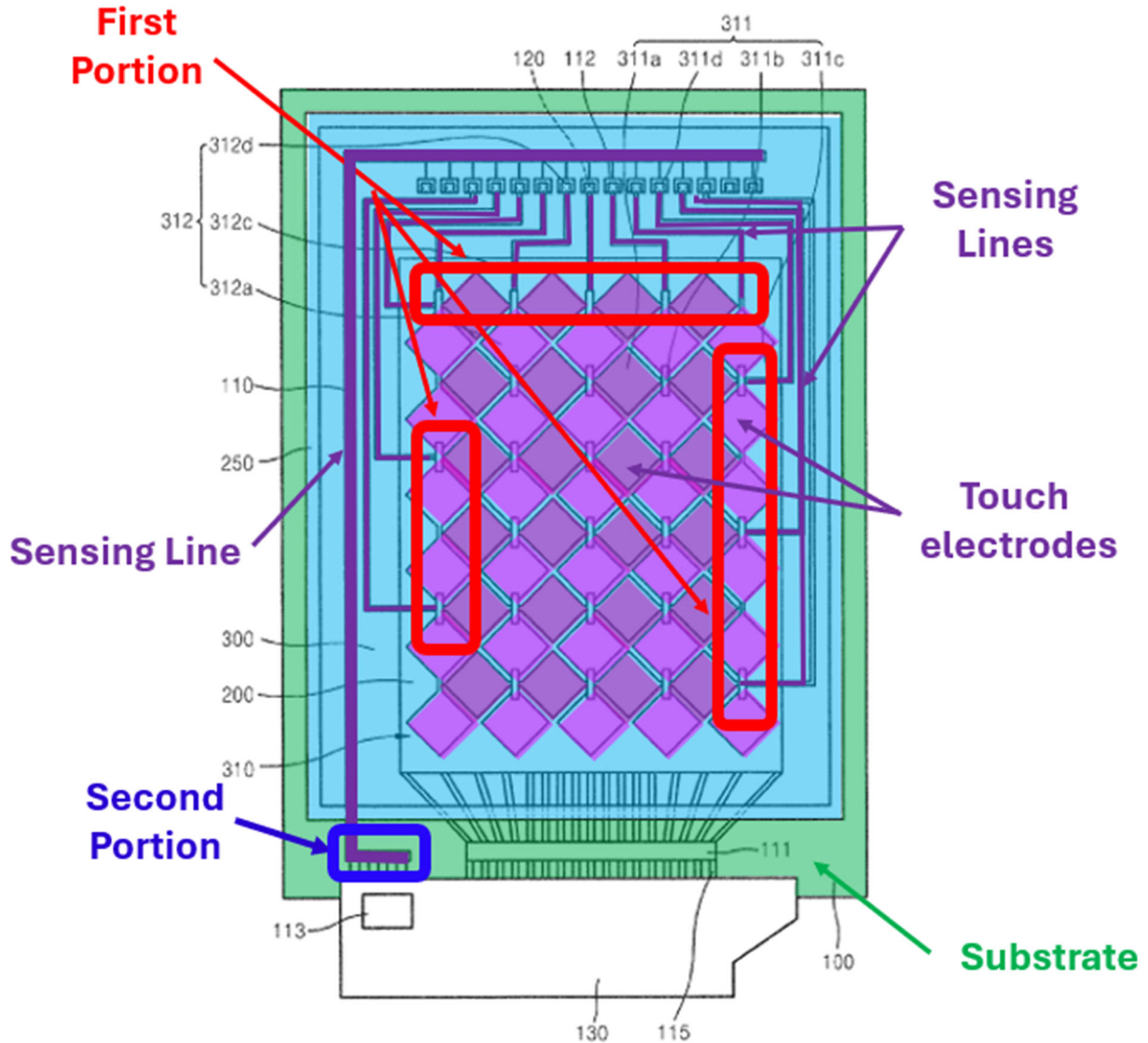
Chen-Jang teaches Claim 2. *Flasck*, ¶¶191-95.

Chen or *Chen-Jang* teaches conductive lines with a first portion provided on or near barrier layer (128) to connect to the touch sensors, and a second portion on substrate (110). §§VII.A.3.e (1[d]), VII.A.3.f (1[e]), VII.A.3.k (1[j]); *Flasck*, ¶192.

Jang provides a top-down view depicting sensing lines (311c, 312c, 110)—like Chen’s conductive lines—that extend from a first (display) area to a second (non-display) area of the substrate to connect on-display touch sensors to off-display processors, which would have instructed POSITAs implementing Chen’s device.

Jang, Fig. 4; §VII.A.3.b (1[a]); *Flasck*, ¶192.

FIG. 4



Chen depicts a configuration in the sensing lines including conductive lines (“second portions”) located outside of and extending from, both ends of the touch electrode series (223a, 225a) (“first portions” of the sensing lines) within Chen’s patterned conductive layers (223, 225) downwardly to connect conductive wires

122c-d formed on a substrate (110), meaning Chen discloses that at least some first portions of the conductive lines are located on a same layer.

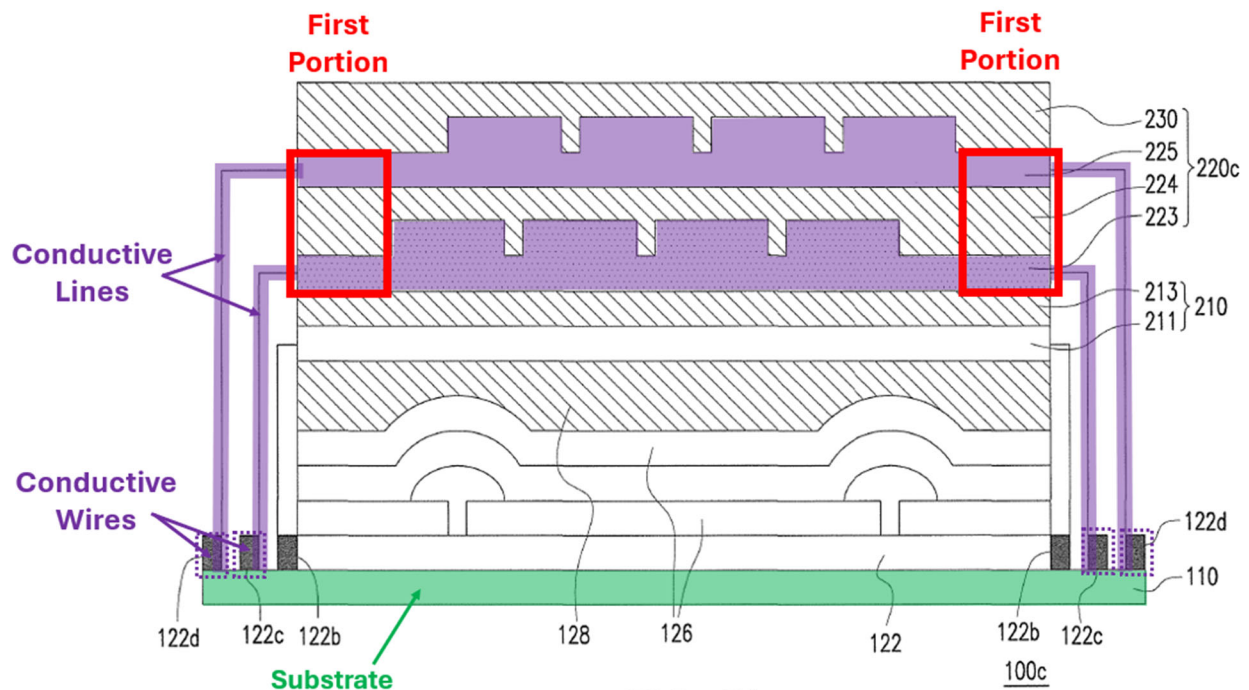


FIG. 3A

Chen, Fig. 3A, 7:13-55; *Flasck*, ¶193.

To the extent that Claim 2 may be construed to mean *all* first portions to be on the same layer, however, such an arrangement would have been obvious. *Flasck*, ¶194. It was extremely old and well-known in the art that capacitive touch-sensor panels conventionally use two sets of touch-pad arrays—one for each (x, y) direction—electrically insulated from one another. *Flasck*, ¶194. Chen's Figure 3 embodiment depicts one way to form the two touch-sensor arrays: one set of touch

sensor pads (223b) and their connections (223a) in one direction (D1) are formed on one layer (first patterned conductive layer 223), and another set of touch sensor pads (225b) and their connections (225a) to create an array in a different direction (D2) are formed on another layer (second patterned conductive layer 225), with the two layers (223 and 225) separated by insulation. *Chen*, Figs. 3A-B. But *Chen* also discloses an alternative embodiment for the touch sensing structure in Figs. 4A-B, in which all touch sensor pads or touch sensing cells are formed on the same layer, with “bridge” connections where the arrays would otherwise intersect, with insulation covering at least where the bridge is formed. *Id.*, Figs. 4A-B, 7:56-8:38.

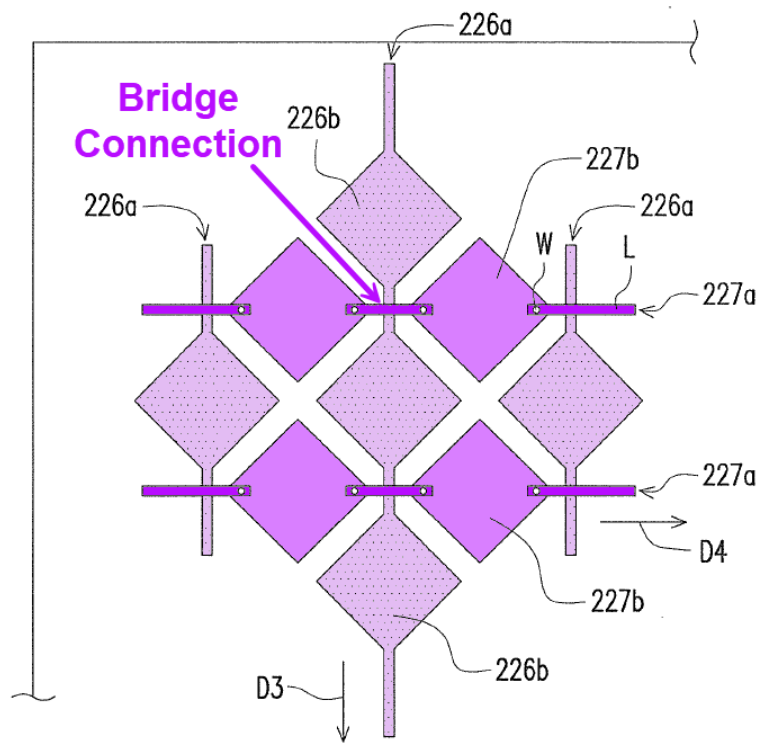
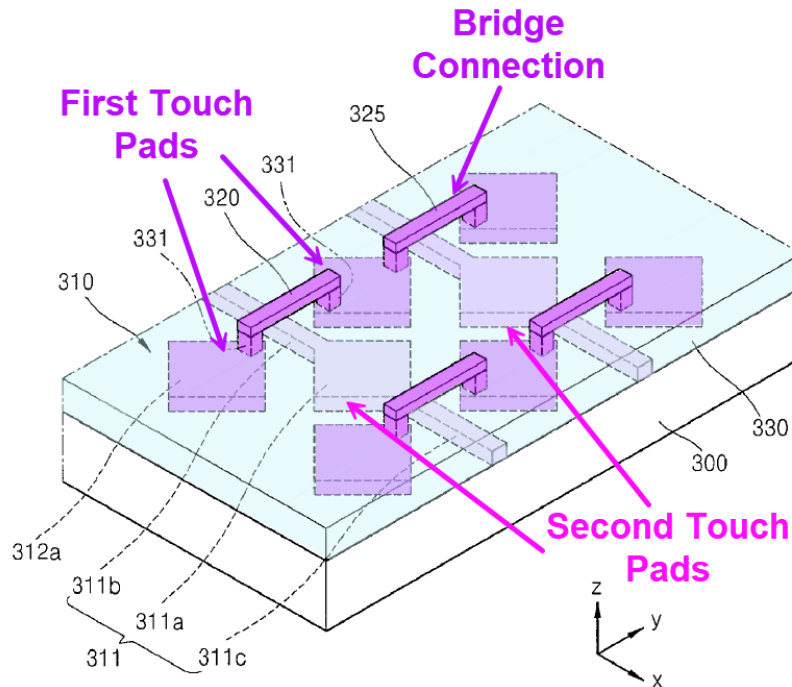


FIG. 4B

Jang depicts this configuration in three dimensions, showing how the certain touch sensor pads and bridges are properly separated by insulation:

FIG. 3E



Jang, Fig. 3E; *Flasck*, ¶195. Because Chen discloses two possible configurations of the touch sensor pads, POSITAs would have considered either as an obvious design choice. *Flasck*, ¶195. But when forming all touch sensor pads on a single layer, with one set of touch sensor pads connected using a bridge, POSITAs would have understood that **all** “first portions” of Chen’s conductive lines would be on the same layer to connect to each set of touch sensor pads. *Flasck*, ¶195.

5. Claim 3

Chen or Chen-Jang teaches Claim 3 as described above. §§VII.A.3.f (1[e]), VII.A.3.k (1[j]) (explaining first portion provided on or near barrier layer (128) and second portion on substrate (110)); *Flasck*, ¶196.

6. Claim 4

Chen or Chen-Jang teaches Claim 4. *Flasck*, ¶¶197-99.

Because Chen discloses “first portions” of the conductive lines are located over the top of the sealing layer (e.g., water/oxygen barrier layer 128) to connect to the touch sensors formed on or above that layer, but “second portions” are provided over or on the substrate (§VII.A.3.f (1[e])), POSITAs would have understood that Chen’s first portions of the conductive lines have a first distance from the substrate that is greater than the distance between the second portions of the conductive lines and the substrate. *Flasck*, ¶198.

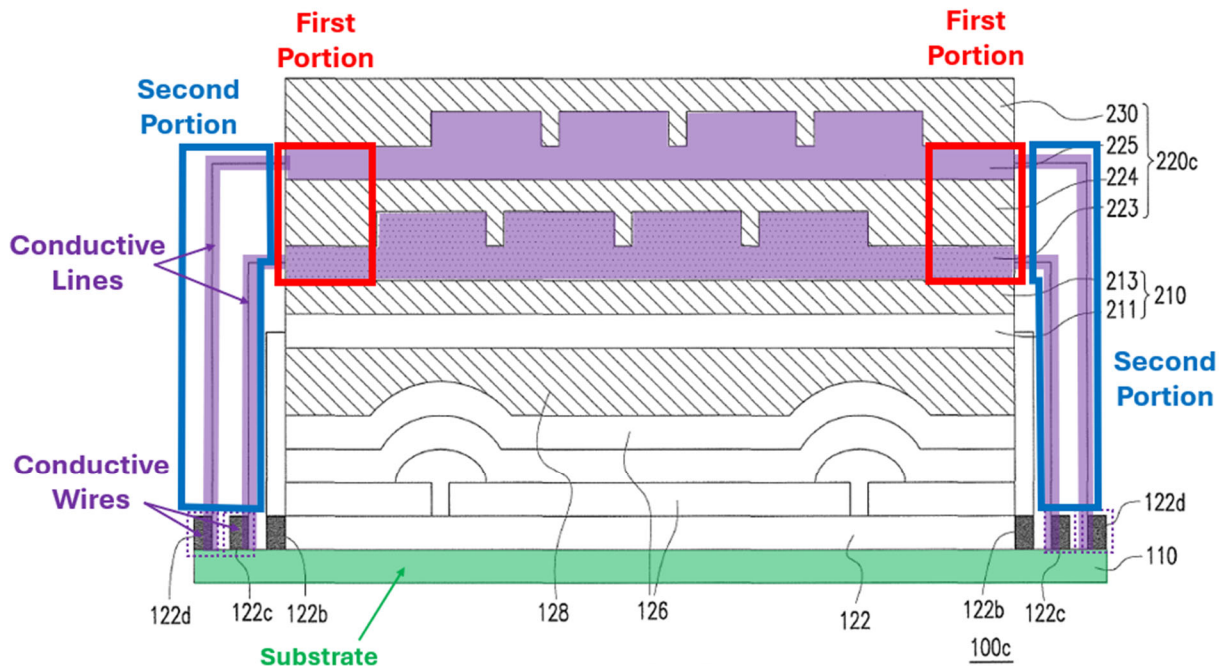


FIG. 3A

Chen, Fig. 3A, 7:13-55; *Flasck*, ¶198.

Jang would have further confirmed this arrangement. §VII.A.3.f (1[e]).

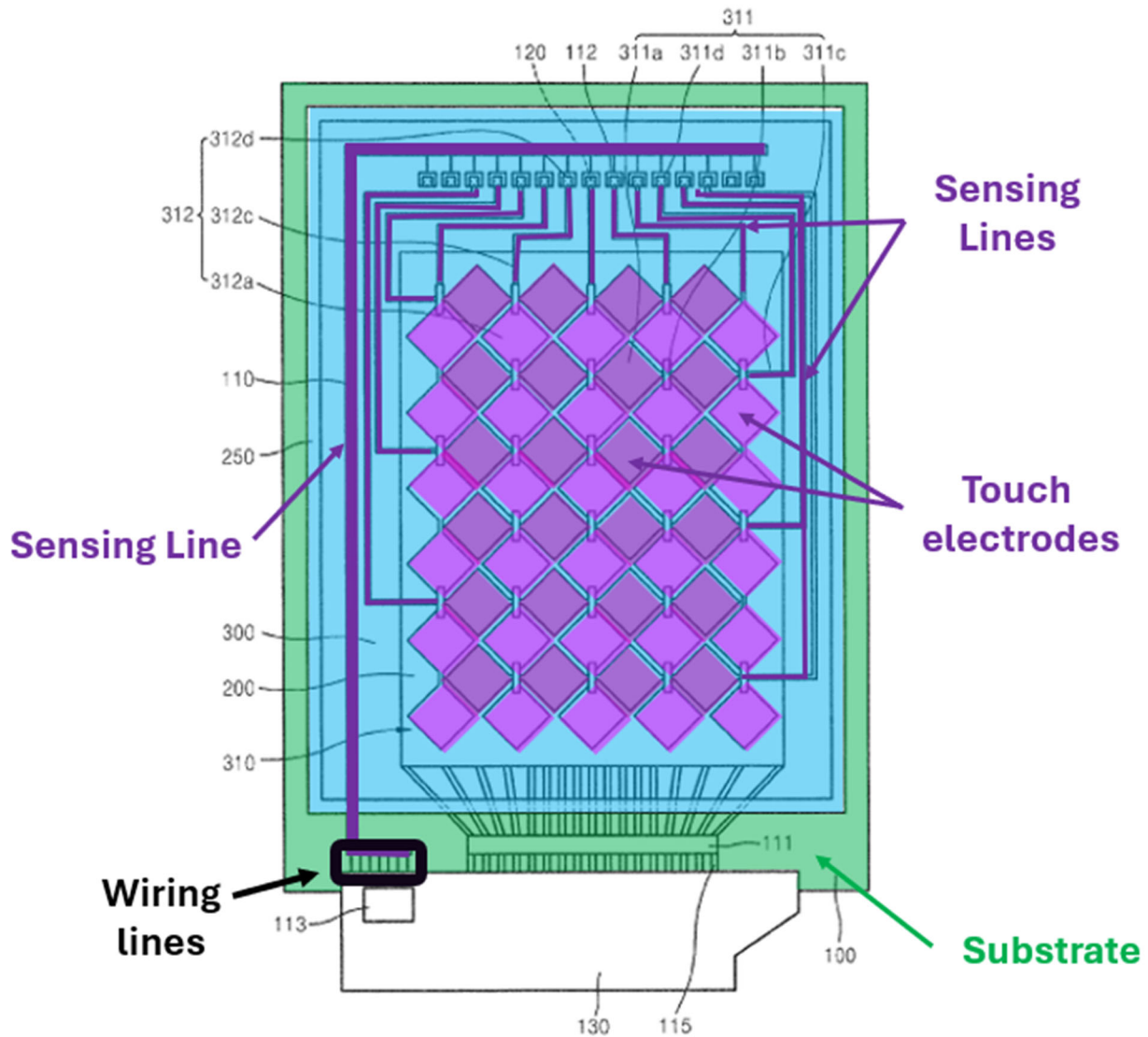
7. Claim 5

Chen or Chen-Jang teaches Claim 5. *Flasck*, ¶¶200-04.

POSITAs would have understood Chen’s wiring lines connect sensing lines to a driving circuit because “the first conductive wire 122b, the second conductive wire 122c, and the third conductive wire 122d can all be circuit pattern layers which are formed on the active array device 122 in advance.” *Chen*, 7:38-55. POSITAs would have understood that Chen’s conductive wires (122c, d) connect—at an intermediate position—to both the touch electrodes through conductive lines (“sensing lines”), that are above and/or over the substrate 110, and to driving and/or processing components to form an electrical connection that both delivers electricity to the touch sensors and evaluates electrical signals in response to a user’s touch from the touch sensors. *Flasck*, ¶201. POSITAs would have understood that Chen’s conductive wires 122c-d on the substrate 110 disclose the claimed “wiring lines” as claimed. *Id.*

Similarly, Jang teaches conductive lines connected to two driving circuits: (1) display-drive integrated circuit (111, “DDI”) connected to flexible PCB (130) to “drive the display unit 200” by input/output lines (115); and (2) touch-panel-drive integrated circuit (113, “TDI”) that is “configured to receive the electrical signals to drive and control the touch panel” disposed on flexible PCB (130):

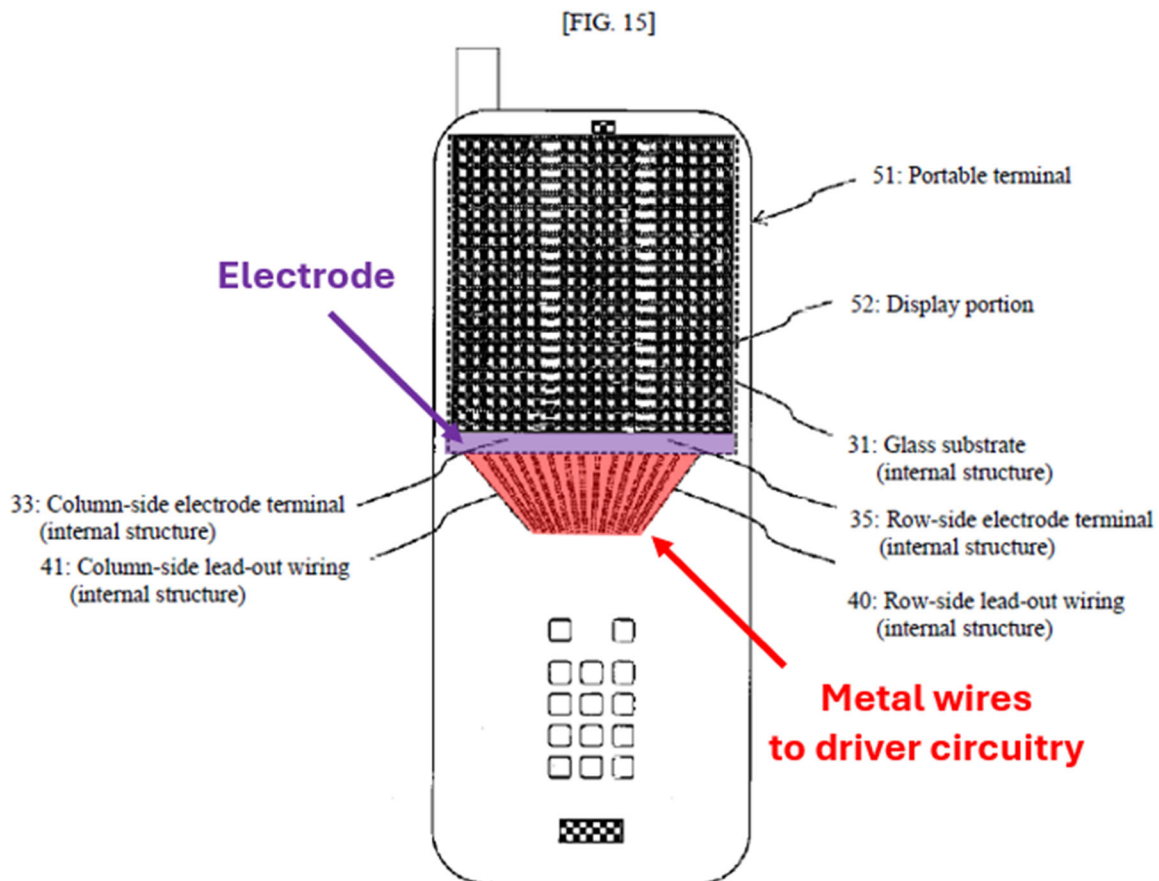
FIG. 4



Jang, Fig. 4, ¶¶83-86. *Jang*'s touch sensors are connected by data line (110) to either a separate TDI (113), or the TDI may be integrated with DDI (111) to consolidate and receive all touch sensing and display signals in a single driver circuit. *Id.*, ¶88; *Flasck*, ¶202.

POSITAs would have been motivated to connect Chen's conductive lines to driver circuitry for the reasons discussed above. §VII.A.3.g (1[f]).

POSITAs would have further understood that Chen's sensing lines connect to drive circuitry like Sakamoto's "lead out wiring" in mobile phones (Fig. 15, below) as an application ripe for Chen's miniaturized device benefitting from Sakamoto's display size-increasing design:



Sakamoto, Figs. 14-15, 19-20, ¶¶4-5, 26-27; *Chen*, 1:16-57; *Flasck*, ¶¶203-04.

8. Claim 6

Chen-Jang teaches Claim 6. *Flasck*, ¶¶205-07.

Although Chen does not expressly explain the materials used for the conductive lines and touch sensor pads (223b, 225b), POSITAs would have found using different materials obvious. Jang describes a capacitive touch panel in which “first pattern layer 310 and the second pattern layer 320 may be formed of suitable transparent materials, e.g., ITO, IZO, ZnO, and/or In₂O₃.” *Jang*, ¶¶71-72, 77. These materials were extremely old and well-known for touch panels, and Chen refers to the use of the same for the EMI layer. *Chen*, 6:15-40; *Flasck*, ¶206. POSITAs would have understood Chen’s conductive lines would have been made of a metal wire material often used for connections. *Chen*, 7:38-55; *Flasck*, ¶¶206-07.

Further, the selection of particular materials would have been an obvious design choice. *See Ritchie v. Vast Res., Inc.*, 563 F.3d 1334, 1337 (Fed. Cir. 2009) (precedential); *In re Lackey*, 371 Fed. Appx. 80, 82 (Fed. Cir. 2010).

9. Claim 7

Chen-Jang teaches Claim 7. *Flasck*, ¶¶208-09.

Jang teaches two driver circuits both located in a second (non-display) area of the substrate. §VII.A.3.g (1[f]); *Flasck*, ¶208. POSITAs implementing Chen’s device consistent with Jang’s arrangement would have placed the driving circuit(s) in a second (non-display) area to process touch-sensor and display signals in an area

outside that of the display to maintain a minimal thickness for the display.

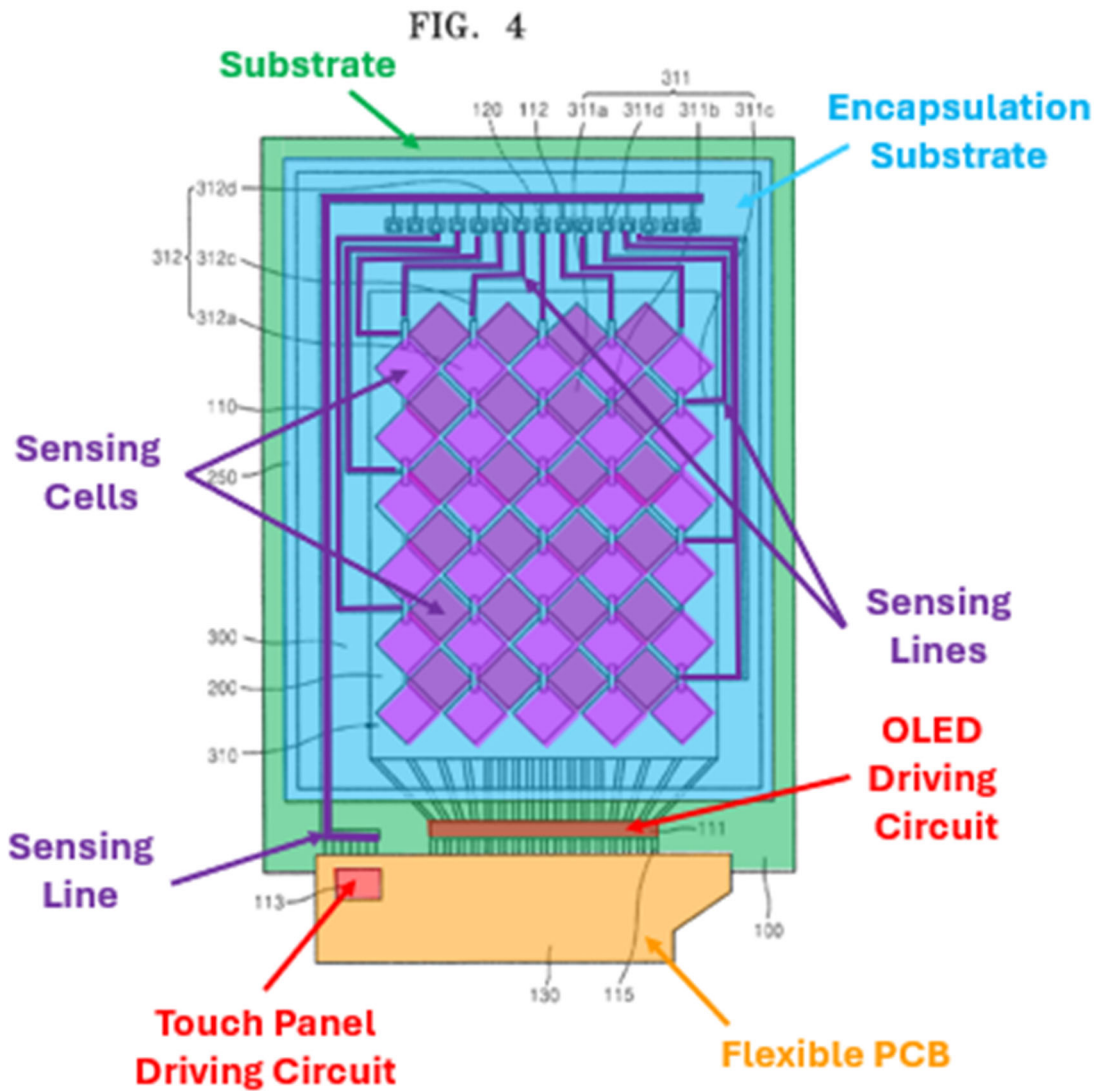
§§VII.A.3.g (1[f]), VII.A.2; *Flasck*, ¶209.

10. Claim 8

Chen-Jang teaches Claim 8 as described above. §§VII.A.3.g (1[f]), VII.A.2; *Flasck*, ¶210.

11. Claim 9

Chen-Jang teaches Claim 9 as described above. §§VII.A.3.g (1[f]), VII.A.10 (cl. 8), VII.A.2; *Flasck*, ¶¶211-12. Jang's touch panel driving circuit (113) is formed on the FPCB and connects to sensing line (110):



Jang, Fig. 4.

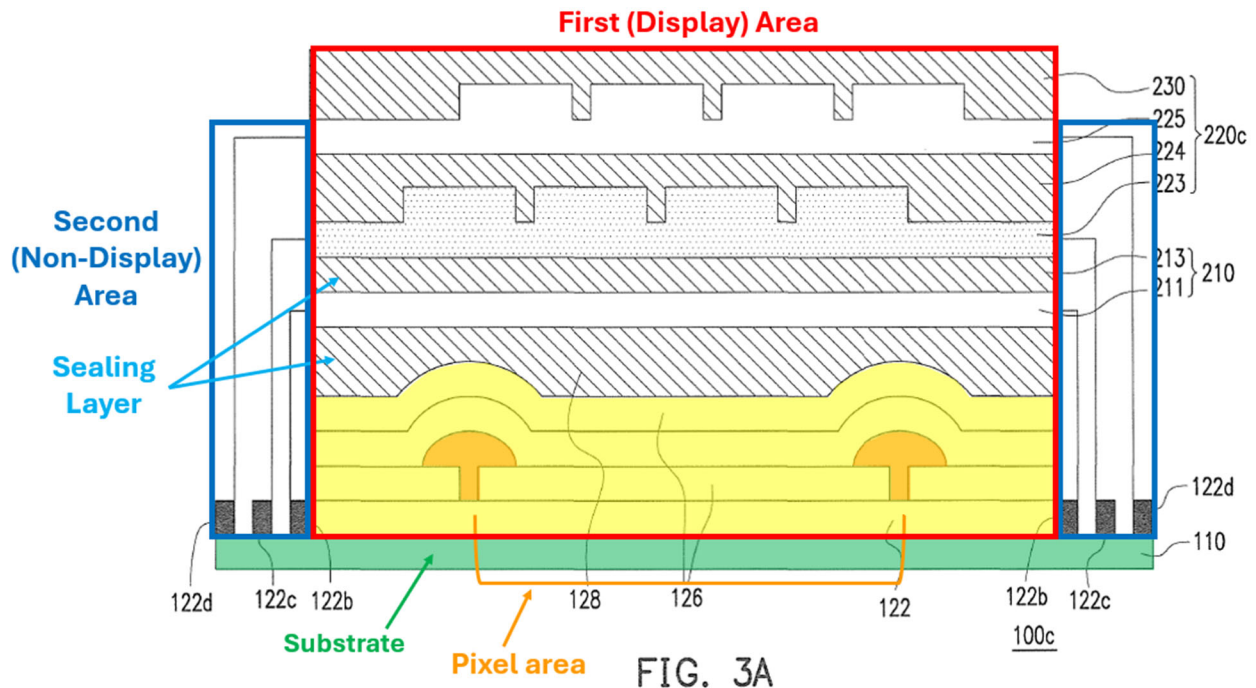
12. Claim 10

Chen-Jang teaches Claim 10 as described above. §§VII.A.3.a (1[pre]), VII.A.3.b (1[a]), VII.A.3.f (1[e]), VII.A.3.j (1[i],); *Flasck*, ¶213.

13. Claim 11:

Chen teaches Claim 11. *Flasck*, ¶¶214-16.

Chen's first (display) areas have greater area size than the second (non-display) areas:



Chen, Figs. 1A, 3A, 2:66-3:8, 3:10-13, 3:24-25, 5:50-52. POSITAs would have understood that *Chen* is not drawn to scale and that display areas are typically much larger than the non-display areas in an OLED display. *Flasck*, ¶215; *see, e.g., Lee*, Figs. 1, 7. That is because a display area must be big enough to be viewable by a user, but non-display areas must only be big enough to house the wiring and processors needed to operate the display, which were known to be far smaller than the display itself. *Flasck*, ¶¶215-16.

14. Claim 12

Chen-Sano teach Claim 12 as described above. §§VII.A.3.d (1[c]), VII.A.2; *Flasck*, ¶¶217-18.

Chen envisions its water/oxygen barrier layer as sealing layer (128) “can be an inorganic thin film, an organic thin film, ***or a combination thereof.***” *Chen*, 3:66-67. Consistent with the teaching in *Chen*, Sano similarly teaches the buffer layers may be an organic material (*Sano*, ¶72) and the barrier layers may be an inorganic material (*id.*, ¶73). *Flasck*, ¶218.

15. Claim 13

Chen or Chen-Jang teaches Claim 13. §VII.A.4 (cl. 2); *Flasck*, ¶¶219-20.

It would have been obvious to form all of Chen’s touch sensor pads (226b, 227b) on a single layer, with one set of touch sensor pads (227b) connected using a bridge provided on a different material layer (conductive lines connected to patterned conductive layers). §VII.A.4 (cl. 2). POSITAs would have understood that the bridges (227a, the “first connection patterns,” as claimed) would be patterned independently from the touch sensor pads in an upper layer of the first touch sensor pads (227b) because the bridges (227a) would be formed on a separate material layer above an interstitial insulation layer (234). *Chen*, 7:56-8:38, Figs. 3A-B, 4A-B; *Flasck*, ¶220. Jang depicts this arrangement in three dimensions. §VII.A.4 (cl. 2).

**B. Ground 1B: Obviousness over Chen-Matsuo-Sano-Sakamoto
(Claims 1-13)**

1. Prior Art

POSITAs would have recognized Chen, Matsuo, Sano, and Sakamoto all teach critical operational features and design aspects of OLED touch panel display devices (*Flasck*, ¶¶106, 221) and constitute analogous art (*id.*, ¶¶222-24).

2. Motivation to Combine

Grounds 1A and 1B differ only insofar as Jang is replaced by Matsuo. Just as POSITAs would have looked to Jang to implement Chen’s conductive lines, POSITAs would have been motivated to consult Matsuo, which expressly describes how touch-sensing lines for a touch-sensor panel are arranged outside of a display area to connect to a driving circuit. *Matsuo*, ¶¶38, 39; *Flasck*, ¶225. Matsuo provides a top-down view showing the arrangement of conductive lines that Chen does not expressly provide to instruct POSITAs implementing Chen’s device. *Flasck*, ¶225.

POSITAs would have had a reasonable expectation of success modifying Chen in view of Matsuo because Matsuo describes the arrangements of touch-sensor lines that Chen already provides. *Flasck*, ¶226. The only difference between Chen and Matsuo’s implementation is that Chen provides its conductive lines (“sensing lines”) on the display substrate, whereas Matsuo provides them on a touch-panel substrate, but Matsuo would have still informed POSITAs how to arrange Chen’s conductive lines with respect to a substrate, generally, outside of the display area.

Flasck, ¶226. In other words, Matsuo merely provides express instruction for POSITAs to implement Chen’s device on a physical display panel. *Flasck*, ¶226; §VII.A.2.

Because Matsuo is a replacement for Jang in Ground 1A, the analyses for Ground 1B below fully address only those claim limitations that rely upon Matsuo. *Flasck*, ¶227.

3. Claim 1

a. 1[Pre]

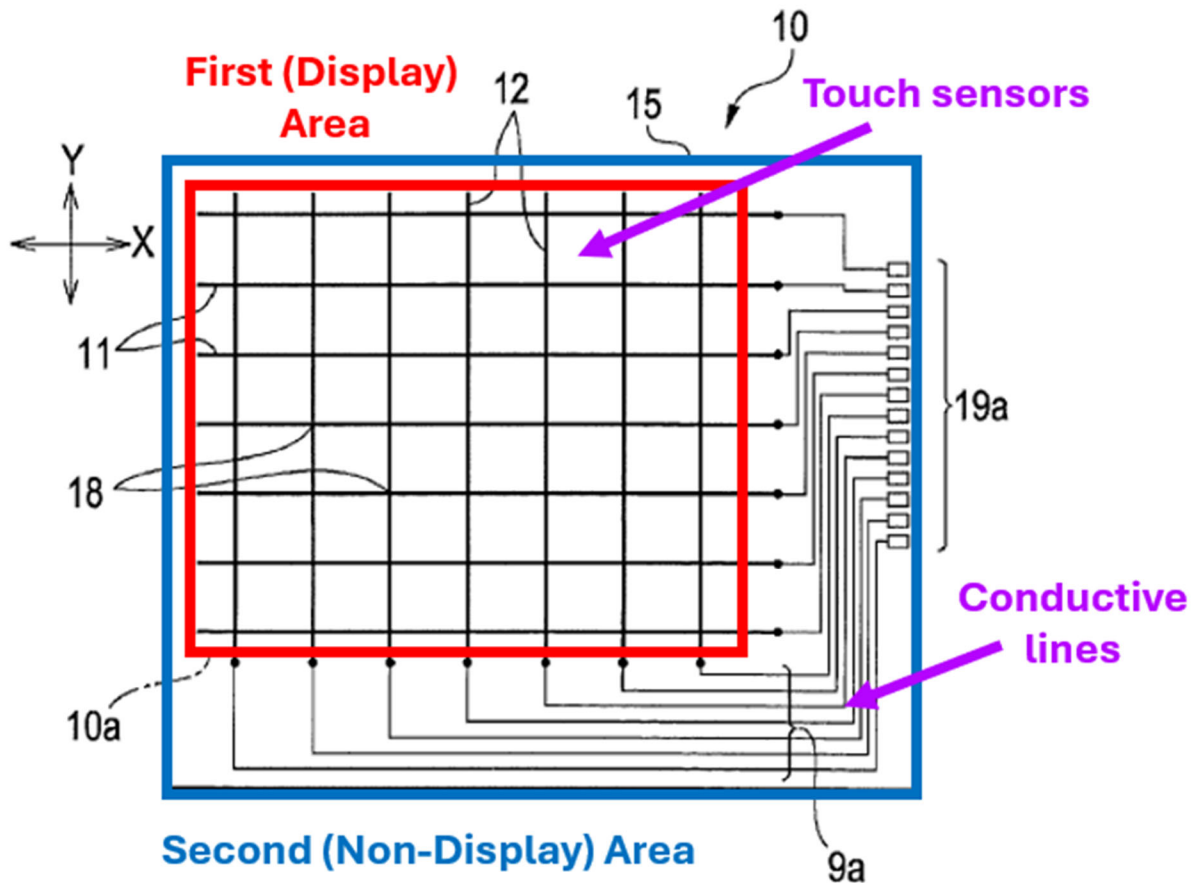
See §VII.A.3.a (Ground 1A, 1[c]). *Flasck*, ¶228.

b. 1[a]

Chen or Chen-Matsuo teaches 1[a]. *Flasck*, ¶¶229-30; §VII.A.3.b (Ground 1A, 1[a]).

Matsuo confirms how POSITAs would have understood Chen’s arrangement. *Flasck*, ¶229; §VII.B.2. Complementing Chen’s cross-sectional views, Matsuo’s top-down view depicts conductive metal wires (9a) (“sensing lines”) like Chen’s conductive lines that connect on-display touch sensors to off-display processors (at 19). *Matsuo*, Fig. 1B, ¶47 (“the metal wires 9a extend *outside the input region* 10a.”); *Flasck*, ¶229.

FIG. 1B



POSITAs implementing Chen's device would have understood that Chen's display has a first display area with the display and touch-sensor components and a second non-display area adjacent to the first display area with processing elements and conductive lines connecting the on-display and off-display components, consistent with Matsuo. *Flasck*, ¶230; §VII.A.2.

c. 1[b]

See §§VII.A.3.b (Ground 1A, 1[a]), VII.B.3.a (1[a]); *Flasck*, ¶231.

d. 1[c]

See §VII.A.3.d (Ground 1A, 1[c]). *Flasck*, ¶232.

e. 1[d]

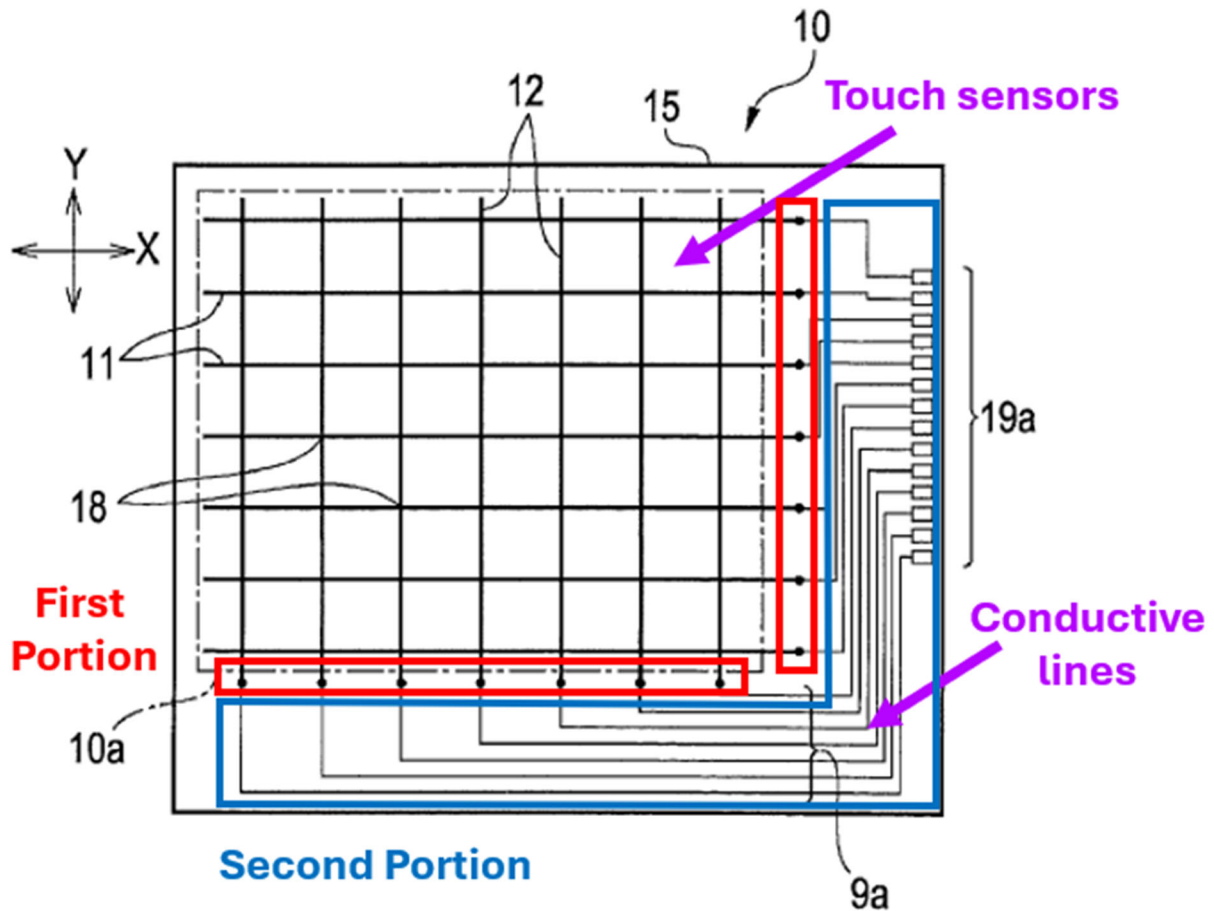
See §VII.A.3.e (Ground 1A, 1[d]). *Flasck*, ¶233.

f. 1[e]

Chen or Chen-Matsuo teaches 1[e]. *Flasck*, ¶¶234-36; §VII.A.3.f (Ground 1A, 1[e]).

Matsuo confirms how POSITAs would have understood Chen's arrangement. *Flasck*, ¶236; §VII.B.2. Unlike Chen's cross-sectional views, Matsuo's top-down view depicts conductive lines (9a) like Chen's conducting lines that have a first portion connecting to the touch sensors, and another portion that runs along the substrate to connect to a PCB.

FIG. 1B



Matsuo, Fig. 1B, ¶¶47, 61, 77; *Flasck*, ¶235.

POSITAS would have understood Chen in Fig. 3A provides conductive lines as sensing lines which include one portion as the “first portion” connecting to conductive layers (223, 225), and includes a part that bridges over the step difference downwardly to substrate (110) to connect to another portion as the “second portion” formed over the substrate to reach conductive wires (122c, d) on substrate (110), to off-display processing components, consistent with *Matsuo*. *Flasck*, ¶236; §VII.A.2.

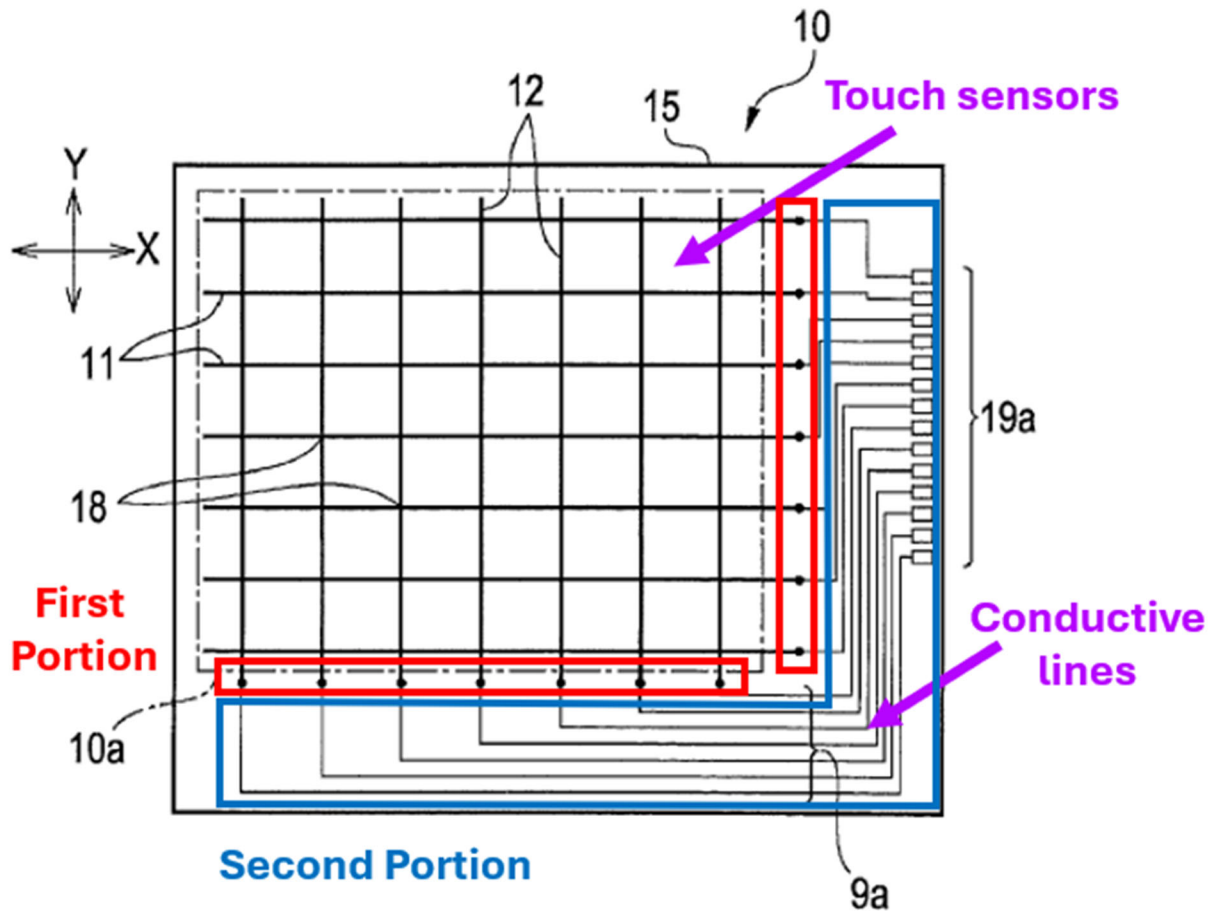
g. 1[f]

Chen-Matsuo teaches 1[f]. *Flasck*, ¶¶237-40.

Although Chen does not expressly explain what the conductive wires (122c, d) and conductive lines are connected to, POSITAs would have understood that they are connected to driving and/or processing circuitry to deliver electricity to the touch sensors and evaluate electrical signals in response to a user's touch. *Flasck*, ¶238.

Matsuo teaches that “the second flexible substrate 19 is also connected to a driving circuit (not shown) for allowing the capacitive input device 10 to detect an input position,” and shows metal wires (9a) connecting to terminals (19a) to form the connection to flexible substrate (19) with the driving circuit.

FIG. 1B



Matsuo, Fig. 1B, ¶¶39, 47; *Flasck*, ¶239.

POSITAs implementing Chen's device would have been motivated to connect Chen's conductive wires (122c, d) to a driving circuit on a separate substrate to drive the touch sensors and respond to a user's touch. *Flasck*, ¶240; §VII.B.2.

h. 1[g]

See §VII.A.3.h (Ground 1A, 1[g]). *Flasck*, ¶241.

i. 1[h]

Chen-Sano-Matsuo teaches 1[h]. *Flasck*, ¶¶242-44.

Chen and Sano teach forming Chen's barrier layer (128) as a multi-layered sealing layer consistent with Sano, which would produce a sealing layer with an inclined surface, as explained in 1[c]. §VII.A.3.d (1[c]); *Flasck*, ¶243. The Chen-Matsuo combination connects Chen's conductive wires (122c, d) to a driving circuit either directly on the substrate, or connected to the substrate through a flexible PCB, as explained in 1[f]. §VII.B.3.g (1[f]); *Flasck*, ¶243.

POSITAs would have understood—consistent with Sano—that when forming Chen's barrier layer (128) as sealing layer that has an inclined surface, the series of buffer and barrier layers cover the OLED-display elements to prevent degradants from reaching the display, and the edges of the sealing layer then taper outwardly, as Sano shows (only without the underlying OLED-display elements).

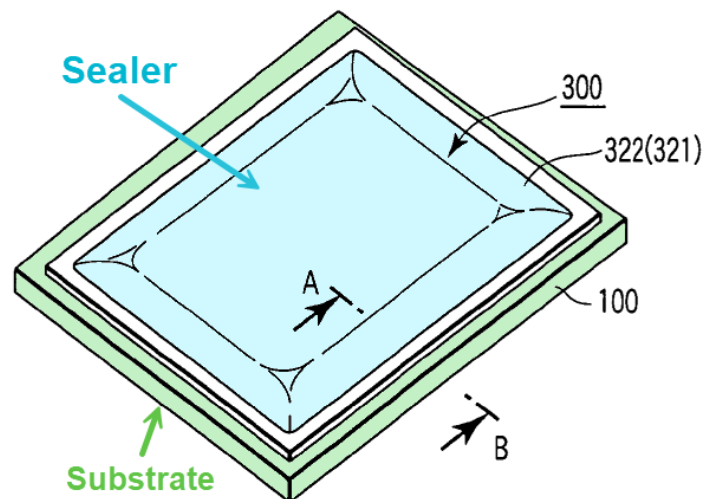
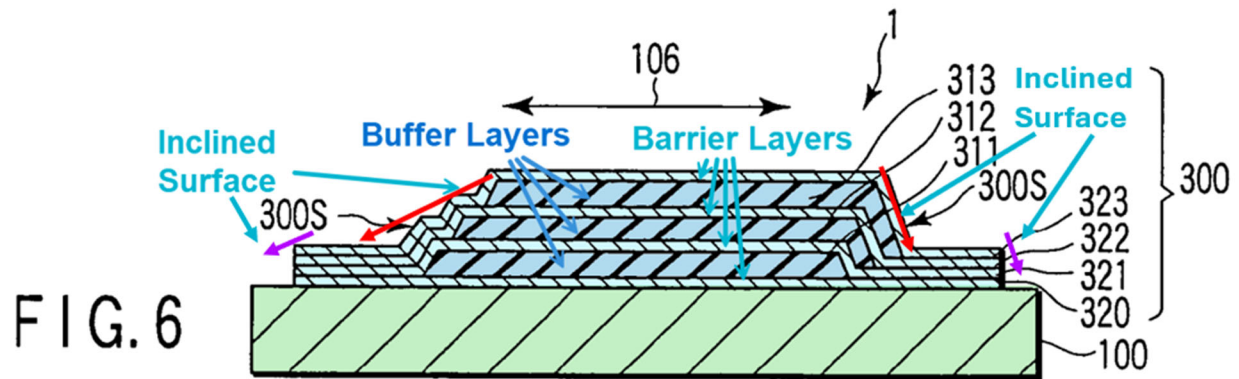


FIG. 3

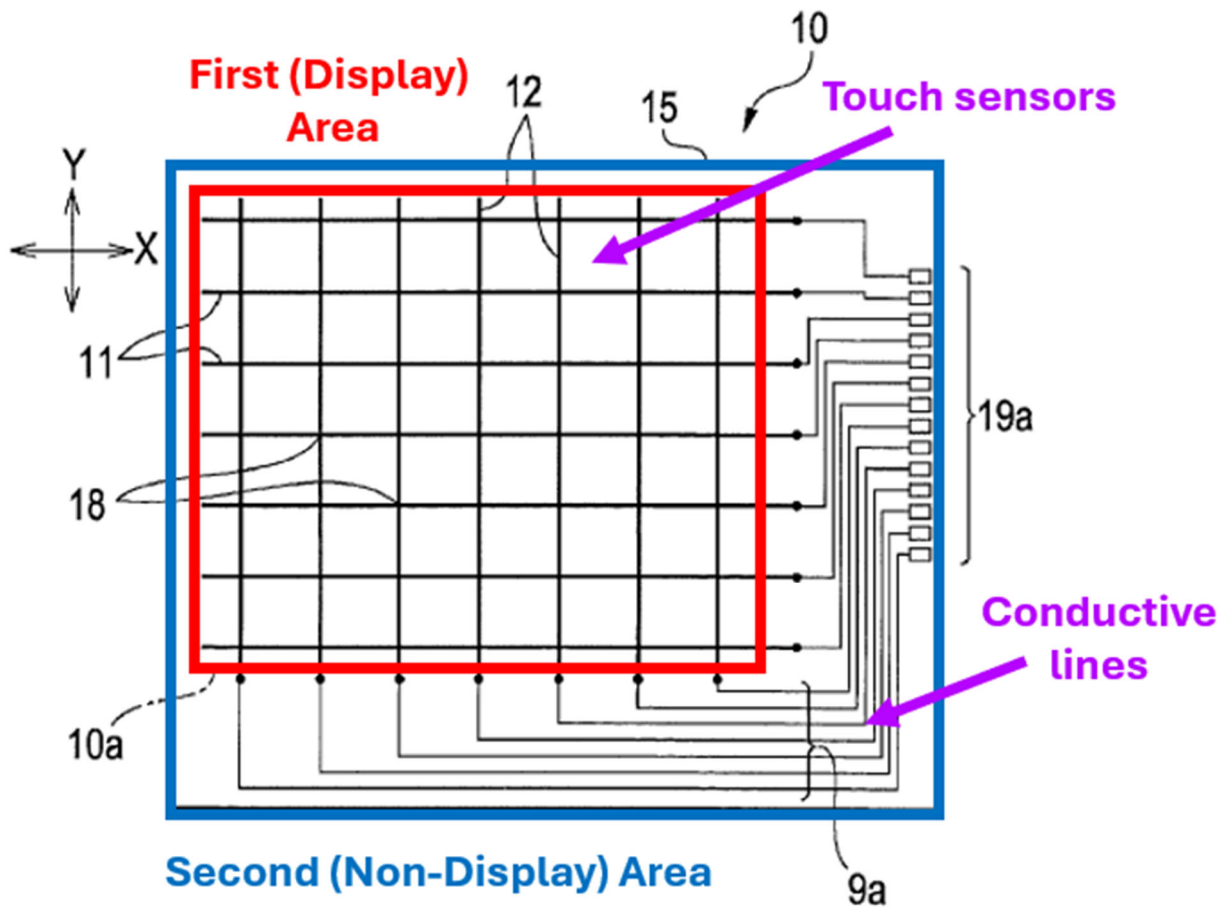


Sano, Figs. 3, 6, ¶¶107-08, 133, 158, 171, 173, 215; *Flasck*, ¶244. Because Matsuo teaches using a driving circuit (not shown) sitting *outside* of the display area (on flexible substrate 19), POSITAs would have understood that a sealing layer formed consistent with Chen and Sano would be inclined downwardly towards the driving circuit that sits outside of the display area. *Flasck*, ¶244.

j. 1[i]

Chen-Matsuo-Sano-Sakamoto teaches 1[i]. *Flasck*, ¶¶245-47.

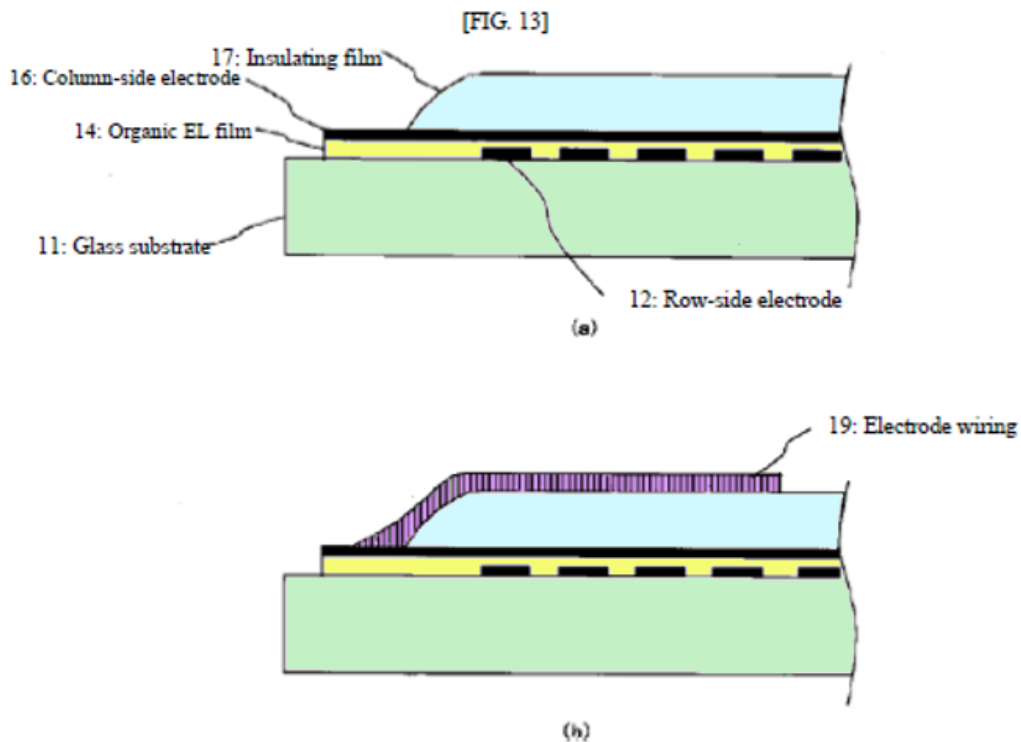
FIG. 1B



Matsuo, Fig. 1B; *Flasck*, ¶246.

When modifying Chen's barrier layer (128) to have a multi-layered sealing layer with an inclined edge—consistent with Sano (§VII.A.3.d (Ground 1A, 1[c]))—POSITAs would have understood that some parts of Chen's conductive lines would be connected to conductive wires (122c, d) on substrate 110, and would need to connect to first and second patterned conductive layers (223, 225) on top of sealing layer (128). Although a few ways were known to make that connection, POSITAs

would have understood that the most obvious and straightforward option entails forming part of Chen's conductive lines as sensing lines between the first portion on the top of sealing layer (128) and the second portion over substrate (110) to connect Chen's conductive wires (122c, d) on substrate (110) so that this portion of the sensing lines is along the inclined surface of sealing layer (128) to connect the first portion and second portion to each other, as taught by Sakamoto and others in the art. §VII.A.2; *Flasck*, ¶247.



Sakamoto, Figs. 13a-b.

k. **1[j]**

Chen-Matsuo-Sano-Sakamoto teaches 1[j]. *Flasck*, ¶¶248-50.

Chen's conductive lines as the sensing lines have a first portion over the top of sealing layer (128) to connect to touch sensors (223, 225) formed on top of sealing layer (128), and a second portion over substrate (110) connected to conductive wires (122c, d) formed on substrate (110). §§VII.A.3.e-VII.A.3.f (Ground 1A, 1[d]-[e]).

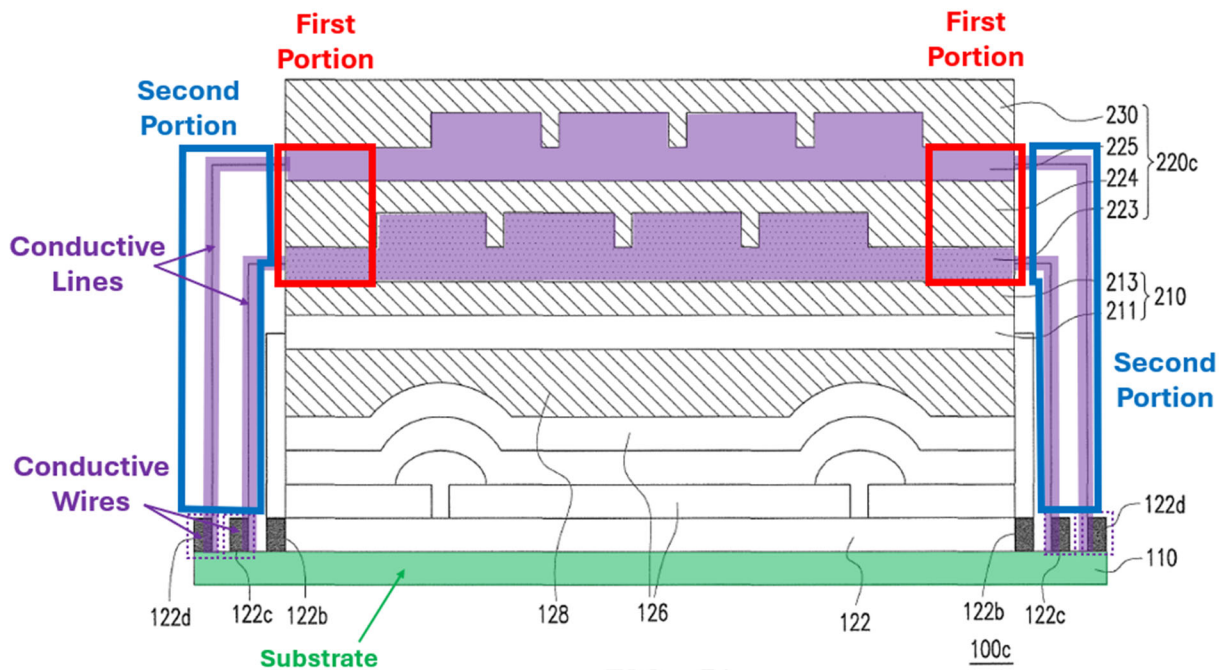
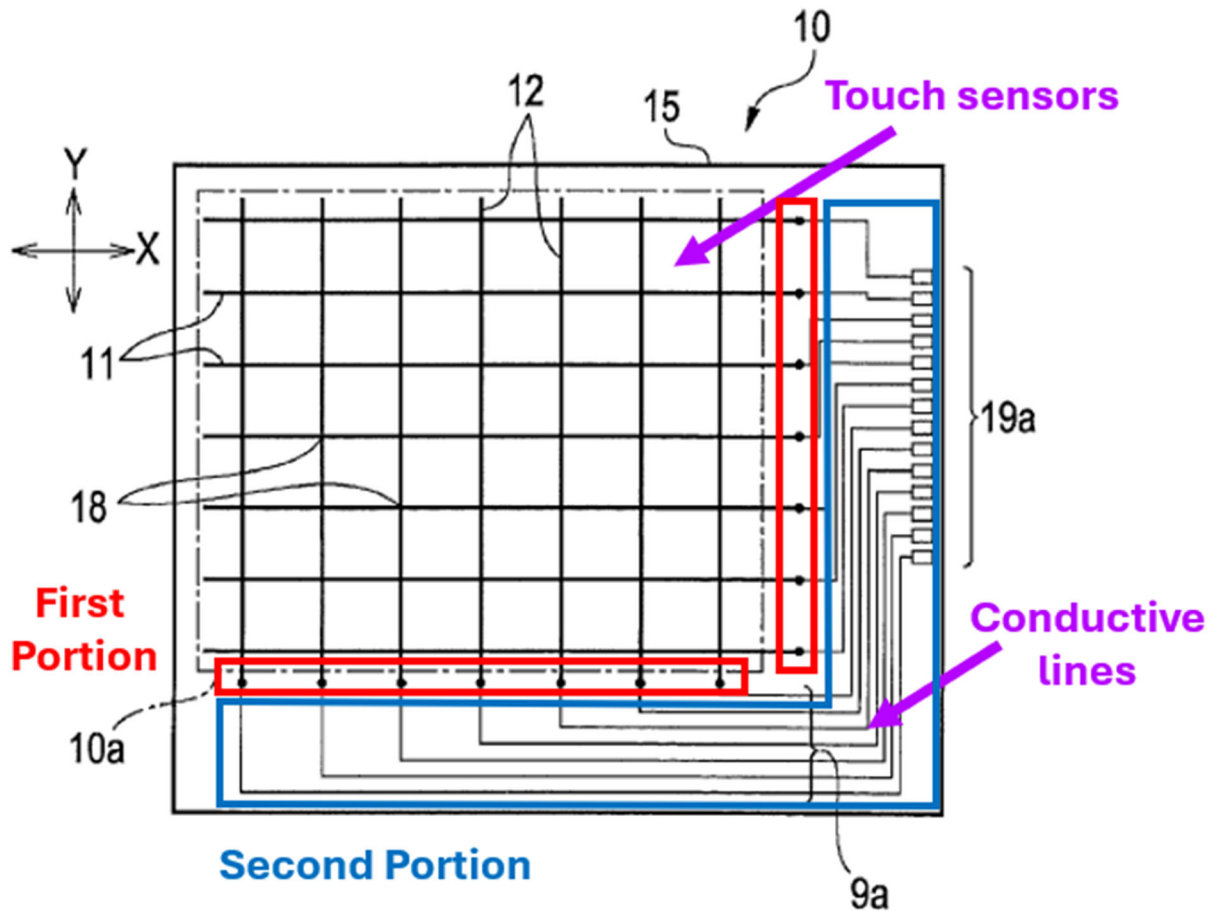


FIG. 3A

Chen, Fig. 3A, 7:13-55; *Flasck*, ¶249.

Matsuo provides an exemplary top-down view of a similar arrangement, showing a first portion connected to the touch sensors, and a second portion that runs along the substrate and connects to a driving circuit.

FIG. 1B



§VII.B.3.f (1[e]); *Flasck*, ¶250.

When modifying Chen's barrier layer (128) to have a multi-layered sealing layer with an inclined edge, consistent with Sano (§VII.A.3.d (Ground 1A, 1[c])), POSITAs would have understood that Chen's conductive lines would have a first portion formed over the top surface of barrier layer (128) and downwardly connect to another second portion connected to conductive wires (122c, d) already formed on substrate (110)—similar to Matsuo's top-down depiction—and the conductive

lines extend from the touch sensors) along the inclined edge of sealing layer (128) (i.e., Sano's moderately inclined surface 300S and inorganic barrier layer taper at its end) to the second area of the substrate as taught by Sakamoto for connecting to the conductive wire and driving circuit. §§VII.B.3.g (1[f]), VII.B.3.j (1[i]); *Flasck*, ¶250.

I. 1[k] and 1[l]

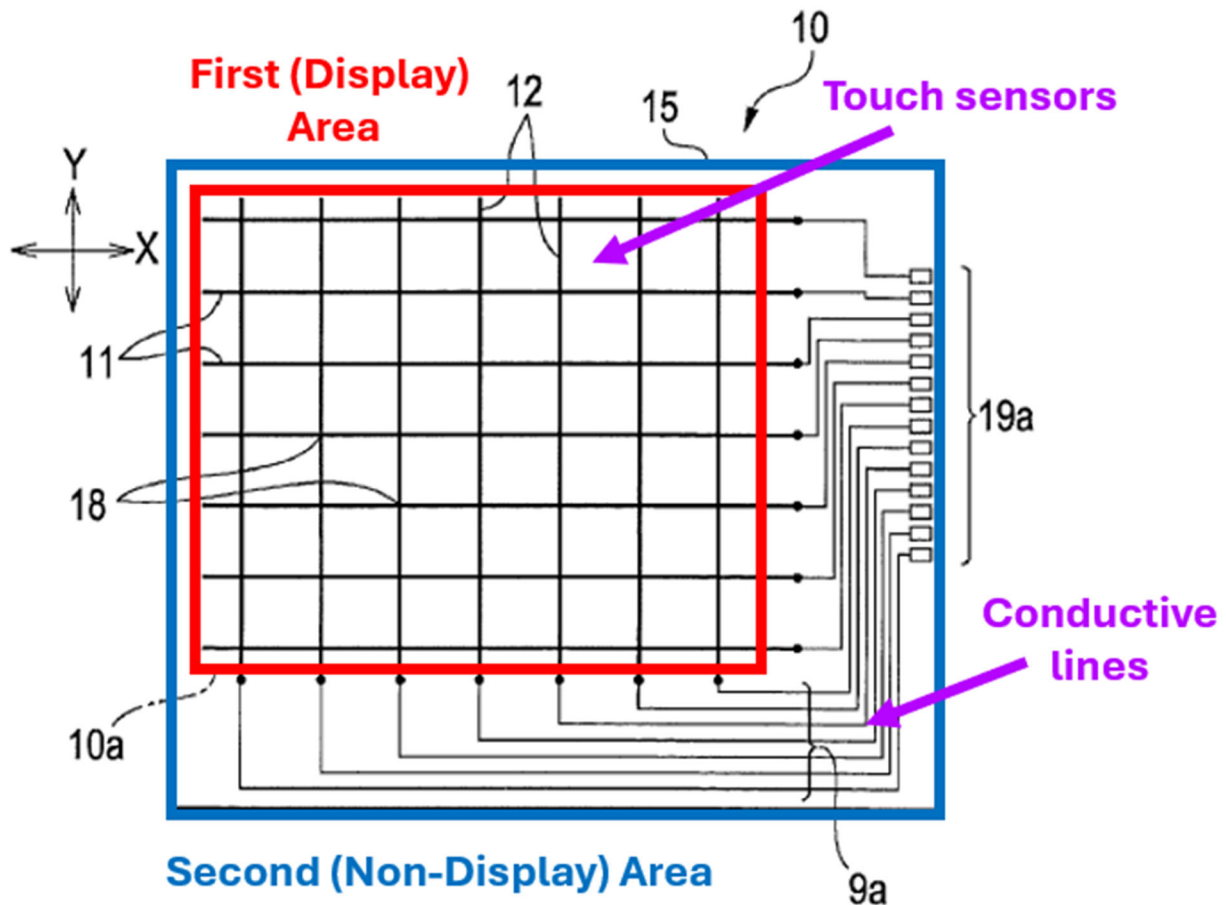
See §§VII.A.3.l-VII.A.3.m (Ground 1A, 1[k]-1[l]). *Flasck*, ¶¶251-52.

4. Claim 2

Chen-Matsuo teaches Claim 2. *Flasck*, ¶¶253-56.

Chen teaches conductive lines with a first portion provided in the layers for the touch sensors over the top of sealing layer (128) to connect to the touch sensors, and second portion of the sensing lines over substrate (110) to connect to conductive wires 122c-d on substrate (110). §§VII.A.3.e (Ground 1A, 1[d]), VII.B.3.f (1[e]), VII.B.3.k (1[j]); *Flasck*, ¶254. Matsuo provides a top-down view that shows conductive lines (9a) as sensing lines like Chen's conductive lines that extend from a first (display) area to a second (non-display) area of the substrate to connect on-display touch sensors to off-display processors, which would have guided POSITAs when implementing Chen's device. *Matsuo*, Fig. 1B; §VII.B.3.a (1[a]); *Flasck*, ¶254.

FIG. 1B



Chen in Fig. 3A also depicts both ends of a touch-pad array (223, 225) of touch sensor pads (223b, 225b) as sensing cells include connecting electrodes as the first portion of the sensing lines that are connected between sensing cells in form of touch sensor pads (223b, 225b) and second portion of the conductive lines as the sensing lines that downwardly connect to conductive wires (122c, d) on substrate (110). Referring to Fig. 3B in light of Fig. 3A, first portions (223a on the edge of the touch-pad array formed by touch sensor pads 223b) of the different sensing lines are

in the same conductive layer (223) and, similarly, first portions (225a on the edge of the touch-pad array formed by touch sensor pads 225b) of the different sensing lines are in the same conductive layer (225). Therefore, Chen discloses that at least some first portions of the conductive lines are located on a same layer.

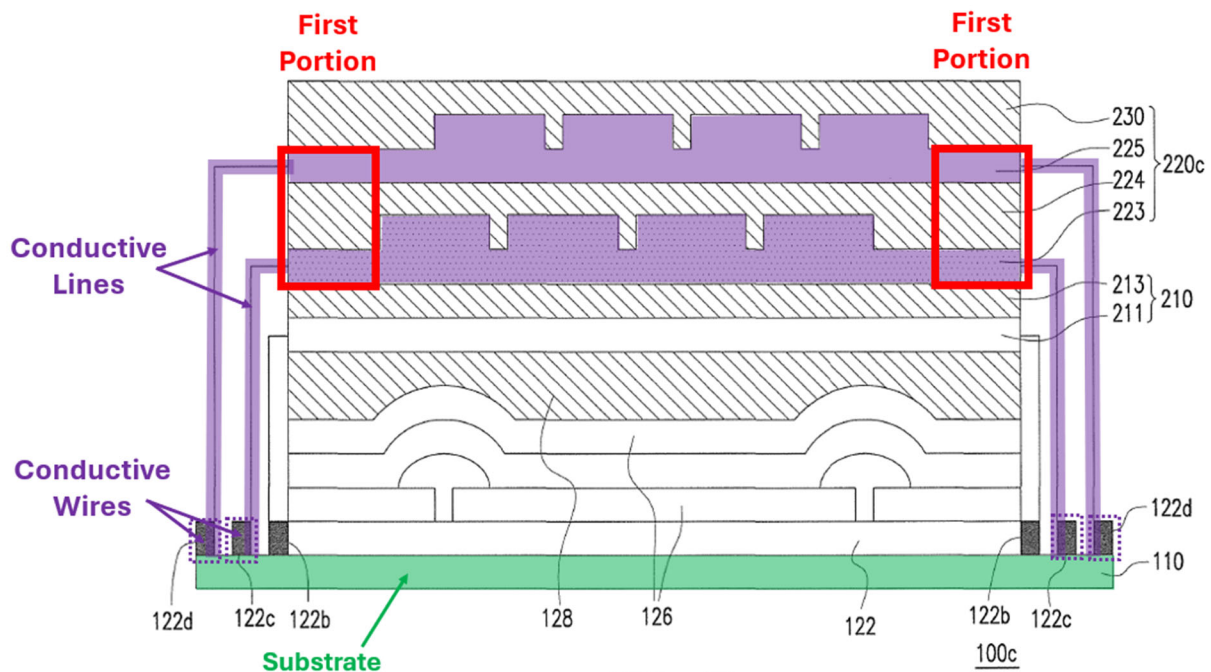


FIG. 3A

Chen, Fig. 3A, 7:13-55; *Flasck*, ¶255.

To the extent this limitation requires *all* first portions to be on the same layer, however, such an arrangement would have been obvious in view of *Chen*, for the reasons described above. §VII.A.4; *Flasck*, ¶256.

5. Claim 3

Chen or Chen-Matsuo teaches Claim 3 as described above. §§VII.B.3.f(1[e]), VII.A.3.k(1[j]) (explaining first portion provided on or near barrier layer (128) and second portion on substrate (110)); *Flasck*, ¶257.

6. Claim 4

Chen or Chen-Matsuo teaches Claim 4. *Flasck*, ¶¶258-60.

Because Chen’s “first portions” of the conductive lines are located over the top of the sealing layer (e.g., 128) to connect to the touch sensors formed on or above that sealing layer, but “second portions” are provided over substrate (110) to connect to conductive wires (122c, d) on substrate (110) (§VII.B.3.f(1[e])), POSITAs would have understood that Chen discloses that the first portions of the conductive lines have a first distance from the substrate that is greater than the distance between the second portions of the conductive lines and the substrate. *Flasck*, ¶259.

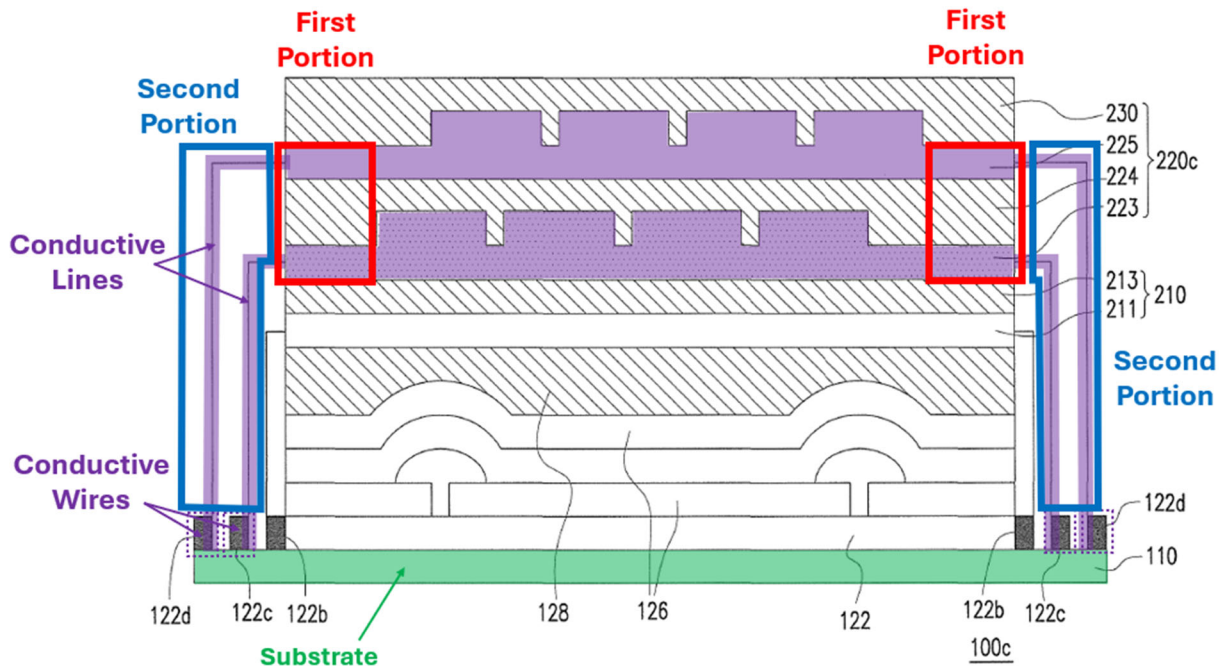


FIG. 3A

Chen, Fig. 3A, 7:13-55; *Flasck*, ¶259.

Matsuo would have further confirmed this arrangement. §VII.B.3.f (1[e]);
Flasck, ¶260.

7. Claim 5

Chen-Matsuo teaches Claim 5 as described above. §VII.B.3.g (1[f]), *Flasck*,
¶261.

8. Claim 6

Chen-Matsuo teaches Claim 6. *Flasck*, ¶¶262-65.

Although Chen does not expressly describe the materials used for the
conductive lines and touch sensor pads (223b, 225b), POSITAs would have found
using different materials obvious. See §VII.A.8 (Ground 1A, claim 6). Matsuo's

capacitive touch panel has a “translucent conductive metal oxide layer...made of...indium tin oxide [(ITO)] or indium zinc oxide [(IZO)].” *Matsuo*, ¶17; *Flasck*, ¶263. Matsuo’s “metal wires...connect[] to...first and second translucent electrode lines.” *Matsuo*, ¶¶20, 42, 47, 51; *Flasck*, ¶263. POSITAs would have understood that metal wires were often used for connections because they provided far less electrical resistance than transparent conductive materials (like ITO and IZO), and thus could be made to have a smaller cross-sectional area. *Flasck*, ¶¶264-65; *see also Ritchie v. Vast Res., Inc.*, 563 F.3d at 1337; *In re Lackey*, 371 Fed. Appx. at 82.

9. Claim 7

Chen-Matsuo teaches Claim 7. *Flasck*, ¶¶266-67.

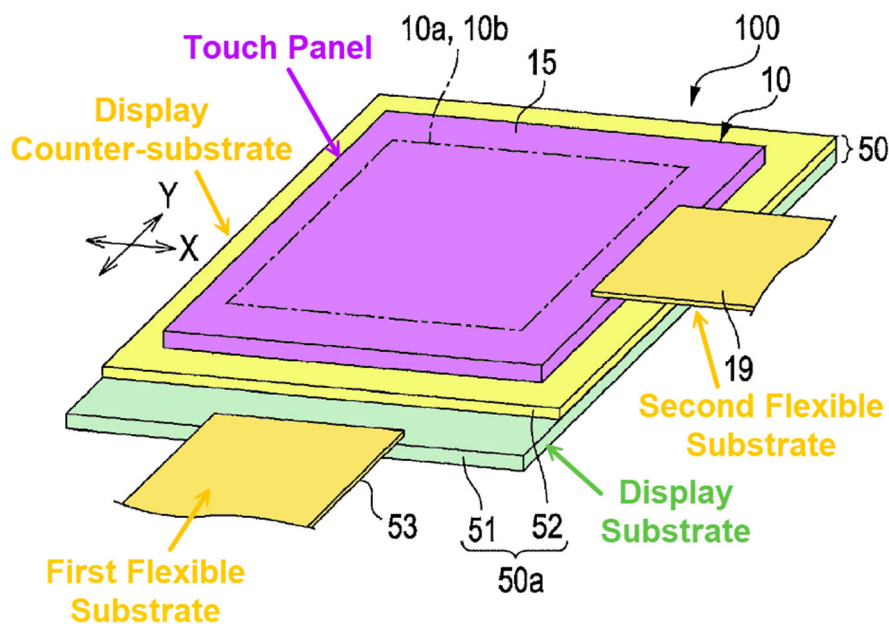
Matsuo teaches metal wires (9a) connected to a driving circuit located on flexible substrate (19a). §VII.B.3.g (1[f]); *Flasck*, ¶267. Although Matsuo does not provide a driving circuit on the **display** substrate, POSITAs implementing Chen’s device would have understood that the driving circuit would be placed in or on a second (off-display) area of the **display** substrate—either placing the driving circuit directly on the substrate, or connected to the substrate by a separate flexible substrate, consistent with Matsuo—because Chen discloses its conductive lines connected to conductive wires 122c-d are provided on the **display** substrate. §§VII.B.3.g (1[f]), VII.B.2; *Flasck*, ¶267. Matsuo *also* provides driving integrated circuits on the display substrate. *Matsuo*, ¶38.

10. Claim 8

Chen-Matsuo teaches Claim 8. *Flasck*, ¶¶268-70.

Matsuo's "flexible substrate" (53) is attached to the second area of the *display* substrate. *Matsuo*, Fig. 1A, ¶38; *Flasck*, ¶269.

FIG. 1A



Although Matsuo does not expressly state that flexible substrates (53, 19) are flexible PCBs, POSITAs would have known that because the flexible substrates were intended to contain driving circuits (*see* §VII.B.3.g (1[f])), they would be formed as printed circuit boards so that the connecting lines are embedded on the flexible substrate. *Flasck*, ¶270.

11. Claim 9

Chen-Matsuo teaches Claim 9 as described above. §§VII.B.3.g (1[f]), VII.B.10 (cl. 8), VII.B.2; *Flasck*, ¶271.

12. Claim 10

Chen-Matsuo teaches Claim 10 as described above. §§VII.A.3.a (Ground 1A, 1[pre]), VII.B.3.a (1[a]), VII.B.3.f (1[e]), VII.B.3.j (1[i]); *Flasck*, ¶272.

13. Claims 11-13

See §§VII.A.13-VII.A.15 (Ground 1A, Claims 11-13). *Flasck*, ¶273.

C. Grounds 2A/2B: Obviousness over Imamura-Yang-Sakamoto and Imamura-Yang-Sakamoto-Chen (Claims 1-13)⁴

1. Prior Art

POSITAs would have recognized Imamura, Yang, Sakamoto, and Chen all teach critical operational features and design aspects of OLED touch panel display devices (*Flasck*, ¶¶106, 274-76) and constitute analogous art (*id.*, ¶¶277-79).

2. Motivation to Combine

Imamura discloses an OLED display that is sealed from environmental degradants, but does not explain the display with any form of user input; Imamura's display either has no user input, or relies upon external inputs (e.g., keyboard,

⁴ Ground 2B requires the same prior art mapping as Ground 2A, excepting only the addition of Chen rendering claim 1[d] further obvious as explained.

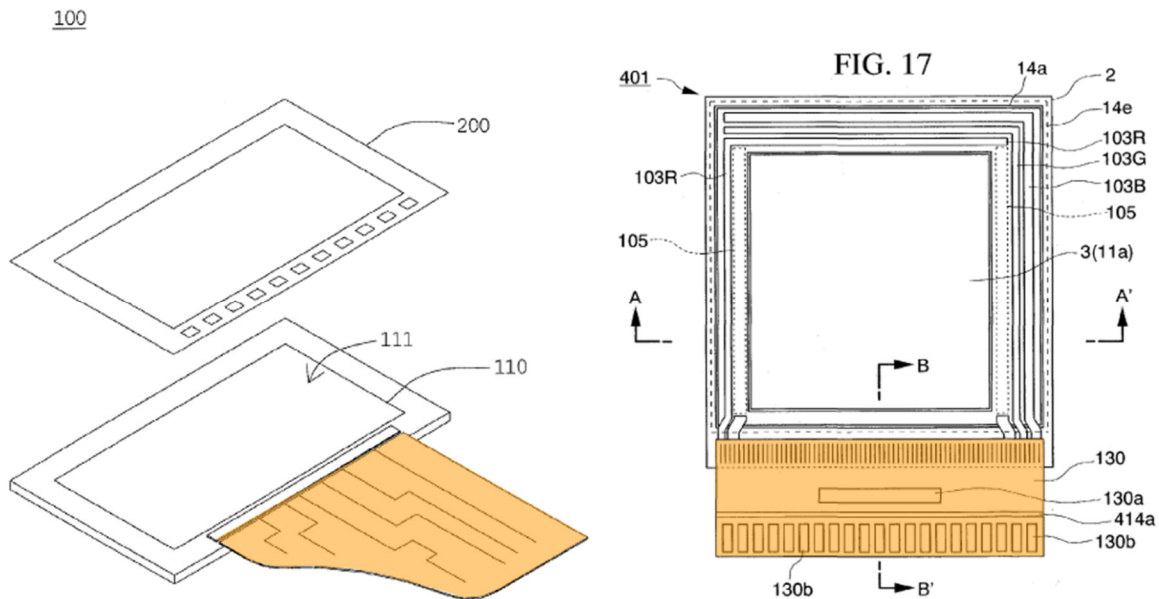
mouse). *Flasck*, ¶280. Touch-panel displays were growing in popularity as of 2010, and POSITAs would have been motivated to modify Imamura to incorporate a touch panel into Imamura’s display to provide a direct form of user input. *Id.*

POSITAs would have turned to other prior-art references (Yang, Chen), to identify the known structures of the touch panel and how they would have been integrated into the display. *Id.*, ¶281. Yang expressly teaches that its capacitive touch panel may be “integrated into a panel of [a] display device” with an OLED display (*Yang*, ¶32), and describes how the touch-panel layers are formed on top of a display. *Yang*, ¶¶5, 11-12, 32-33. Chen teaches forming a touch sensing structure over top a water/oxygen barrier layer. §A.3.e; *Flasck*, ¶281.

POSITAs would have had a reasonable expectation of success making this modification because it merely involves forming additional touch-panel-related layers on Imamura’s display; both Yang and Chen taught the layers required. *Flasck*, ¶282. Moreover, integrating a touch-sensor panel into a display was a routine and well-known process by 2010 (e.g., Chen’s integrated touch-sensor panel-OLED display). *Chen*, Figs. 3A-B, 4A-B; *see also In re Morris*, 127 F.3d 1048, 1050-53, 1055-56 (Fed. Cir. 1997) (citation omitted) (obvious to integrate components).

When adding a touch-sensor panel to Imamura’s display, however, POSITAs would have understood that the touch sensors would need to be connected to an off-display driving circuit to operate. *Flasck*, ¶283. Both Yang and Imamura couple a

flexible printed circuit board (orange) to a substrate to provide control circuitry to their respective panels. Compare Yang, Fig. 2 (left) with Imamura, Fig. 17 (right):



Flasck, ¶283.

Because the touch panel would be formed on top of Imamura's existing display, POSITAs would have understood the need to connect the touch sensors on top of Imamura's sealing membrane to a driving circuit placed in a non-display area on either Imamura's substrate or flexible tape. *Id.*, ¶284. POSITAs would have understood that there are a few ways to make this connection, but would have been particularly motivated to deposit a connection along Imamura's sealing membrane for the reasons discussed above in Ground 1A based on Sakomoto. §VII.A.2; *Flasck*, ¶284.

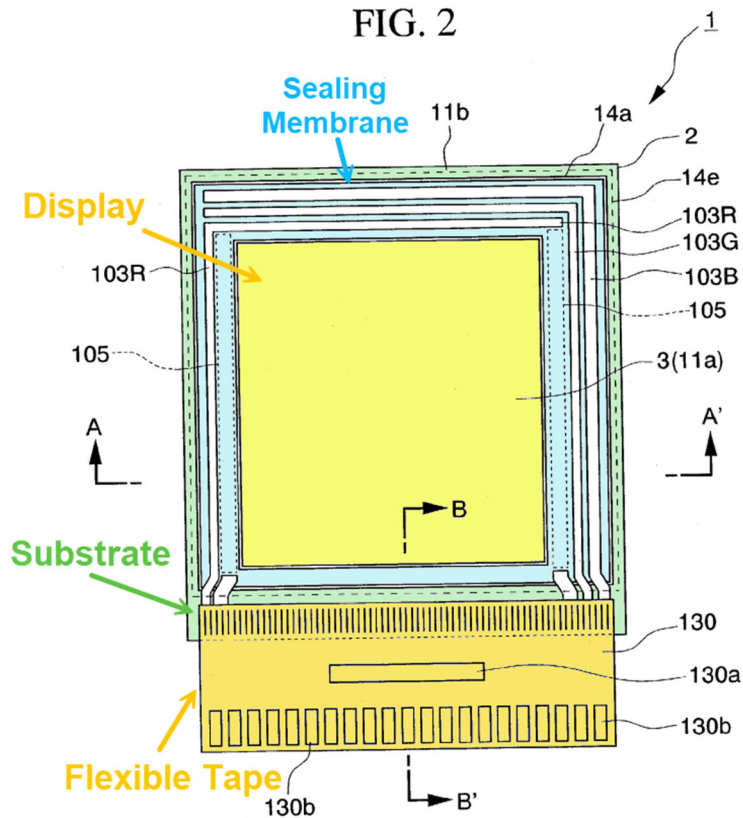
POSITAs would have had a reasonable expectation of success in making this modification because it required a known technique combining known, discrete elements—a display panel and a touch panel—into an integrated device. *Flasck*, ¶285. POSITAs would have also recognized—and been able—to meet the need to route electrical signals between each of the two panels—either by integrating their circuitry as well or providing separate circuitry for each. *Id.*

3. Claim 1

a. 1[pre]

To the extent limiting, Imamura teaches 1[pre]. *Flasck*, ¶¶286-87.

Imamura’s “organic EL display device” includes display section 3:

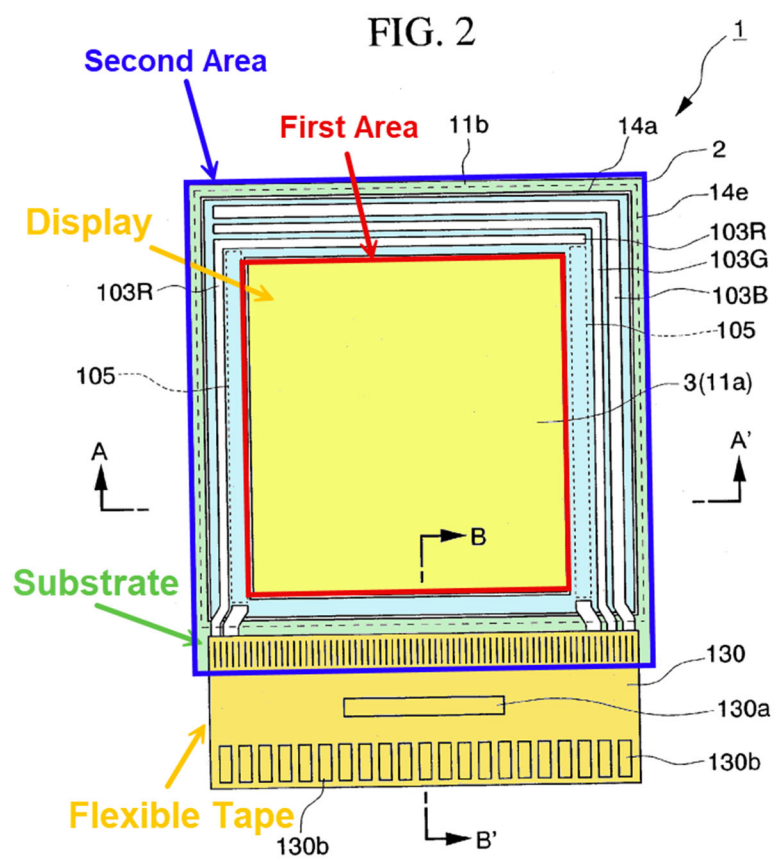


Imamura, Fig. 2, ¶¶2, 90, 99; *Flasck*, ¶287.

b. 1[a]

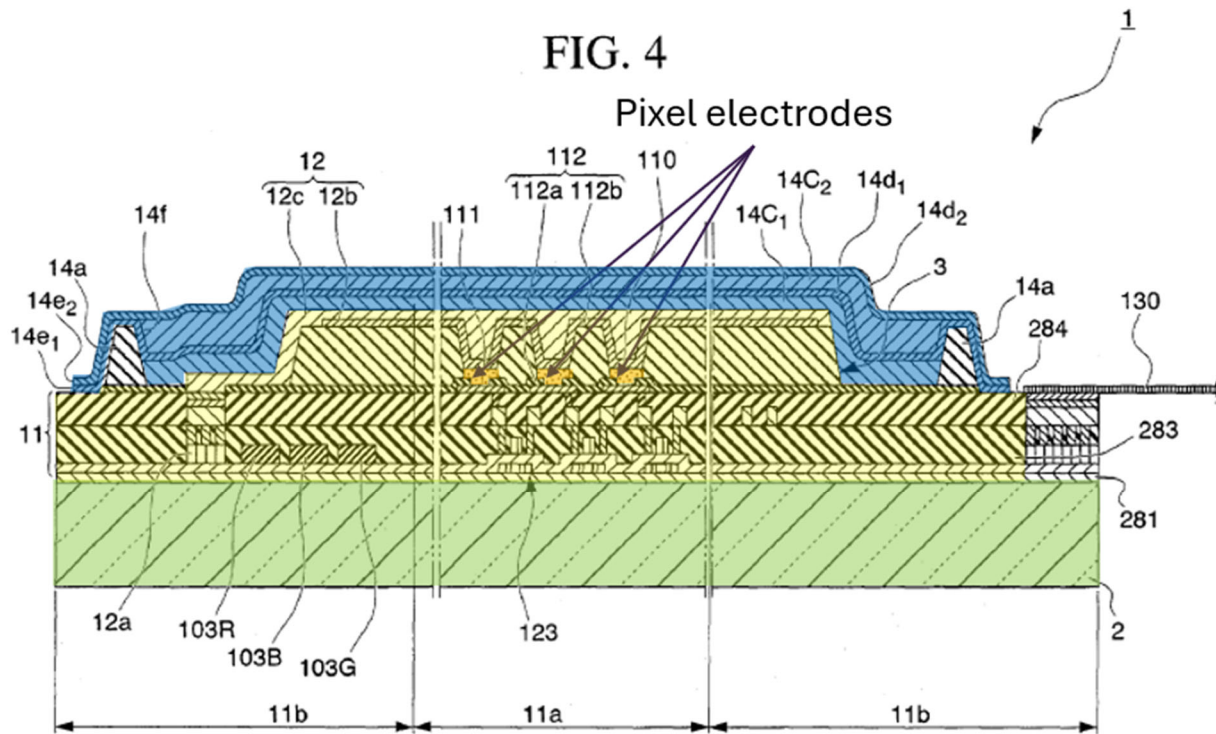
Imamura teaches 1[a]. *Flasck*, ¶¶288-89.

Imamura discloses first display area (3) provided on substrate (2) on which a plurality of pixel electrodes (111) with thin-film transistors (“TFTs”) (123) are formed, and a second area adjacent to the first area (the non-display portions of the substrate):



Imamura, Fig. 2.

FIG. 4



Id., Fig. 4, ¶¶101, 105, 128; *Flasck*, ¶289.

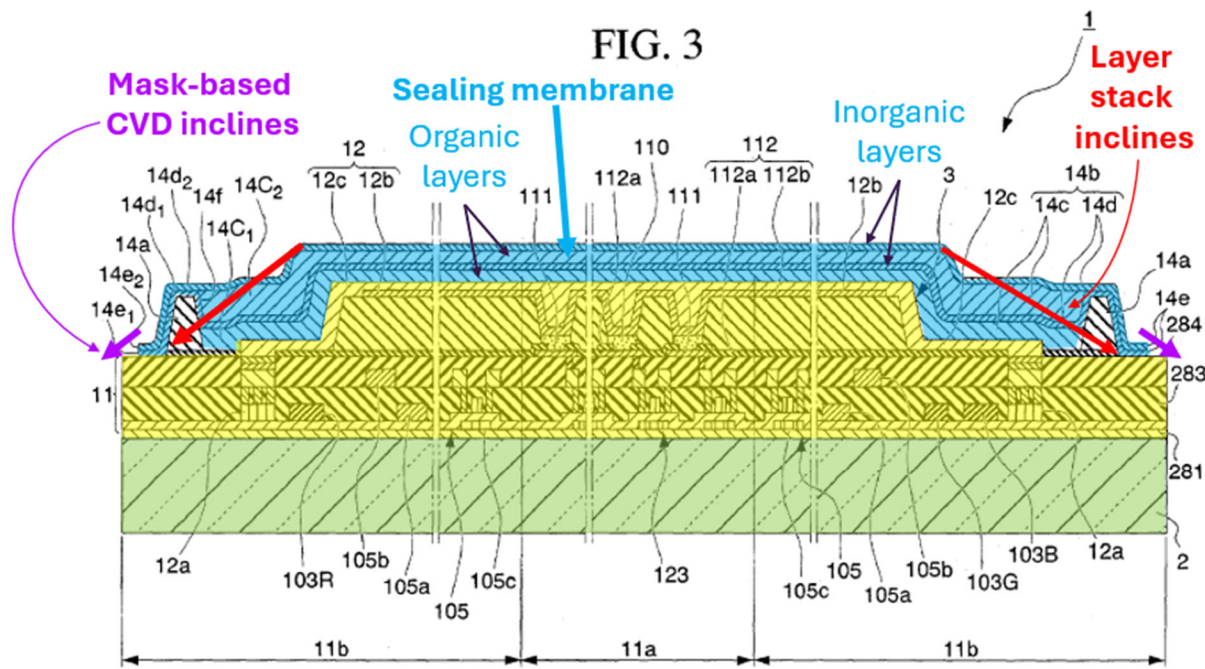
c. 1[b]

Imamura teaches 1[b] as described above. §VII.C.3.b (1[a]); *Flasck*, ¶290.

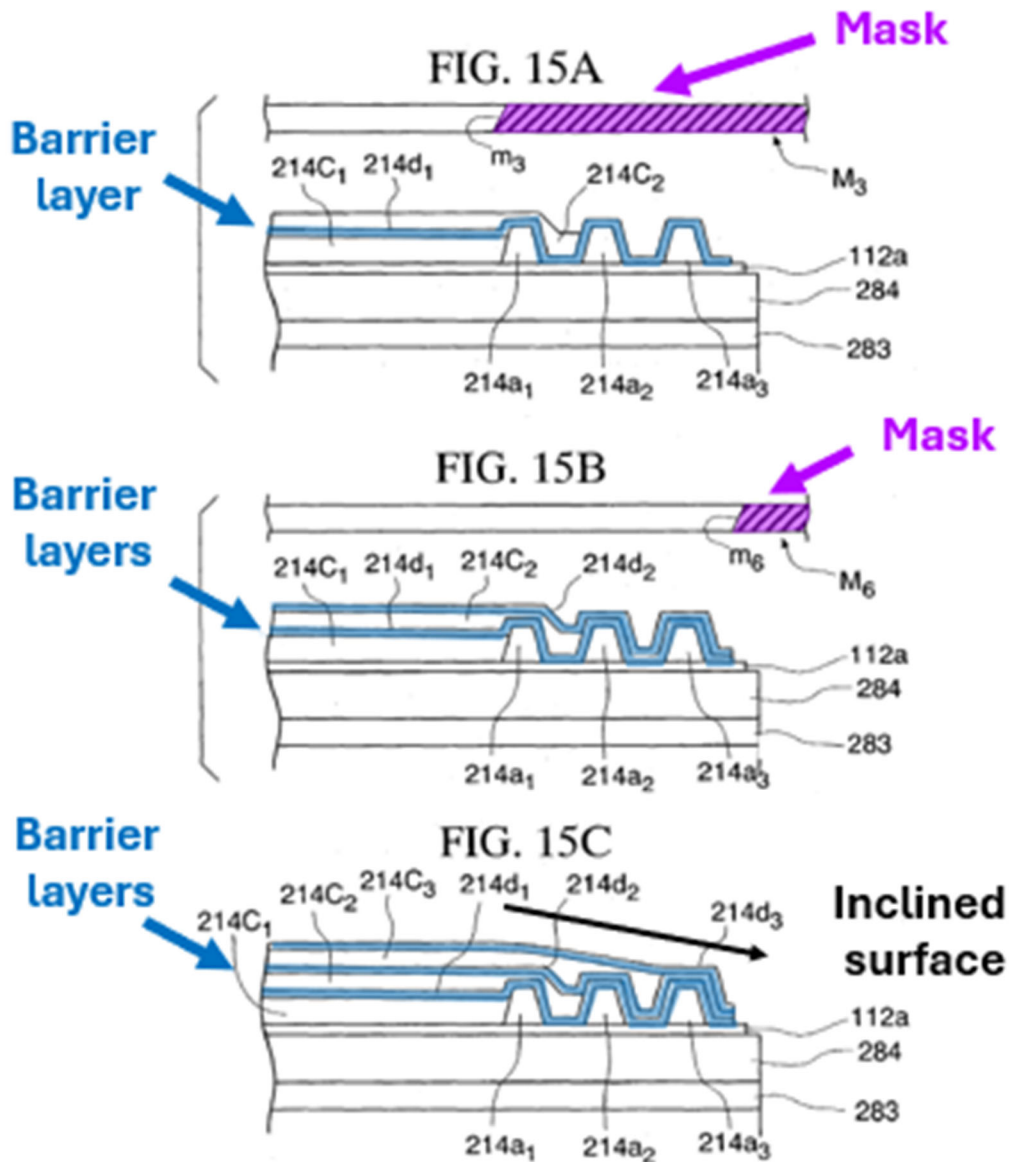
d. 1[c]

Imamura teaches 1[c]. *Flasck*, ¶¶291-93.

Imamura's multilayered sealing membrane ("sealing thin film") covers a first area (pixel area) and extends outward; POSITAs would have recognized it includes an incline surface resulting from deposited step differences in the inorganic-organic layer stack and mask-based CVD deposition of topmost inorganic layer (14d₂) at its end as explained above (*see* §III):



Imamura, Fig. 3, ¶¶112-13; *Flasck*, ¶292. Imamura's mask-based inorganic-organic layer stack inclined surface is formed in steps:



Id., Figs. 15A-C, ¶¶163, 168-73; *Flasck*, ¶292.

Imamura’s sealing membrane is “superior in blocking water and oxygen” and “functions to prevent degradation of the cathode electrode 12 and the active layer 110 by inhibiting permeation of water, oxygen, impurity ions, or the like into the display element section 3.” *Imamura*, ¶114; *Flasck*, ¶293.

e. 1[d]

(i) Ground 2A

Imamura-Yang teaches 1[d]. *Flasck*, ¶¶294-97.

Imamura teaches a multilayer sealing membrane in OLED displays.
§VII.C.3.d (1[c]); *Flasck*, ¶295.

Although Imamura does not explain touch sensing based on a plurality of sensing cells formed on top of the sealing film, POSITAs would have been motivated to add a touch-sensor panel to Imamura's display as discussed above. §VII.C.2. Yang teaches a capacitive touch panel (200) that includes a first direction (410) electrode layer (300) that includes first direction electrodes 350 as part of the claimed "sensing cells," and second direction (420) electrode layer (500) that includes second direction electrodes 550 as part of the claimed "sensing cells" oriented in two different directions (410, 420) and separated by an electrical insulating dielectric layer (250):

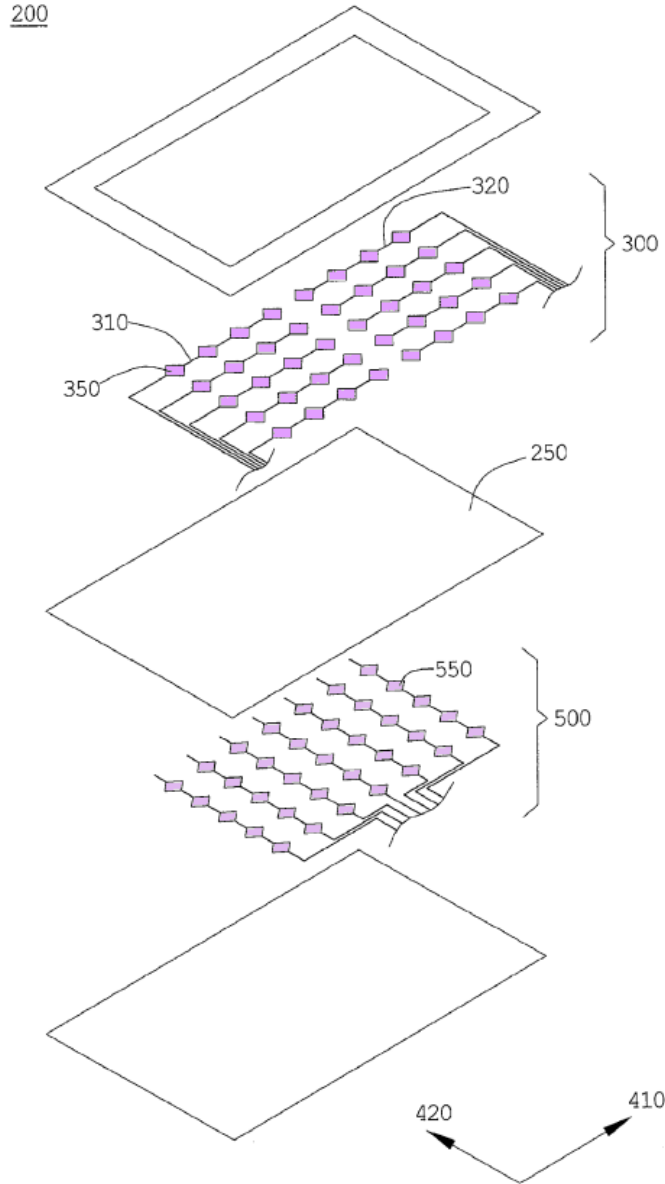


Fig.3

Yang, Fig. 3, ¶34; *Flasck*, ¶296 .

POSITAs would have understood that *Yang*'s first and second electrode layers (300, 500) would have been formed over a top surface of *Imamura*'s sealing membrane to sense a user's touch for a touch sensing OLED display. *Yang*, ¶33

(explaining that the “touch panel may...be integrated in the [display] panel” and “the capacitive touch panel 200 will detect the [user’s] contact point and transmit a signal”), ¶¶5, 11-12, 32. §VII.C.2; *Flasck*, ¶297.

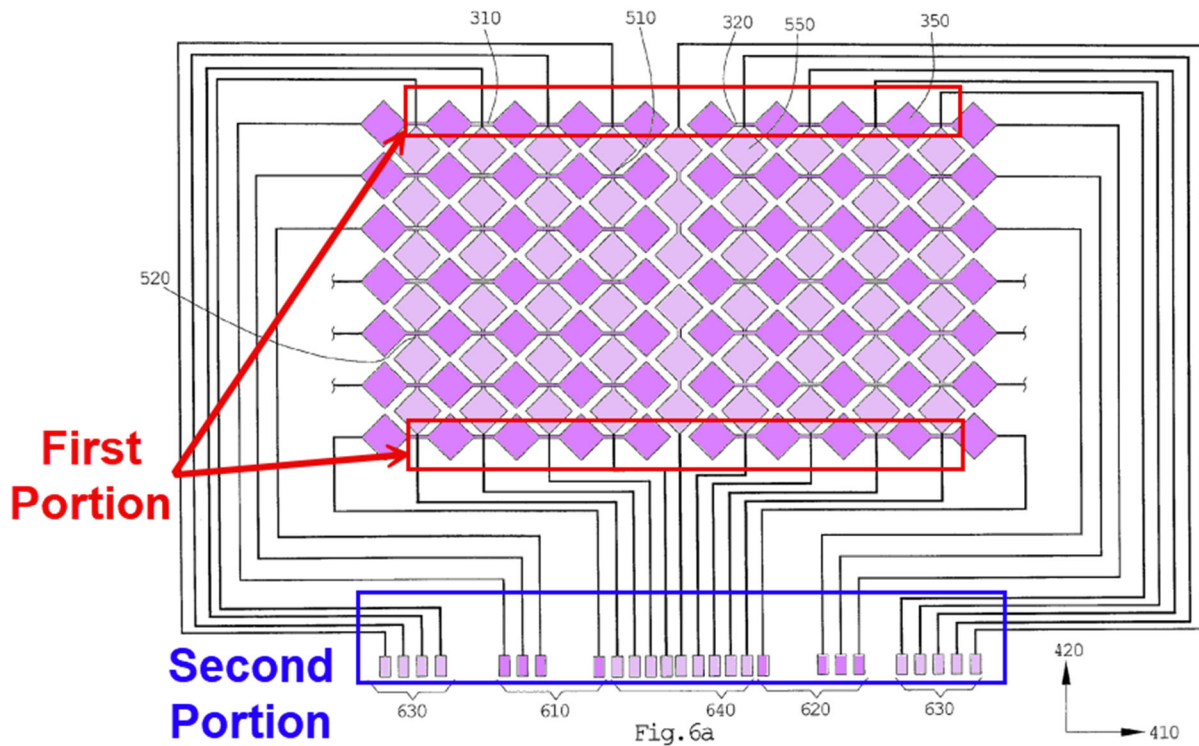
(ii) Ground 2B

To the extent unexplained above, POSITAs combining Imamura with Yang would have further consulted Chen’s known structure to understand how Yang’s first and second electrode layers would have been formed over a top surface of Imamura’s sealing membrane. *Yang*, ¶33; *Chen*, 7:13-55; §VII.C.2; *Flasck*, ¶298.

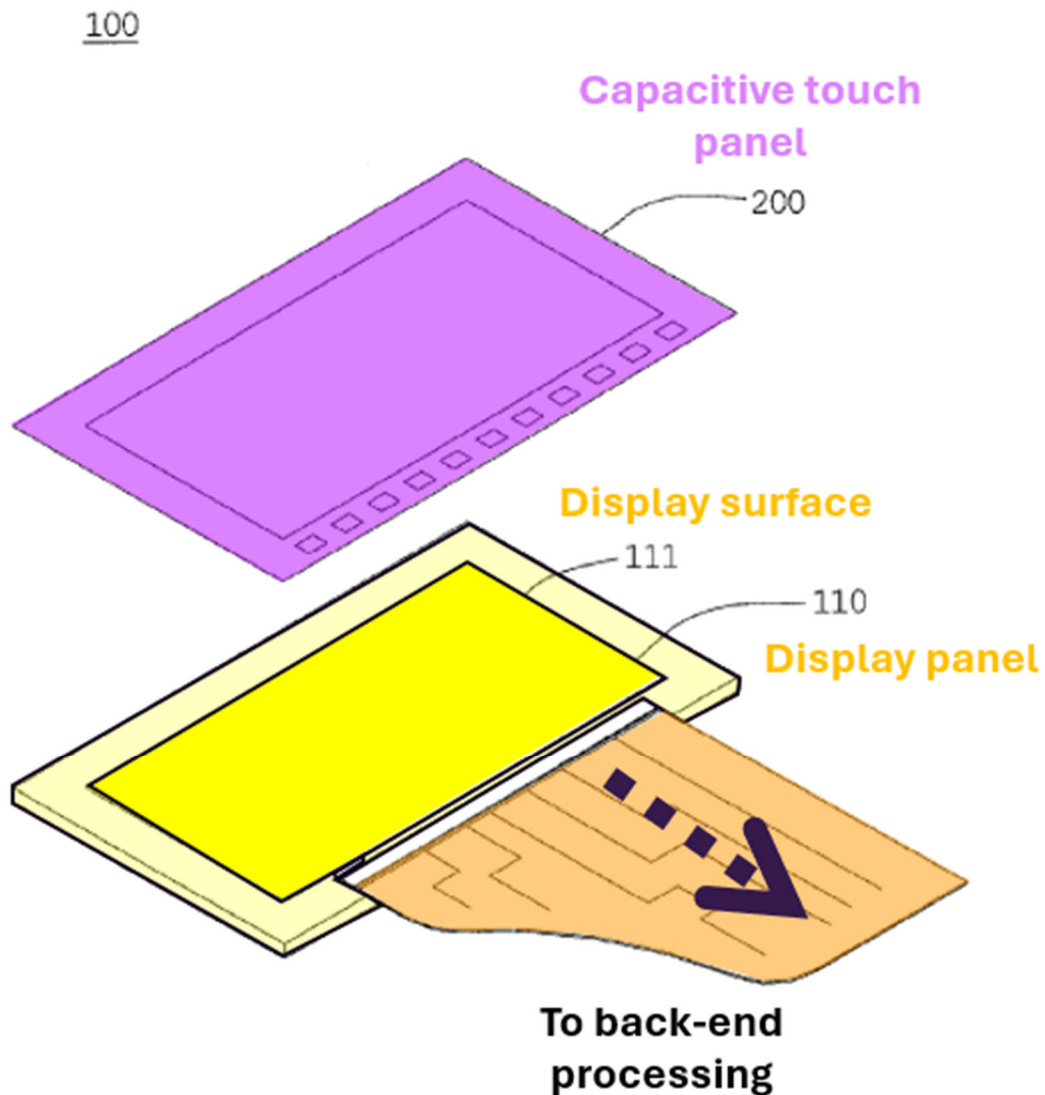
f. 1[e]

Imamura-Yang teaches 1[e]. *Flasck*, ¶¶299-300.

Although Imamura does not explain whether there is a touch-sensor panel on its OLED display, POSITAs would have been motivated to add one to Imamura’s display as discussed above. §VII.C.2. Yang teaches a capacitive touch panel that includes a plurality of touch electrodes (e.g., 350, 550) electrically coupled together in strings (510, 520) along two directions (410, 420), respectively, and further to a plurality of conductive lines (“sensing lines,” as claimed) at their ends that POSITAs would have understood would have been formed above Imamura’s sealing membrane layer (“first portion”) and downwardly connected to linking pads (610-40) formed upon Imamura’s substrate (“second portion”) for further connection to processing elements described in 1[f], below:



Yang, Fig. 6a, ¶¶35, 38, 40-42; *Flasck*, ¶300. *Yang* further discloses a “back-end processor” where “the capacitive touch panel will detect the contact point and send a signal to be processed by the backend processor.” *Id.*, ¶¶12, 32-33, Fig. 2.



POSITAs would have recognized that Yang expressly teaches how its touch panel layers are formed on top of a display (*Yang*, ¶¶12, 32-33), and that a display would have included its own substrate and required fabricating some type of structure to route the electrical connections at the higher layers (“first portion”) as part of the sensing lines downwardly to electrical connections of the sensing lines over the lower display substrate (“second portion”) to connect to drive circuitry (or

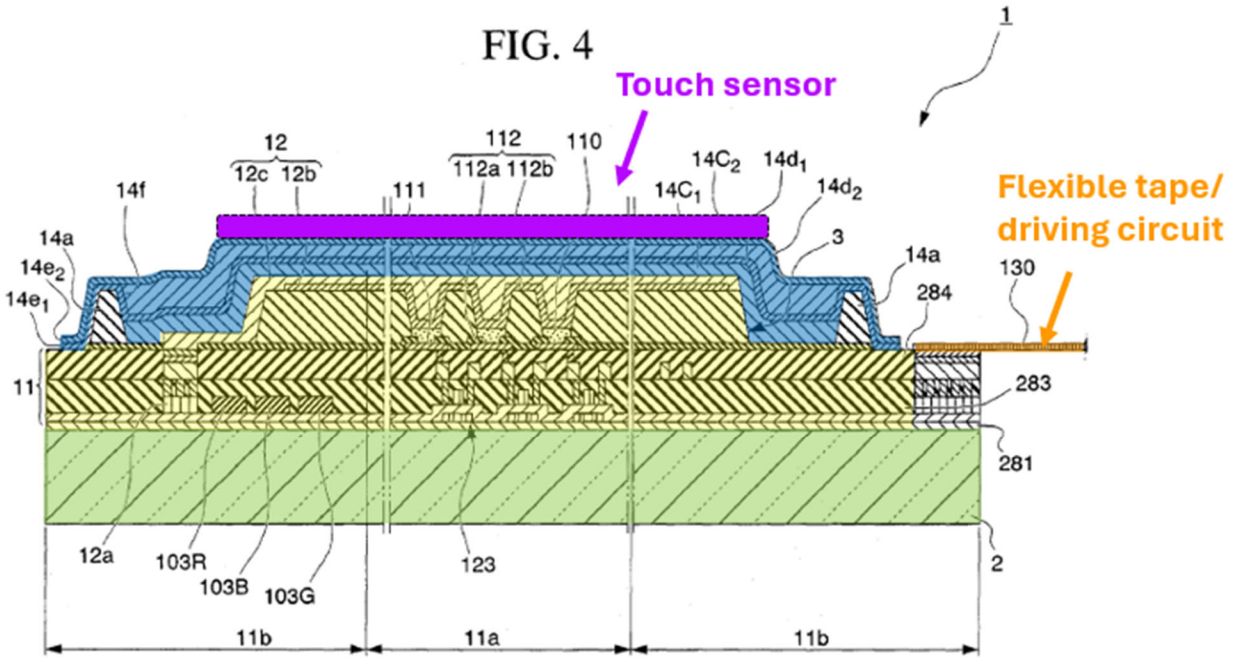
“back-end processor”) coinciding with the lowest substrate on which the display panel is formed to control the entirety of the multilayer OLED/touch panel display.

§VII.C.2. POSITAs would have found it obvious to integrate Yang’s touch panel driving circuit into Imamura’s display driving circuit because it was a known design choice. *See, e.g., Jang*, ¶88; *Cok*, 2:47-51; *Flasck*, ¶300. *See also In re Morris*, 127 F.3d at 1048, 1050-53, 1055-56.

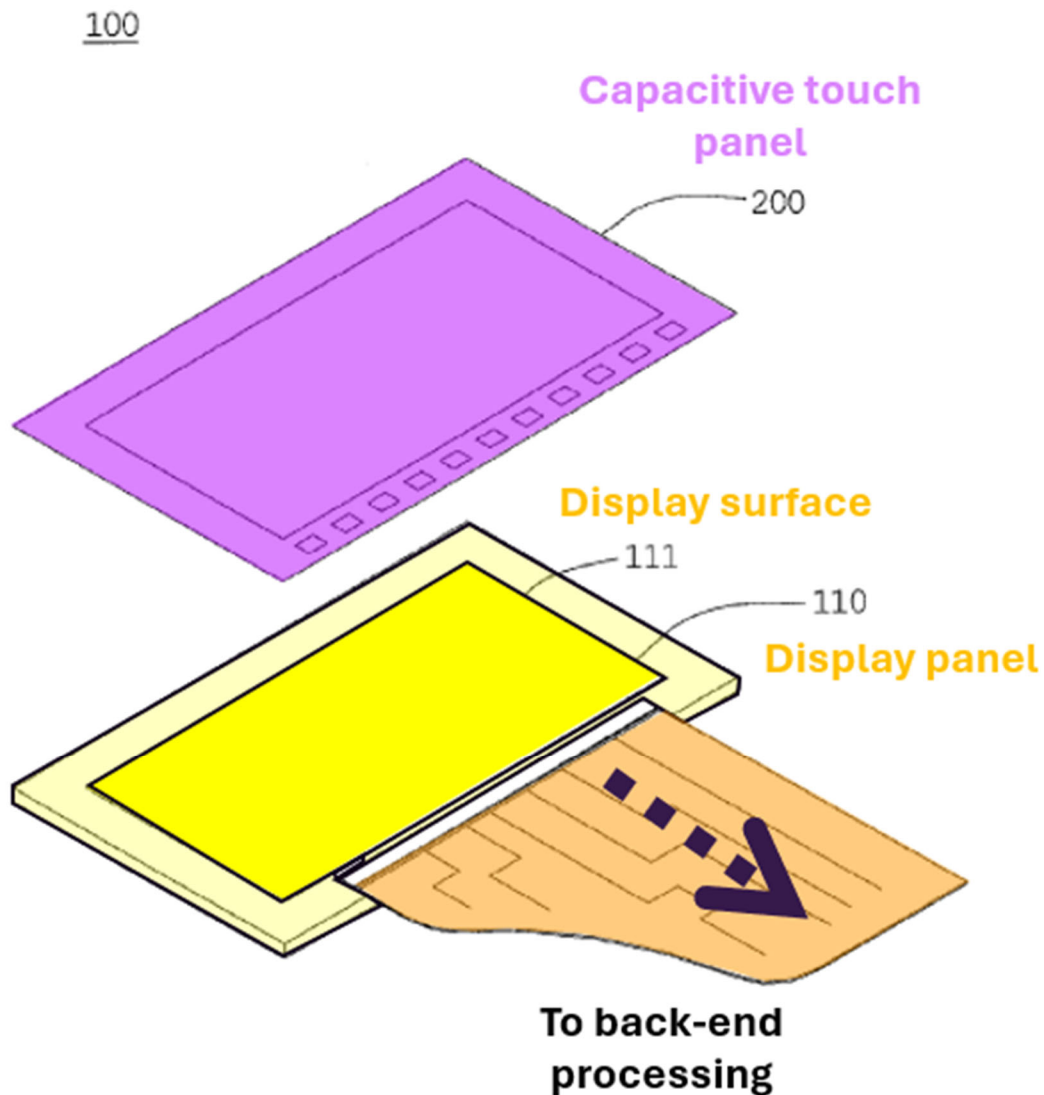
g. 1[f]

Imamura-Yang teaches 1[f]. *Flasck*, ¶¶301-03.

Imamura teaches a “drive circuit” for the display located on flexible tape 130. *Imamura*, Fig. 4, ¶¶196, 208. Although Imamura does not explain a driving circuit for a touch-sensor panel, POSITAs would have been motivated to add a touch-sensor panel to Imamura’s display as discussed above.



Id., Fig. 4; §VII.C.2. Yang’s capacitive touch panel (200) couples to a “back-end processor” to process a signal from a user’s touch.



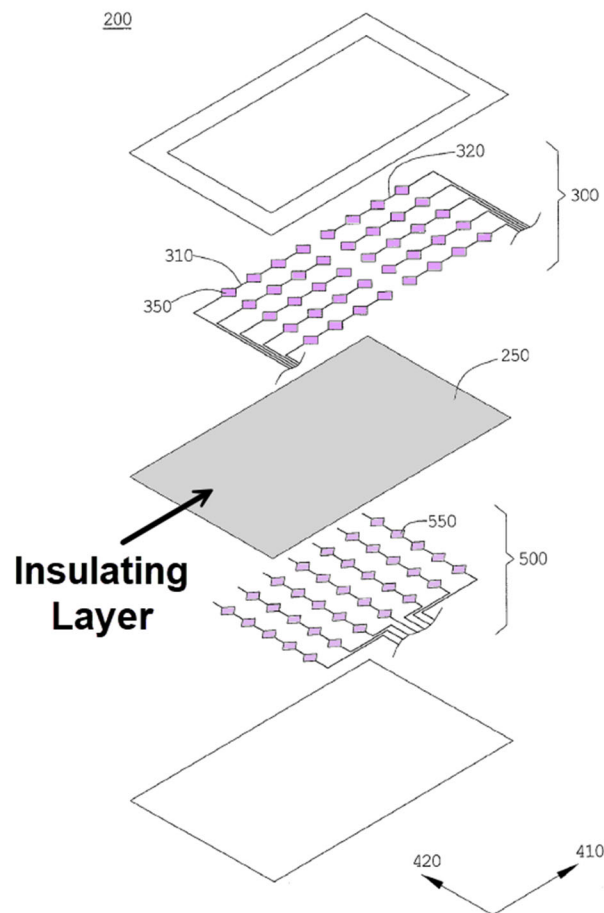
Yang, Fig. 2, ¶¶12, 33, 38, 42, 46; *Flasck*, ¶302.

POSITAs integrating Yang’s touch panel with Imamura’s display would have understood that either two different “back-end” driving circuits would be provided (one for the display panel, and one for the touch panel), or Yang’s “back-end” processor would be integrated into Imamura’s display driving circuit as explained above. §VII.C.3.f; *Flasck*, ¶303.

h. 1[g]

Imamura-Yang teaches 1[g]. *Flasck*, ¶¶304-05.

Although Imamura does not explain a touch-sensor panel on the display, POSITAs would have been motivated to add a touch-sensor panel to Imamura's display as discussed above. §VII.C.2. Yang teaches an intermediary dielectric layer 250 ("insulating layer," as claimed) positioned between the two electrode layers (300, 500):

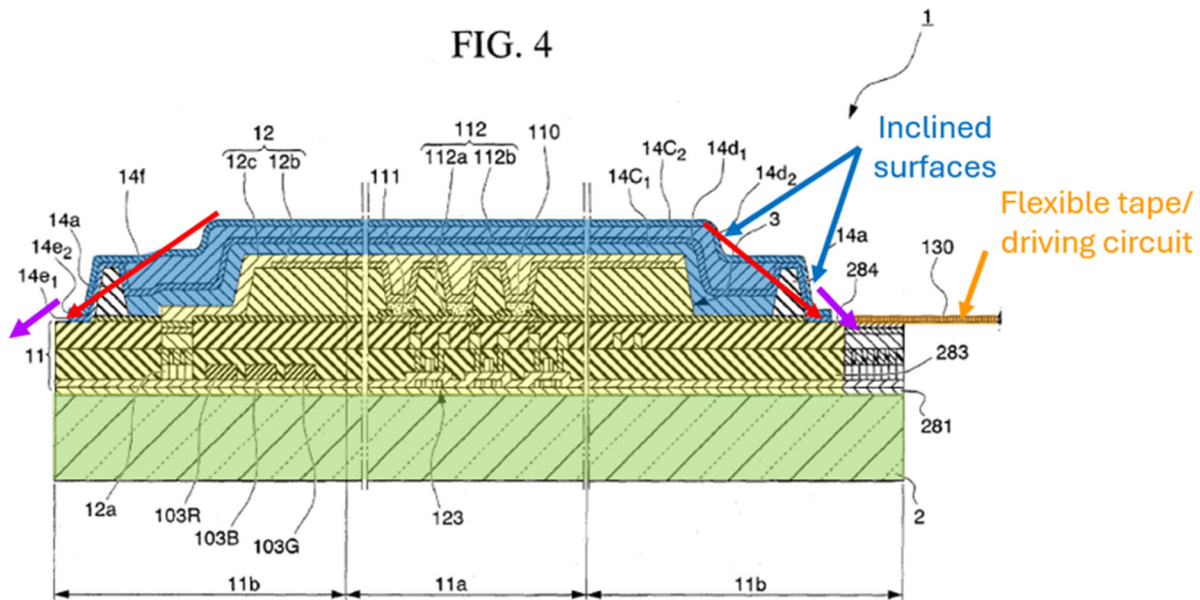


Yang, Fig. 3, ¶34; §VII.C.3.e (1[d]); *Flasck*, ¶305.

i. 1[h]

Imamura-Yang teaches 1[h]. *Flasck*, ¶¶306-07.

POSITAs would have recognized that Imamura's multilayered sealing membrane includes a two-part inclined surface sloping downward toward ("inclines downwardly") the flexible tape (130) containing drive circuit (130a):



Imamura, Fig. 4; ¶¶100, 112. POSITAs would have understood that Imamura's sealing membrane is intended to encapsulate the OLED display, so when integrating Yang's touch-sensor panel, (§VII.C.2), the sealing membrane would incline downwardly towards the driving circuit of the touch-sensor panel regardless of whether it is provided separate or integrated into Imamura's existing driving circuit

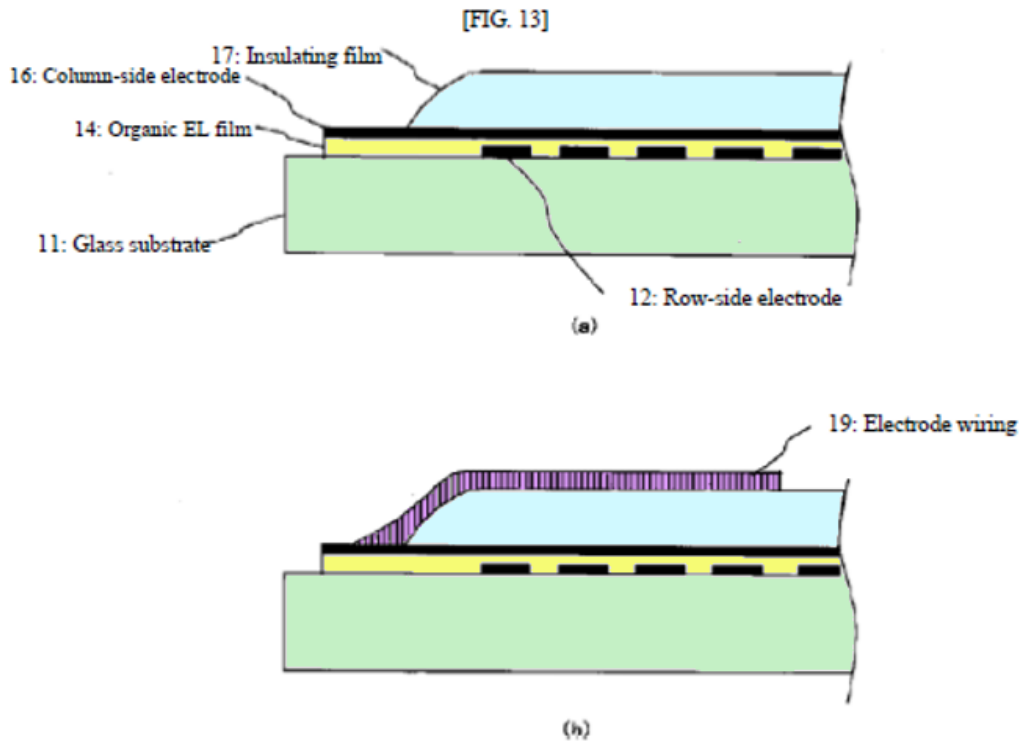
because the driving circuit is placed outside of the display area being encapsulated.

Flasck, ¶307.

j. 1[i]

Imamura-Yang-Sakamoto teaches 1[i]. *Flasck*, ¶¶308-09.

When integrating Yang's touch-sensor panel on top of Imamura's display, POSITAs would have understood that Imamura's sealing membrane encapsulates the OLED display, and the driving circuits are placed outside of the encapsulated OLED display area, so the touch panel's conductive lines would need to traverse from the driving circuit to an area above Imamura's sealing membrane. §§VII.C.3.e-VII.C.3.g (1[d]-1[f]); *Flasck*, ¶309. POSITAs would have understood a few connections options, but that the most obvious and straightforward option entails forming part of Yang's touch-panel conductive lines along the inclined surface of the sealing layer, as taught by Sakamoto and others. §§VII.C.2, VII.A.2; *Flasck*, ¶309.

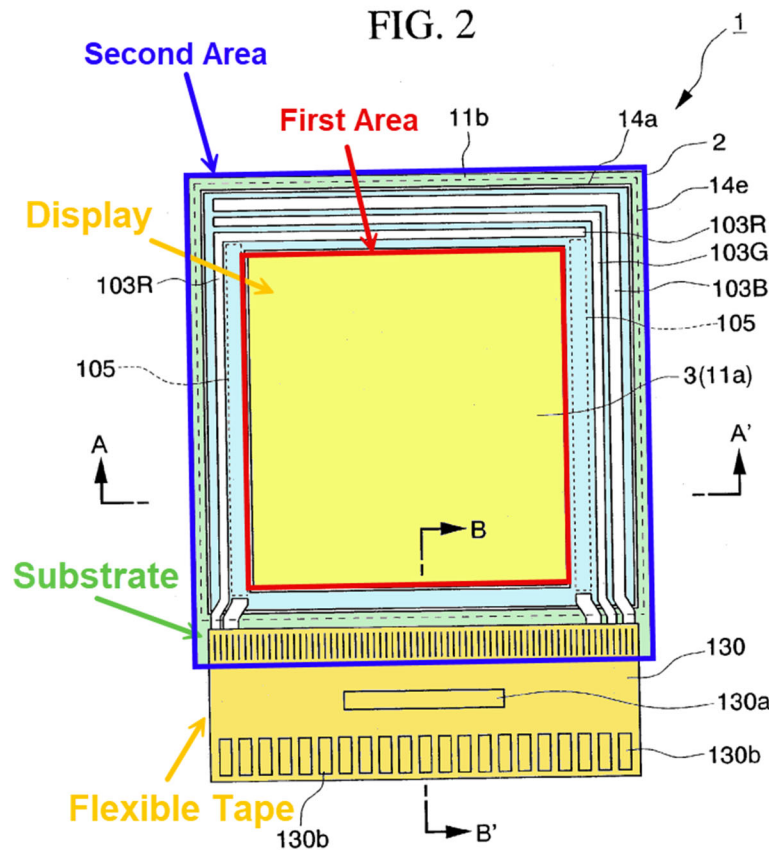


Sakamoto, Figs. 13a-b.

k. 1[j]

The Imamura-Yang-Sakamoto combination teaches 1[j]. *Flasck*, ¶¶310-13.

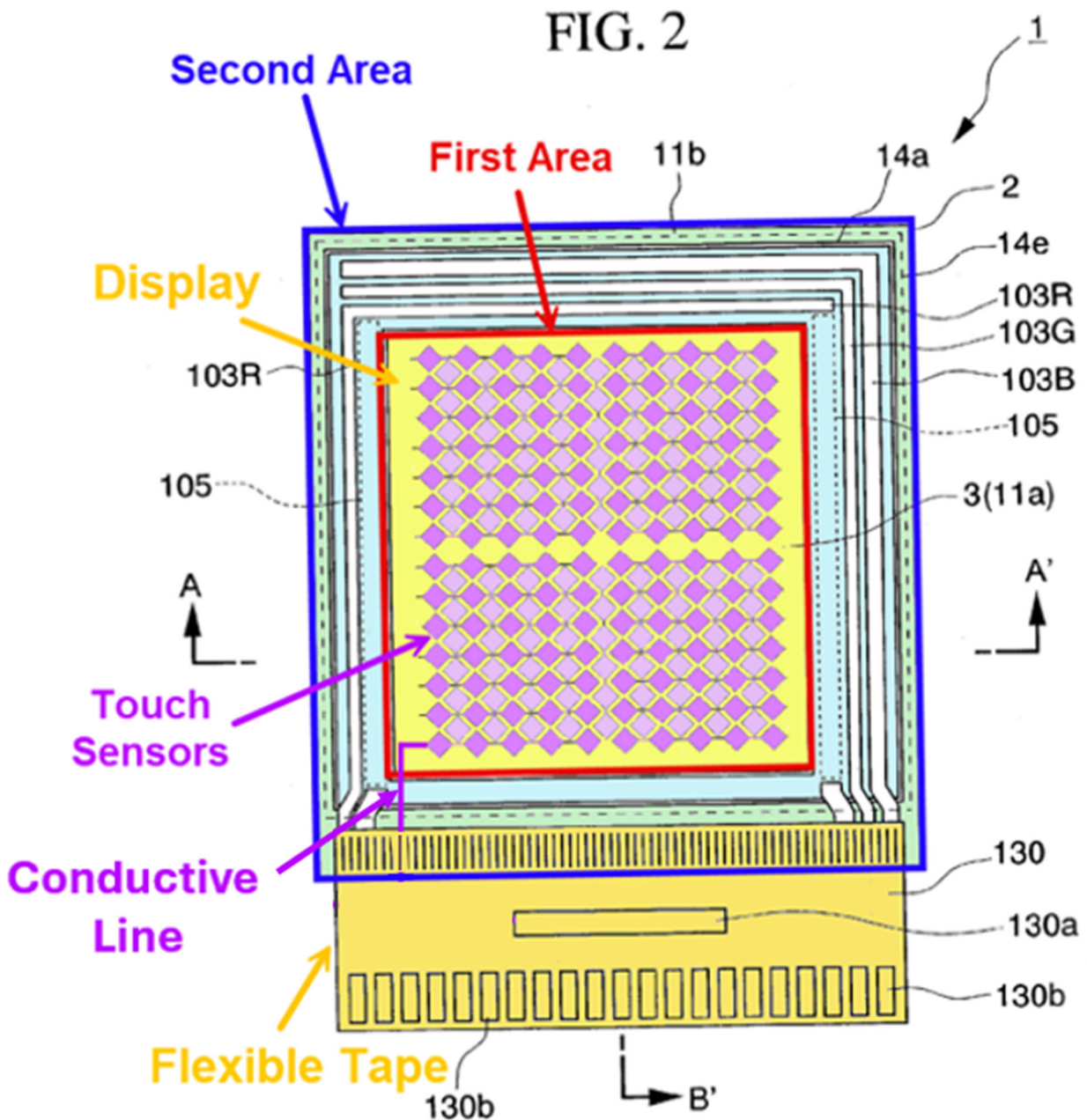
Imamura's display device includes a first display area (3) and adjacent second areas containing non-display circuitry. §VII.C.3.b (1[a]):



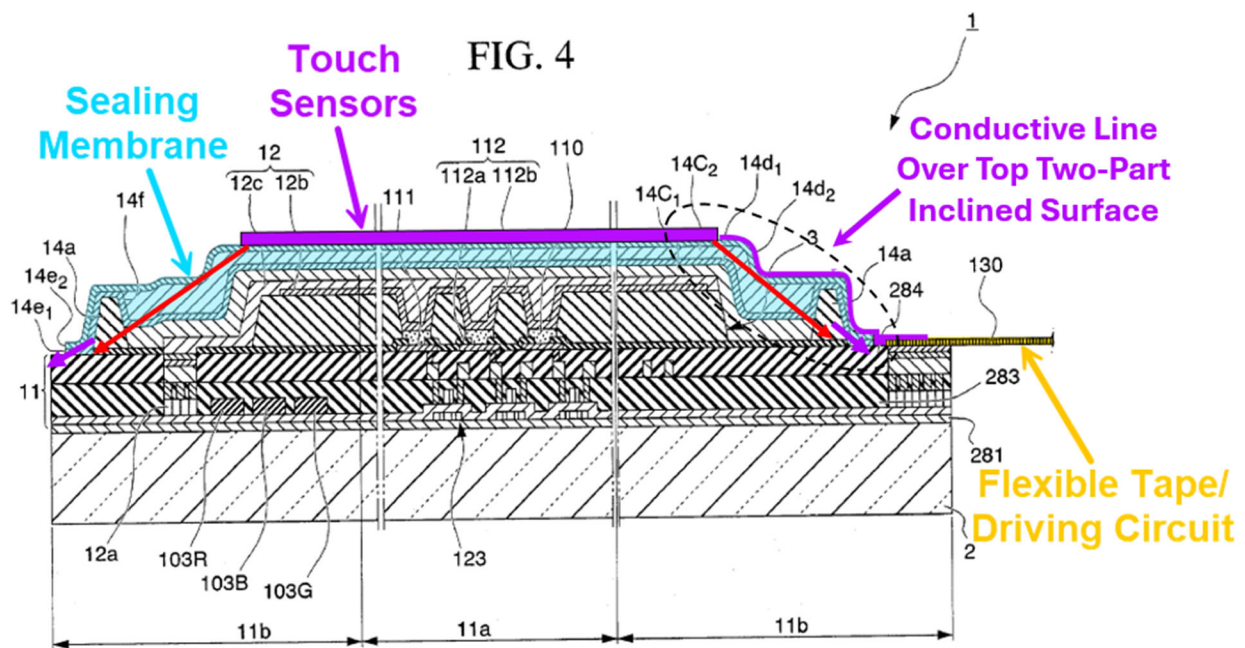
Imamura, Fig. 2.

When integrating Yang’s touch-sensor panel on top of *Imamura*’s display, POSITAs would have understood that *Imamura*’s sealing membrane encapsulates the OLED display, and the driving circuits are placed outside of the encapsulated OLED display area. §§VII.C.3.e0-VII.C.3.g (1[d]-1[f]); *Flasck*, ¶312. Therefore, the touch panel’s conductive lines would need to traverse from the first (display) area to the second (off-display) area—including over the inclined surface of *Imamura*’s sealing membrane—where the driving circuit is located in the second area. *Id.* POSITAs would have understood the following combination showing Yang’s touch-

sensor electrodes placed in Imamura's display area with conductive lines leaving that area to connect to an off-display driving circuit:



Imamura, Fig. 2.



Id., Fig. 4; *Flasck*, ¶312.

POSITAs would have understood that the combination would produce conductive lines (“sensing lines”) that are formed over the top surface of Imamura’s sealing membrane in the first (display) portion and formed over the substrate in the second (non-display) portion, along Imamura’s two-part inclined sealing membrane surface) to the second (non-display) area to connect the conductive lines to conductive wires that serve as a conductive interface to and from the driving circuit.

Flasck, ¶313.

l. 1[k]

Imamura-Yang teaches 1[k]. *Flasck*, ¶¶314-15.

Although Imamura does not explain a touch-sensor panel on the display, POSITAs would have been motivated to add a touch-sensor panel to Imamura's display as discussed above. §VII.C.2. Yang discloses each set of electrodes are connected by first and second connection patterns (e.g., 310) to connect sets of electrodes in two directions. *Yang*, ¶¶34, 35, Figs. 3-6c; *Flasck*, ¶315.

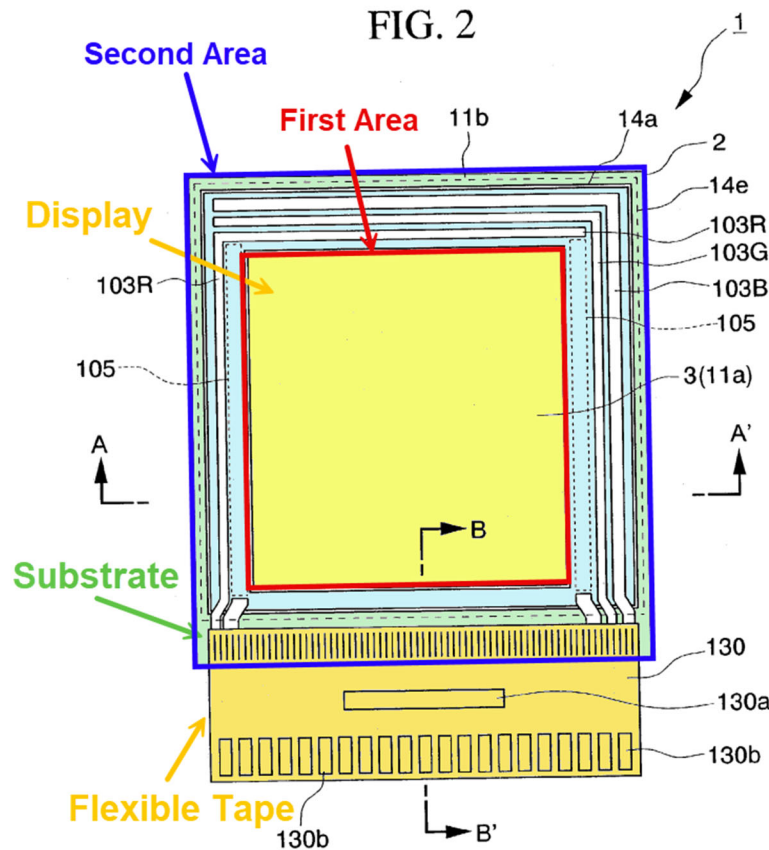
m. 1[l]

Imamura-Yang teaches 1[l] as described in 1[g]. §VII.C.3.h (1[g]); *Flasck*, ¶316.

4. Claim 2

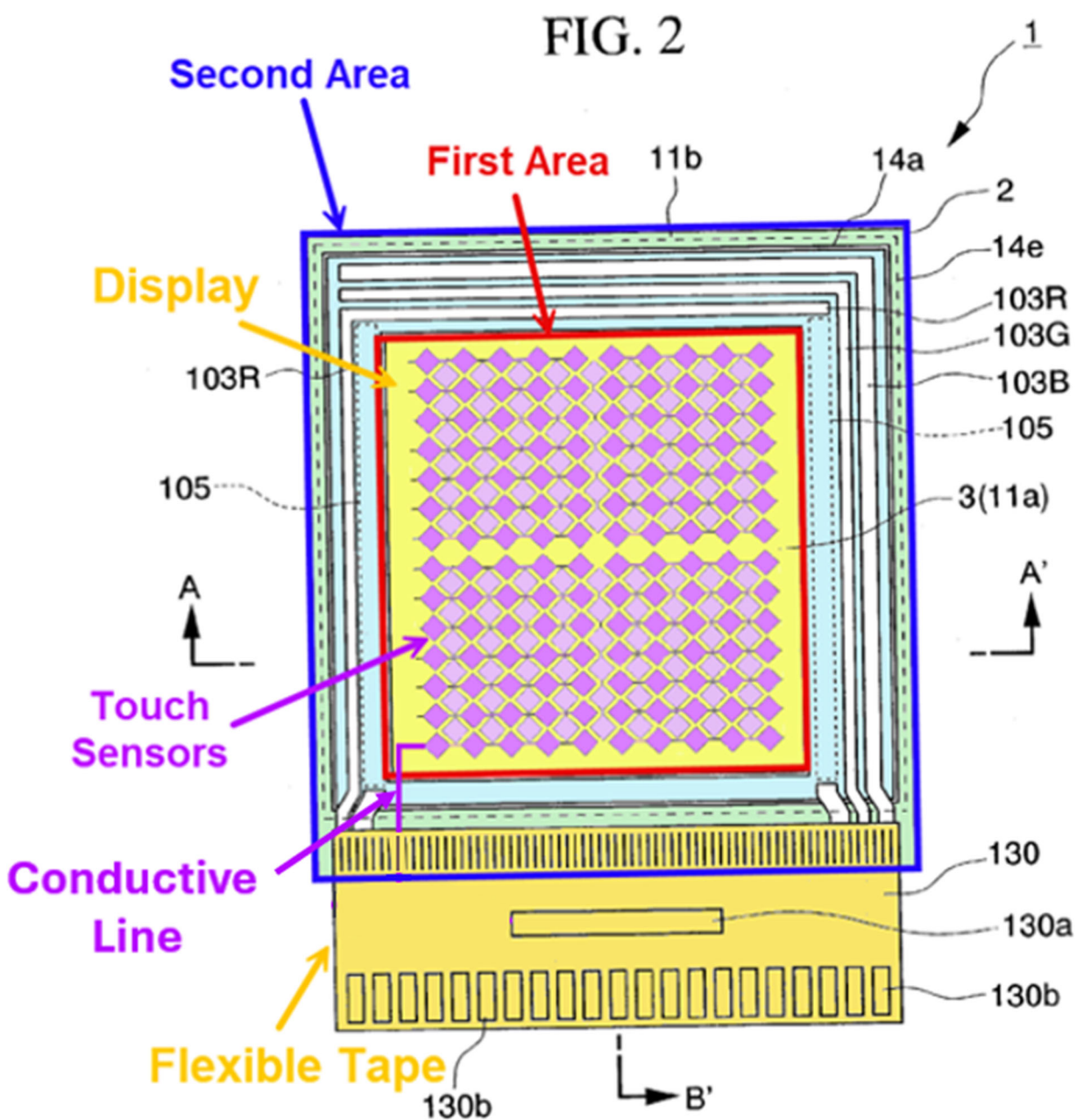
Imamura-Yang-Sakamoto teaches Claim 2. *Flasck*, ¶¶317-22.

Imamura discloses a first (display) area and a second (non-display) area. §VII.C.3.b (1[a]).

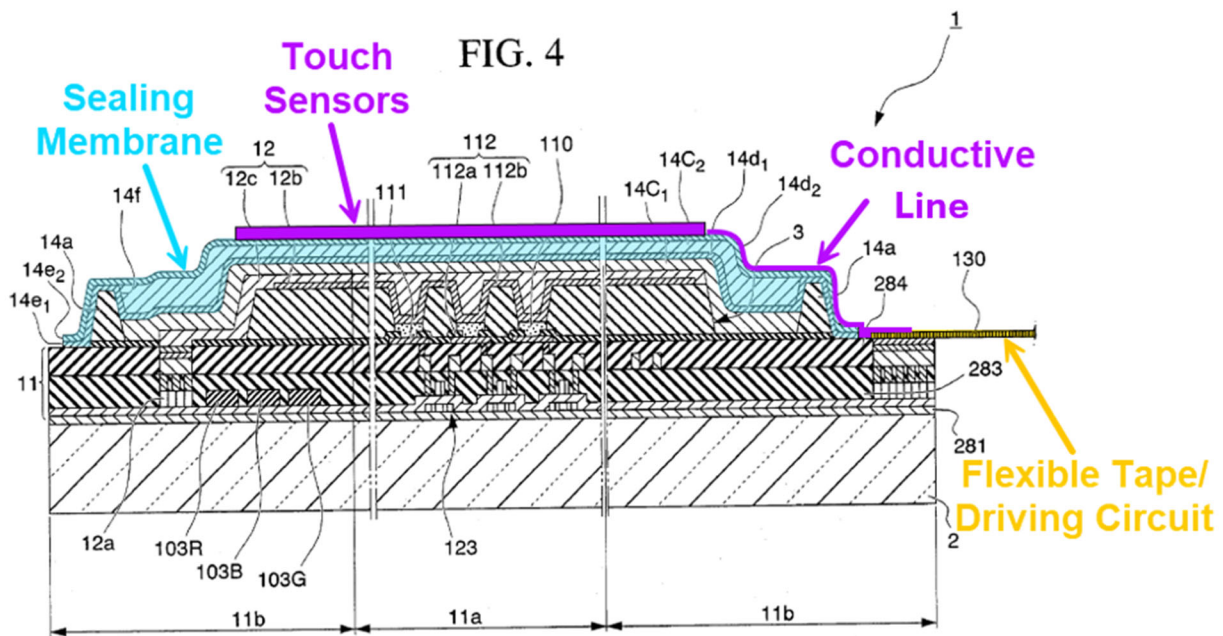


Imamura, Fig. 2.

Imamura combined with Yang teaches conductive lines for the touch-sensor panel that have a first portion formed on Imamura's sealing membrane in the first area, and a second portion that traverses Imamura's sealing membrane edge and substrate to connect to a driving circuit in the second area. §VII.C.3.k (1[i]).



Imamura, Fig. 2.



Id., Fig. 4.

The Imamura-Yang combination teaches the first portion of the conductive lines is located on Imamura's sealing membrane and a second portion is located on the second area of Imamura's substrate, and first portions of the sensing lines are located on a same layer (e.g., Imamura's sealing membrane layer, before being connected to the touch sensors on their own respective layers). *Flasck*, ¶320.

To the extent this limitation requires *all* first portions to be on the same layer, however, such an arrangement would have been obvious. *Id.*, ¶321. It was extremely old and well-known in the art that capacitive touch-sensor panels conventionally use two sets of touch-pad arrays—one for each (x, y) direction—that are electrically insulated from one another. *Id.* Yang discloses one way to form the two touch-sensor arrays: one set of touch sensor pads and their connections in one direction are formed

on one layer, and touch sensor pads and their connections to create an array in a different direction are formed on another layer, with the two layers separated by insulation. *Yang*, Fig. 3 (showing electrode layers 300 and 500 provided as separate layers, each oriented in a specific direction). But an alternative arrangement was just as well-known in the art, in which all touch sensor pads are formed on the same layer, with “bridge” connections where the arrays would otherwise intersect, with insulation covering at least where the bridge is formed. *See, e.g., Chen*, Figs. 4A, 4B, 7:56-8:38; *Jang*, Fig. 3E; *Chih-Yung*, Figs. 2F, 3, 4; *Flasck*, ¶321.

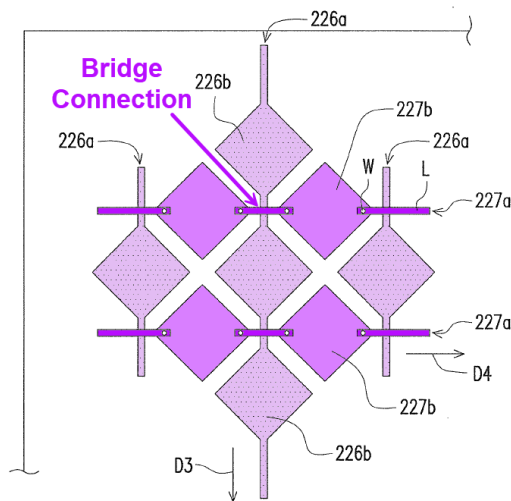


FIG. 4B

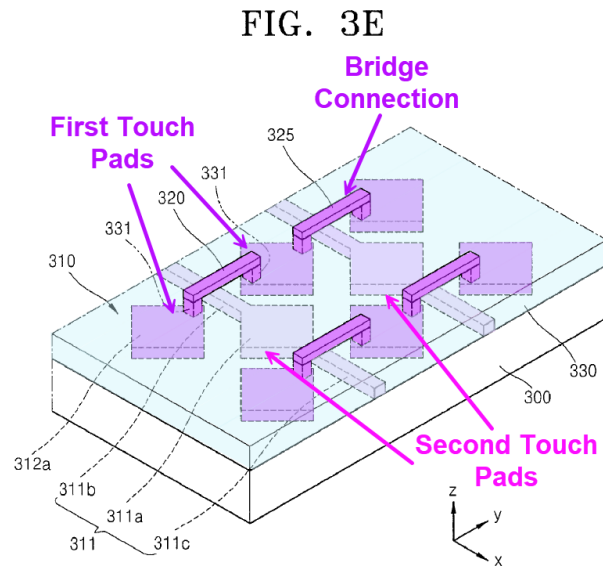


FIG. 3E

POSITAs would have considered forming Yang’s touch sensors using either configuration as an obvious design choice. *Flasck*, ¶322. But when forming all touch electrodes on a single layer, with one set of touch sensor pads connected using a

bridge, POSITAs would have understood that *all* “first portions” of Yang’s conductive lines would be on the same layer to connect to each set of electrodes. *Id.*

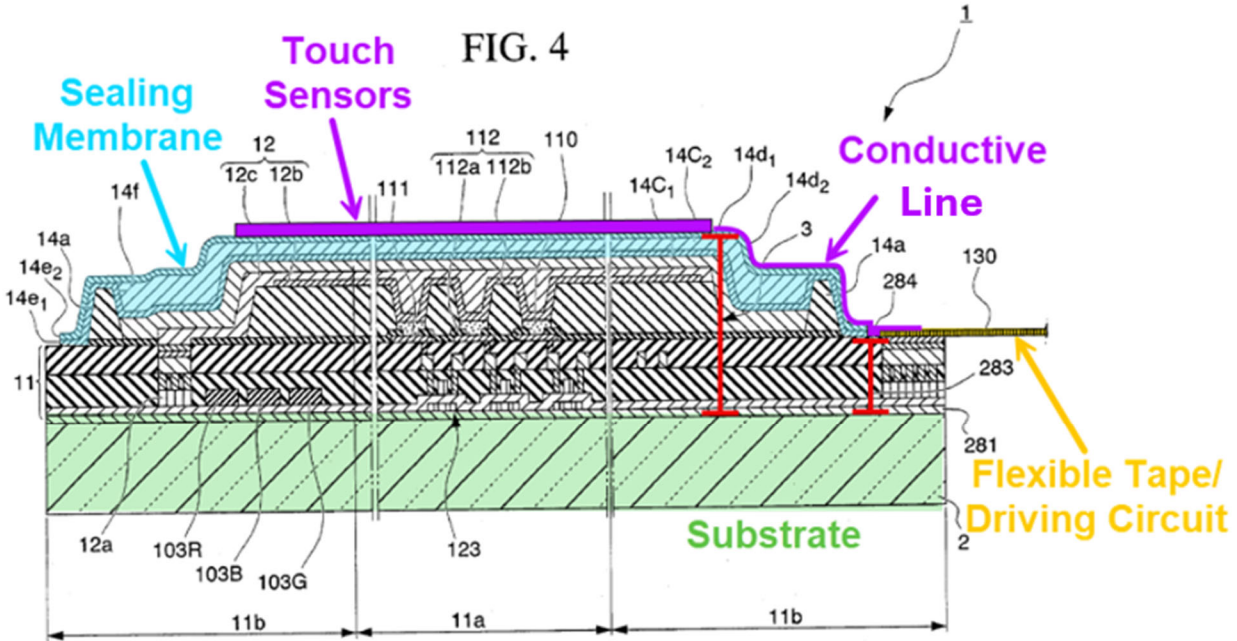
5. Claim 3

Imamura-Yang teaches Claim 3 as described above. §§VII.C.3.f (1[e]), VII.C.3.k (1[j]); *Flasck*, ¶323.

6. Claim 4

Imamura-Yang teaches Claim 4. *Flasck*, ¶¶324-25.

Because the combination of Imamura and Yang produce “first portions” of the conductive lines located on Imamura’s sealing membrane to connect to the touch sensors formed on or above that layer, but “second portions” are provided on or near the substrate (§VII.C.3.f (1[e])), POSITAs would have understood that the combination produces first portions of the conductive lines at a first distance from the substrate that is greater than the distance between the second portions of the conductive lines and the substrate. *Id.*, ¶325.



Imamura, Fig. 4.

7. Claim 5

Imamura-Yang teaches Claim 5 as described above. §VII.C.3.g (1[f]); *Flasck*, ¶326.

8. Claim 6

Imamura-Yang-Sakamoto teaches Claim 6. *Flasck*, ¶¶327-29.

POSITAs would have found it obvious to make Yang’s conductive lines and touch electrodes of different materials. Yang’s electrodes were intended to cover a display region of the display, which would have informed POSITAs that they were likely transparent conductive materials (e.g., ITO, IZO). *Yang*, ¶33, Figs. 2, 3; *see also Chen*, 6:15-40; *Barbier*, ¶3; *Bouten*, 3:30-41. Yang refers to “conducting wires”

for the sensing lines, which POSITAs would have understood would typically be a metal wire material. *Yang* ¶42, *Flasck*, ¶328. POSITAs would have understood that metal wires were often used for connections because they provided far less electrical resistance than transparent conductive materials (like ITO and IZO), and thus would have been made to have a smaller cross-sectional area. *Flasck*, ¶¶328-29; *see also Ritchie v. Vast Res., Inc.*, 563 F.3d at 1337; *In re Lackey*, 31 Fed. Appx. at 82.

9. Claim 7

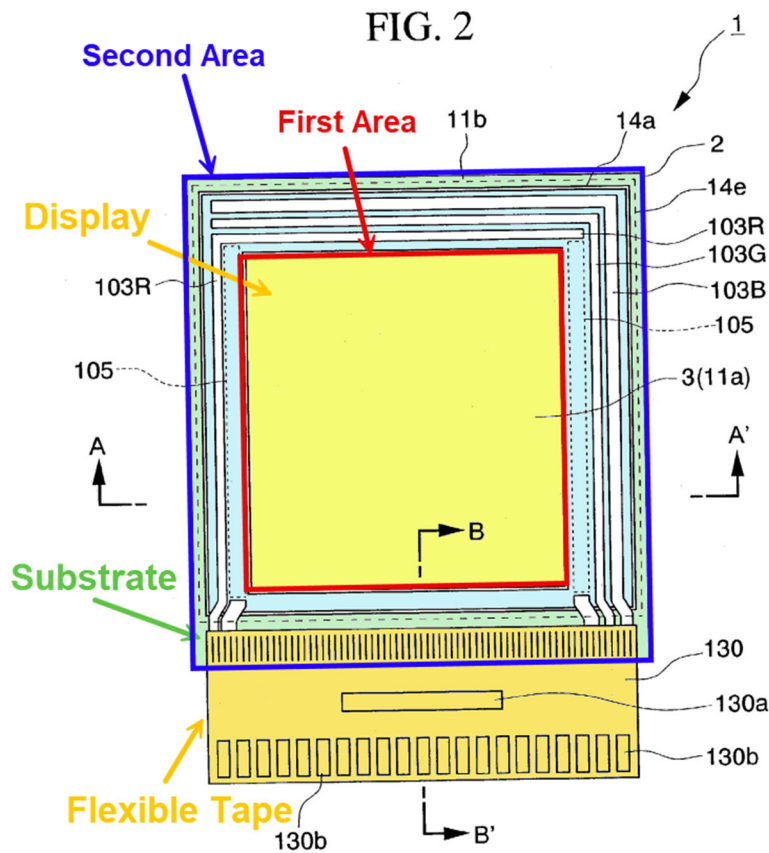
Imamura-Yang teaches Claim 7. *Flasck*, ¶¶330-31.

Imamura teaches a “drive circuit” for the display located on flexible tape 130. *Imamura*, ¶¶196, 208. POSITAs would have understood that, upon integrating Yang’s touch panel with Imamura’s display, either two different “back-end” driving circuits would be provided (one for the display panel, and one for the touch panel), or alternatively Imamura’s driving circuit and Yang’s “back-end” processor would be integrated to drive both the display and touch-sensor panels. §VII.C.3.g (1[f]); *Flasck*, ¶331. *See also In re Morris*, 127 F.3d at 1048, 1050-53, 1055-56. In either case, POSITAs would have understood that the driving circuit driving Yang’s touch-sensor electrodes would be located on a second (non-display) area of the substrate—whether directly on Imamura’s substrate (2) or flexible tape (130) provided in the second (non-display) area on substrate (2). *Flasck*, ¶331.

10. Claim 8

Imamura teaches Claim 8. *Flasck*, ¶¶332-34.

Imamura teaches a “drive circuit” for the display located on flexible tape 130 attached to the second (non-display) area of the substrate. *Imamura*, ¶¶196, 208.



Id., Fig. 2.

Although Imamura does not expressly state that the “flexible tape” is a “printed circuit board,” POSITAs would have been motivated to form and had a reasonable expectation of success in forming Imamura’s “flexible tape” as a “printed circuit board” because Imamura’s flexible tape was intended to house interconnected

electrical components, and printed circuit boards commonly provided means of printing circuit interconnections on a substrate housing electrical components. *Flasck*, ¶334. Others in the art used flexible printed circuit boards to house off-display touch-sensor components. *See, e.g., Hotelling* (Ex-1018), ¶78; *Flasck*, ¶334.

11. Claim 9

Imamura-Yang teaches Claim 9 as described above. §§VII.C.3.g (1[f]), VII.C.10 (cl. 8); *Flasck*, ¶335.

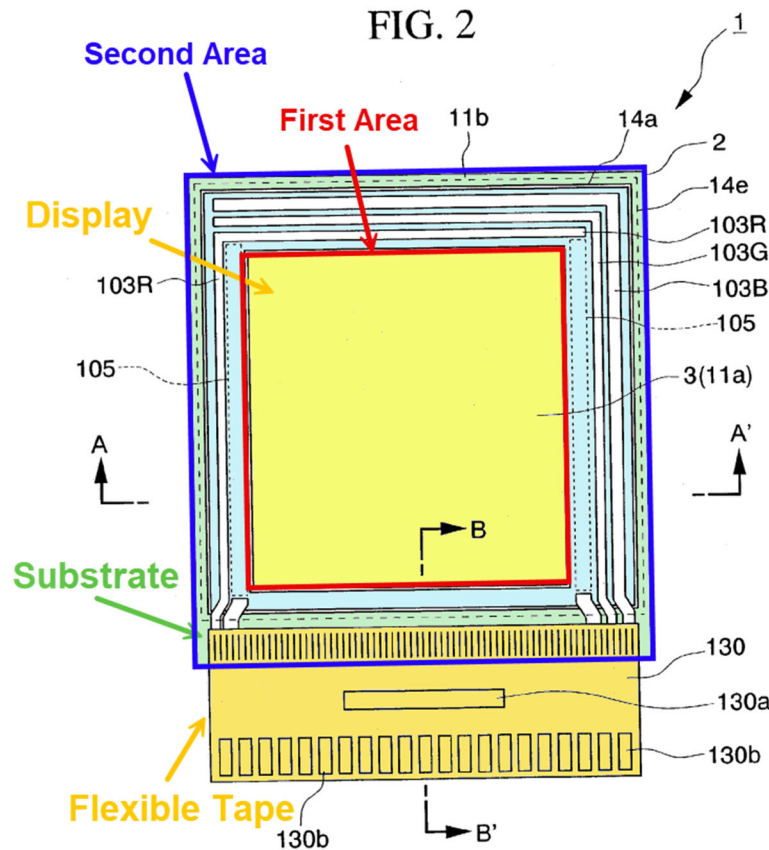
12. Claim 10

Imamura-Yang teaches Claim 10 as described above. *See* §§VII.C.3.a (1[pre]), VII.C.3.b (1[a]), VII.C.3.f (1[e]), VII.C.3.k (1[i]); *Flasck*, ¶336.

13. Claim 11

Imamura teaches Claim 11. *Flasck*, ¶¶337-39.

Imamura depicts a first (display) that appears approximately of greater area size than the second (non-display) areas:



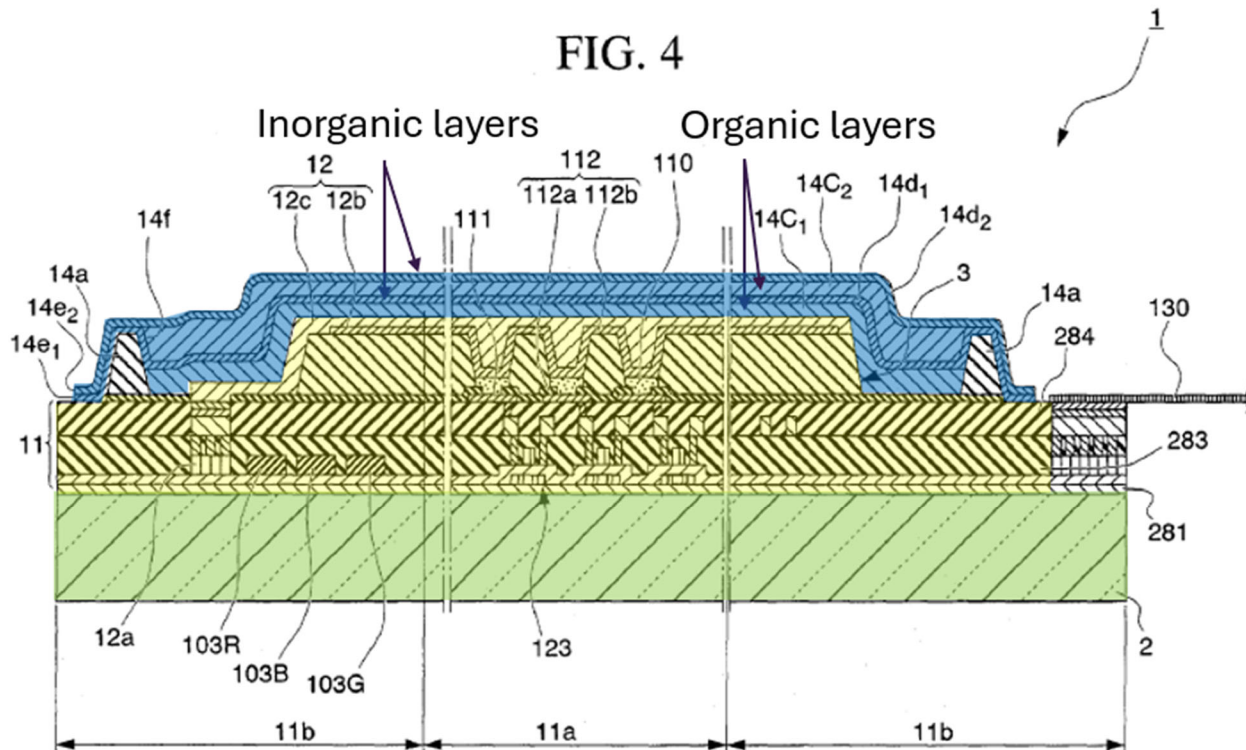
Imamura, Fig. 2. POSITAs would have understood that *Imamura* is not drawn to scale, and that display areas are typically much larger than the non-display areas in an OLED display. *Flasck*, ¶338; see, e.g., *Lee*, Figs. 1, 7. That is because a display area must be big enough to be viewable by a user, but non-display areas must only be big enough to house the wiring and processors needed to operate the display, which were known to be far smaller than the display itself. *Flasck*, ¶338.

POSITAs would have understood that *Chen*'s first (display) area is greater than the second (non-display) area. *Flasck*, ¶339.

14. Claim 12

Imamura teaches Claim 12. *Flasck*, ¶¶340-41.

Imamura discloses that the multilayered sealing membrane includes alternating flattening resin layers (e.g., 14c1-2) made of “polyacrylic resin”—an “organic layer,” as claimed. Barrier layers (e.g., 14d) are made of “an inorganic membrane such as SiO₂”:



Imamura, Fig. 4, ¶¶114-15; *Flasck*, ¶341.

15. Claim 13

Imamura-Yang-Sakamoto teaches Claim 13. *Flasck*, ¶¶342-43.

Although Yang provides two sets of electrodes and their respective connection patterns on two different material layers, POSITAs would have considered it obvious to provide all electrodes on a single layer, and connect one set of electrodes together using a bridge on a different material layer. §VII.C.4 (cl. 2); *Flasck*, ¶343. POSITAs would have understood that the bridges (“first connection patterns,” as claimed) would be patterned independently from the Yang’s electrodes (350, 550) in an upper layer of the electrodes because the bridges would be formed on a separate material layer above Yang’s interstitial insulation layer (250).

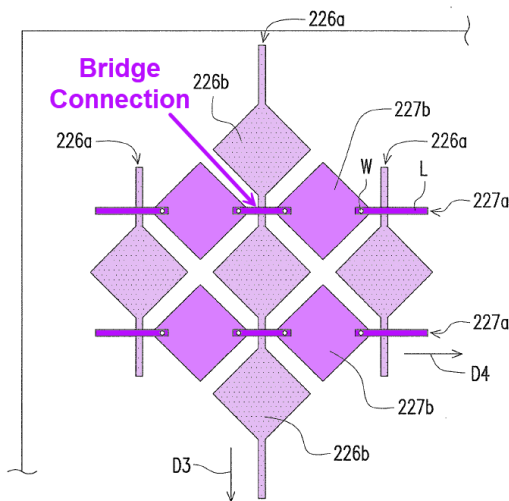
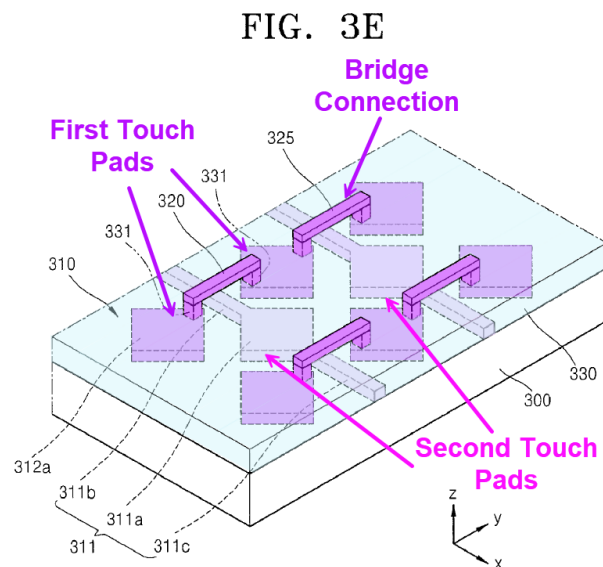


FIG. 4B



Chen, Fig. 4B; *Jang* Fig. 3E; *Flasck*, ¶343.

VIII. CONCLUSION

The Challenged Claims are unpatentable and institution of IPR is respectfully requested. *Flasck*, ¶¶344-45.

IX. MANDATORY NOTICES

A. Real Party in Interest

Petitioner BOE Technology Group Co., Ltd. identifies the following parties as all real parties in interest for the purpose of this Petition:

1. Mianyang BOE Optoelectronics Technology Co., Ltd.,
2. Ordos Yuansheng Optoelectronics Co., Ltd.,
3. Chengdu BOE Optoelectronics Technology Co., Ltd.,
4. Chongqing BOE Optoelectronics Technology Co., Ltd.,
5. Wuhan BOE Optoelectronics Technology Co., Ltd.,
6. Yunnan Invensight Optoelectronics Technology Co., Ltd. f/k/a BMOT
f/k/a Kunming BOE Display Technology, and
7. BOE Technology America, Inc.

B. Related Matters

To the best of Petitioner's knowledge, the '088 patent has been involved in the following matters:

- *Samsung Display Co. v. BOE Technology Group Co.*, No. 2:25-cv-00412-JRG (E.D. Tex.).

C. Notice of Counsel and Service Information

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Petitioner consents to electronic service. All services and communications to the attorneys listed above may be sent to:

PerkinsServiceBOESamsungIPRs@perkinscoie.com

D. Power of Attorney

A power of attorney is filed herewith according to 37 C.F.R. §42.10(b).

Petition for *Inter Partes* Review of U.S. Patent No. 10,013,088 B2
PTAB Case No. IPR2025-01481

Respectfully submitted,

/ Jessica Kaiser /

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Date: September 25, 2025

CERTIFICATE OF WORD COUNT UNDER 37 CFR §42.24(d)

Pursuant to 37 C.F.R. §42.24(a), Petitioner hereby certifies that portions of the above-captioned Petition for *inter partes* review of U.S. Patent No. 10,013,088, in accordance with and reliance on the word count provided by the word-processing system used to prepare this Petition, that the number of words in this paper is 13,586. Pursuant to 37 C.F.R. §42.24(a), this word count is in compliance and excludes the table of contents, table of authorities, mandatory notices under §42.8, certificate of service, certificate of word count, appendix of exhibits, and any claim listing. This word count was prepared using Microsoft Word.

Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that true copies of the Petition for *inter partes* review of U.S. Patent No. 10,013,088 and supporting materials (Exhibits and Power of Attorney) were served via overnight delivery on the Patent Owner at the correspondence address of record as listed on PAIR:

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