

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Chongqing HKC Optoelectronics Technology Co., Ltd.,

Petitioner

v.

138 East LCD Advancements Limited

Patent No. 7,335,913
Case No. IPR2023-00476

PETITION FOR *INTER PARTES* REVIEW

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LIST OF EXHIBITS

Exhibit	Description
Ex. 1001	U.S. Patent No. 7,116,913, issued to <i>Murade</i> , filed May 25, 2004, issued Oct. 3, 2006 (“’913 patent”)
Ex. 1002	Declaration of Carl Sechen, Ph.D. (“Sechen”)
Ex. 1003	Curriculum Vitae of Carl Sechen, Ph.D.
Ex. 1004	Excerpts of the Prosecution History for U.S. Patent No. 7,335,913 (“’913 FW”)
Ex. 1005	Japanese Patent App. Pub. No. JPH10-282522A, filed on April 9, 1997, published on October 23, 1998, and its accompanying translation (“ <i>Adachi</i> ”)
Ex. 1006	U.S. Patent App. Pub. No. 2002/0060780, filed on October 15, 2001, published on May 23, 2002 (“ <i>Takezawa</i> ”)
Ex. 1007	Japanese Patent No. JP2802156B2, filed on September 21, 1990, published on May 1, 1992 as JPH04130418A, and issued September 24, 1998, and its accompanying translation (“ <i>Sekado</i> ”)
Ex. 1008	U.S. Patent No. 6,396,558. filed on August 24, 2000, issued on May 28, 2002 (“ <i>Kim</i> ”)
Ex. 1009	U.S. Patent No. 6,501,519, filed on December 15, 2000, published on September 20, 2001 as U.S. Pub. Pat. App. 2001/0022638, issued on December 31, 2002 (“ <i>Ha</i> ”)
Ex. 1010	U.S. Patent App. Pub. No. 2002/0135293, filed on February 8, 2002, published on September 26, 2002 (“ <i>Aruga</i> ”)
Ex. 1011	Japanese Patent App. Pub. No. JP2000267590A, filed on March 19, 1999, published on September 29, 2000, and its accompanying translation (“ <i>Yoneda</i> ”)

Ex. 1012	Japanese Patent App. Pub. No. JP2004094020A, filed on September 2, 2002, published on March 25, 2004, and its accompanying translation (“ <i>Tanaka</i> ”)
Ex. 1013	U.S. Patent App. Pub. No. 2003/0189686, filed on April 1, 2003, published October 9, 2003 (“ <i>Hirosue</i> ”)
Ex. 1014	Declaration of Li Jiang (“Jiang”)

I. PRELIMINARY STATEMENT

Petitioner requests IPR and cancellation of claims 1-11 of the '913 patent (Ex. 1001).

The claims of the '913 patent primarily recite the basic, well-known description of LCD devices existing at the time of the '913 patent's application. Sechen, ¶¶17-28. The independent claims of the '913 patent recite final limitations of: a plurality of external connecting terminals provided on the extending portion, each of which overlap in plan view with either the plurality of lead wiring lines (claim 1), or the circuit unit (claim 5). However, even these limitations were well-known in the prior art. For example, *Adachi* (Ex. 1005), *Sekado* (Ex. 1006), and *Kim* (Ex. 1008) all disclose LCD's with external connecting terminals that overlap with either the lead wiring lines or the circuit unit.

In view of the prior art as set forth below, the Board should institute IPR and cancel claims 1-11 under 35 U.S.C. §102 and/or §103.

II. THE '913 PATENT

A. Overview

The '913 patent itself describes the known art as disclosing an electro-optical device, with a substrate, on which are display electrodes and a circuit unit for driving the display electrodes, and a counter substrate. The substrates are disposed to face each other with a predetermined gap between them. The

substrates are bonded to each other by a sealant so as to form an internal space in which an electro-optical material (*e.g.*, liquid crystals) is sealed. Sechen, ¶¶18-19.

The substrate provided with the display electrodes extends from the counter substrate on one side in plan view, and external connecting terminals are provided on the extending portion. Further, a driving circuit, which is connected to the external connecting terminals, is on the extending portion. Sechen, ¶¶20-21.

The '913 patent then discloses a first arrangement in which the external connecting terminals and the lead wiring lines are arranged to at least partially overlap each other in plan view (that is, in a three-dimensional manner in the extending portion). Sechen, ¶¶22-28. The '913 patent discloses a second arrangement in which in the extending portion, the circuit unit and the external connecting terminals are disposed to at least partially overlap each other in plan view. Sechen, ¶¶22-28.

B. Prosecution History

Original claims 1 and 5 both required that the external connecting terminals only partially overlap the lead wiring lines, or circuit unit, respectively. Sechen, ¶¶29-33; '913 FW-0334-336. Such claims were rejected as being unpatentable over Morimitsu. Sechen, ¶32; '913 FW-0024. In response, applicant argued that “Morimitsu does not disclose each of the external connecting terminals overlapping with the plurality of lead wiring lines, or circuit unit, in plan view. At

best, Morimitsu suggests that pad ITO film 52 overlaps a single power supply pad 13.” Sechen, ¶33; ’913 FW-0020. Claims 1 and 5 were then amended, *inter alia*, to replace “at least partially overlap” with “overlapping.” Sechen, ¶33; ’913 FW-0015-17.

III. STATEMENT OF PRECISE RELIEF REQUESTED

The challenged claims are unpatentable under Pre-AIA 35 U.S.C. §§102 and/or 103 and should be cancelled in view of the following prior art references based on the grounds articulated in Section VI.

Prior Art References	
Ref. 1	<i>Adachi</i> (Ex. 1005): filed on April 9, 1997, published on October 23, 1998 as JPH10-282522A; prior art under at least pre-AIA 35 U.S.C. §102(a) or (b).
Ref. 2	<i>Takezawa</i> (Ex. 1006): filed on October 15, 2001, published on May 23, 2002 as U.S. Patent Application Pub. No. 2002/0060780; prior art under at least pre-AIA 35 U.S.C. §102(a), (b), or (e).
Ref. 3	<i>Sekado</i> (Ex. 1007): filed on September 21, 1990, published on May 1, 1992 as JPH04130418A, and issued September 24, 1998 as JP2802156B2; prior art under at least pre-AIA 35 U.S.C. §102(a) or (b).
Ref. 4	<i>Kim</i> (Ex. 1008): filed on August 24, 2000, and issued on May 28, 2002 as U.S. Patent No. 6,396,558; prior art under at least pre-AIA 35 U.S.C. §102(a), (b), or (e).
Ref. 5	<i>Ha</i> (Ex. 1009): filed on December 15, 2000, published on September 20, 2001 as U.S. Patent App. Pub. No. 2001/0022638, and issued on December 31, 2002 as U.S. Patent No. 6,501,519; prior art under at least pre-AIA 35 U.S.C. §102(a), (b), or (e).

Ref. 6	<i>Aruga</i> (Ex. 1010): filed on February 8, 2002, and published on September 26, 2002, as U.S. Patent App. Pub. No. 2002/0135293; prior art under at least pre-AIA 35 U.S.C. §102(a), (b), or (e).
Ref. 7	<i>Yoneda</i> (Ex. 1011): filed on March 19, 1999, published on September 29, 2000 as JP2000267590A; prior art under at least pre-AIA 35 U.S.C. §102(a) or (b).
Ref. 8	<i>Tanaka</i> (Ex. 1012): filed on September 2, 2002, published on March 25, 2004 as JP2004094020; prior art under at least pre-AIA 35 U.S.C. §102(a) or (b).
Ref. 9	<i>Hirosue</i> (Ex. 1013): filed on April 1, 2003, published October 9, 2003 as U.S. Patent App. Pub. No. 2003/0189686; prior art under at least pre-AIA 35 U.S.C. §102(a), (b), or (e).

Specific Grounds	
Ground 1	<i>Adachi</i> Anticipates or Renders Obvious in View of a POSITA's General Knowledge Claims 1-4 and 9.
Ground 2	<i>Adachi</i> in Combination with <i>Takezawa</i> Renders Obvious Claim 8.
Ground 3	<i>Adachi</i> in Combination with <i>Aruga</i> Renders Obvious Claim 10.
Ground 4	<i>Sekado</i> Anticipates Claims 1-6 and 9.
Ground 5	<i>Sekado</i> in Combination with <i>Aruga</i> Renders Obvious Claim 7.
Ground 6	<i>Sekado</i> in Combination with <i>Tekezawa</i> Renders Obvious Claim 8.
Ground 7	<i>Sekado</i> in Combination with <i>Kim</i> Renders Obvious Claim 10.
Ground 8	<i>Sekado</i> in Combination with <i>Aruga</i> and <i>Kim</i> Renders Obvious Claim 11.
Ground 9	<i>Takezawa</i> in Combination with <i>Kim</i> Renders Obvious Claims 1-4 and 8-10.

Ground 10	<i>Takezawa</i> in Combination with <i>Yoneda</i> Renders Obvious Claims 5 and 6.
Ground 11	<i>Takezawa</i> in Combination with <i>Yoneda</i> and <i>Aruga</i> Renders Obvious Claim 7.
Ground 12	<i>Takezawa</i> in Combination with <i>Yoneda</i> , <i>Aruga</i> , and <i>Tanaka</i> Renders Obvious Claim 11.
Ground 13	<i>Hirosue</i> Anticipates Claims 5 and 6.
Ground 14	<i>Hirosue</i> in Combination with <i>Aruga</i> Renders Obvious Claim 7.
Ground 15	<i>Hirosue</i> in Combination with <i>Aruga</i> and <i>Tanaka</i> Renders Obvious Claim 11.

IV. LEVEL OF ORDINARY SKILL

A POSITA at the time of the alleged invention of the '913 patent would have either a bachelor's degree in electrical or computer engineering or an equivalent area with three years of experience in the field of display technology or a master's degree with one year of experience in the field of display technology. Sechen, ¶¶41-44.

V. CLAIM CONSTRUCTION

In general, claim terms should be given their plain and ordinary meaning. *Riverwood Int'l. v. R.A. Jones & Co.*, 324 F.3d 1346, 1357 (Fed. Cir. 2003).

In the related litigation, the parties have not exchanged proposed claim constructions. Petitioner currently contends that the Board need not provide a

specific construction for any particular term as the prior art renders the claims unpatentable under any reasonable interpretation of the terms.

VI. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. *Adachi* Anticipates or Renders Obvious in View of a POSITA's General Knowledge Claims 1-4 and 9.

1. Claim 1

An electro-optical device comprising:

Adachi discloses this limitation. Sechen, ¶¶56-57.

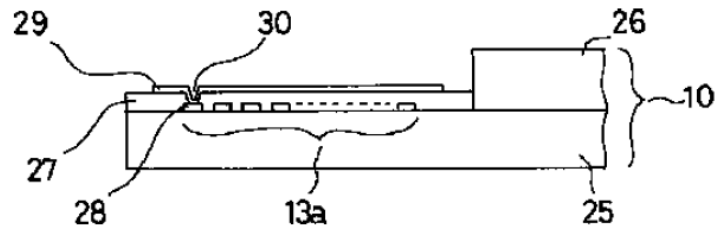
Adachi teaches a liquid crystal display element, which is an electro-optical device. Sechen, ¶¶56-57; *Adachi*, [0014].

a pair of substrates that are disposed to face each other with a predetermined gap therebetween,

Adachi discloses this limitation. Sechen, ¶¶58-64.

Adachi relates to “a liquid crystal display device (LCD) ... [using] a TFT-LCD that controls on-off operation of liquid crystals by a thin film transistor (TFT) provided in each pixel of a liquid crystal display.” Sechen, ¶¶59-60; *Adachi*, ¶[0002]. Such LCDs have substrates that are disposed to face each other with liquid crystals being inbetween them in a display area. *Adachi* Figure 3 illustrates an LCD layout showing array substrate 25 and color filter substrate 26 facing each other, with array substrate 25 having an extending portion. Sechen, ¶¶59-60; *Adachi*, ¶[0035].

【図 3】



Adachi teaches a display region 11 where between the two substrates various other components, such as TFT's, are formed on the array substrate 25. Sechen, ¶¶59-60; *Adachi*, ¶¶[0014]-[0015], [0018]-[0019]; Figs. 1, 2, and 4(e).

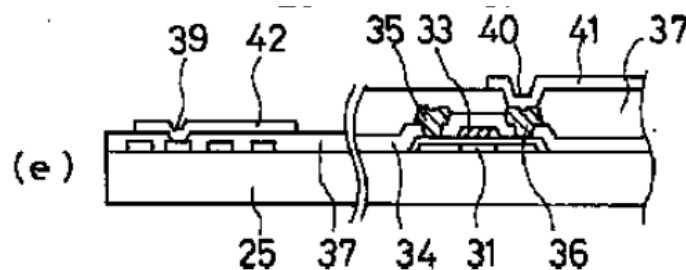
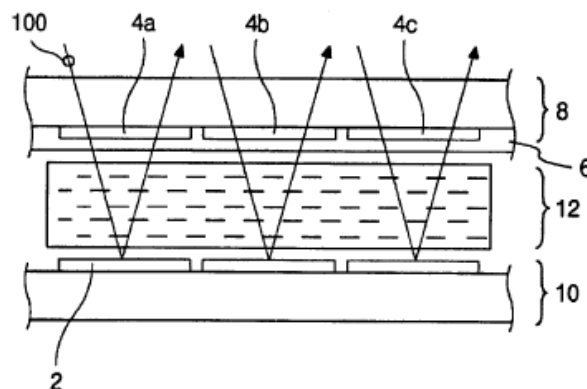


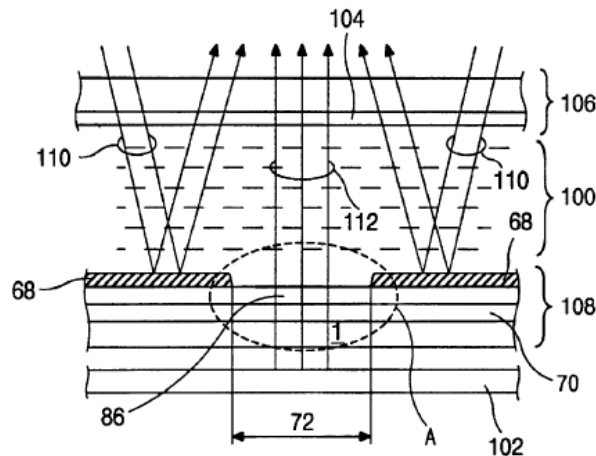
Fig. 4(e) of *Adachi*

Alternatively, a POSITA's general knowledge would include knowing that LCDs necessarily have a gap between the two substrates where the liquid crystals and associated electrical elements are located. The '913 patent describes the known art as comprising substrates that face each other with a predetermined gap between them, which are bonded to each other by a sealant to form an internal space with electro-optical material sealed therein. '913 patent, 1:16-25; Sechen, ¶61.

Similarly, *Ha* discloses that “[a] typical transmissive LCD device includes a liquid crystal panel,” which “includes upper and lower substrates with a liquid crystal layer interposed therebetween,” where “[t]he upper substrate includes a color filter, and the lower substrate includes thin film transistors (TFTs) as switching elements,” (*Ha*, 1:21-26), and that “a typical reflective LCD device ... includes upper and lower substrates 8 and 10 with a liquid crystal layer 12 interposed” where “[t]he upper substrate 8 includes color filter layers 4a, 4b, and 4c ... [and t]he lower substrate 10 includes a switching element,” (*Ha*, 1:49-55). Sechen, ¶62; *Ha*, Fig. 2. *Ha* teaches a transflective LCD device in which color filter 104 is disposed at an upper substrate 106. *Ha*, 2:46-54, and Fig. 5. In all these LCD devices, a gap exists between the upper substrate (which includes the color filter) and the lower substrate (which includes TFT’s), where the gap is used to accommodate liquid crystal. Sechen, ¶62.



(related art)
FIG 2



(related art)
FIG. 5

It would be obvious to a POSITA to arrange the color filter substrate 26 of *Adachi* to face the array substrate 25 with a gap therebetween. Sechen, ¶¶63-64. A POSITA would have found it obvious to combine *Adachi* and their general knowledge that conventional LCDs have two substrates with a predetermined gap between them in which the liquid crystals are located (as recognized by the '913 patent and disclosed by *Ha*). *Id.*; see *Koninklijke Philips NV v. Google LLC*, 948 F.3d 1330, 1337-38 (Fed. Cir. 2020) (discussing use of POSITA's general knowledge for obviousness). Specifically, a POSITA would have found it obvious to implement their general knowledge of forming the gap between the substrates and structural layout of the pixel electrodes with *Adachi*'s display device. *Id.* A POSITA would have been motivated to combine their general knowledge of the predetermined gap with *Adachi*'s display device in order to accommodate the liquid crystals such that the liquid crystals in the gap can be controlled by the pixel

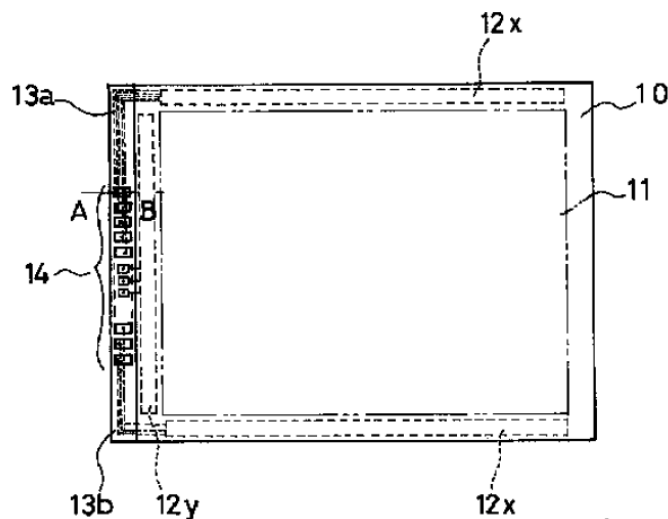
electrodes to orient as needed and hence the display device can display images. *Id.* Further, a POSITA would have found it straightforward to combine their general knowledge of forming the gap between the substrates and structural layout of the pixel electrodes with *Adachi's* display device with predictable results. *Id.*

one substrate of the pair of substrates including an extending portion that extends from the other substrate on one side in plan view;

Adachi discloses this limitation. Sechen, ¶¶65-68.

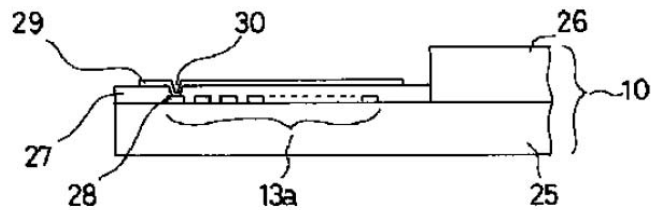
Adachi Figure 1, which is a plan view, shows the array substrate has an extending portion that extends from the color filter substrate on one side (left side). Sechen, ¶¶65-66.

【図 1】



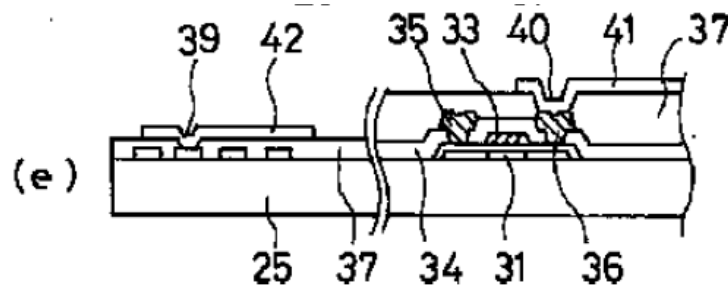
Adachi Figure 3 also discloses the extending portion of the array substrate 25 extends out from the color filter substrate 26. Sechen, ¶¶67-68.

【図 3】



display electrodes that are provided on the one substrate;

Adachi discloses this limitation. Sechen, ¶¶69-71.

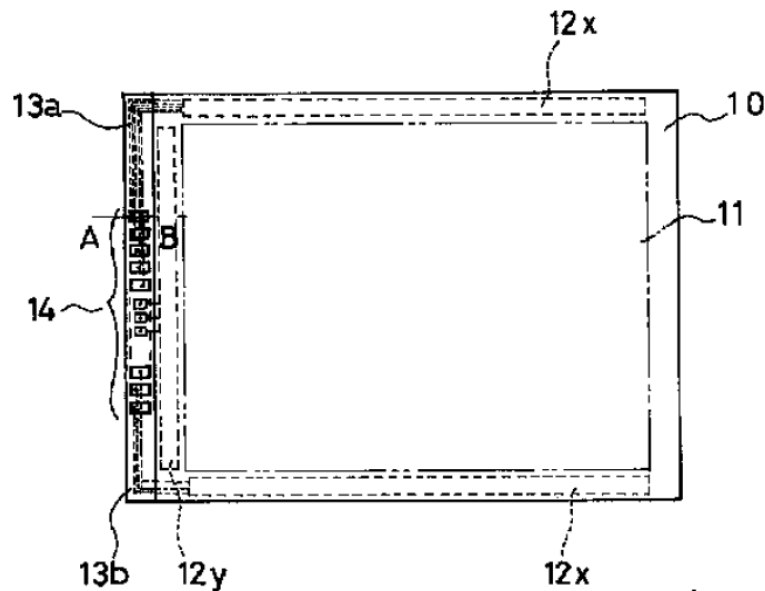


Adachi Figure 4(e) discloses pixel (display) electrodes 41 that are provided on the array substrate 25. Sechen, ¶¶69-71; *Adachi*, ¶[0019].

a circuit unit that is provided on the one substrate so as to drive the display electrodes;

Adachi discloses this limitation. Sechen, ¶¶72-75.

【図 1】

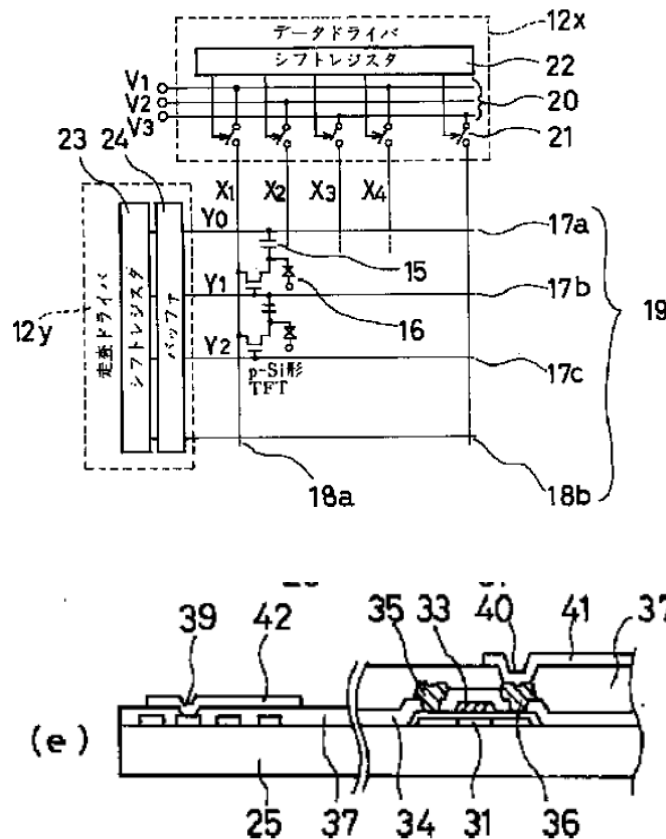


Adachi Figure 1 depicts “the liquid crystal display element 10 has ... drive circuits 12x and 12y that drive the liquid crystal display element [and that] are integrated and built in a periphery of the display region 11,” where “the driving circuit 12x supplies image signals to the data lines 18a to 18b, and the driving circuit 12y supplies scanning signals to the scanning lines 17a to 17c.” Sechen, ¶73; *Adachi*, ¶[0015].

Adachi further discloses that “pixel TFTs ... are arranged at intersections of the scanning lines 17a to 17c and the data lines 18a to 18b.” Sechen, ¶74; *Adachi*, ¶[0015]. *Adachi* Figure 2 shows the drive circuits 12x, 12y supply signals to the TFTs via the scanning lines 17a-17c and the data lines 18a-18b. *Adachi* Figure 4(e) teaches the source electrode 36 of a TFT is electrically connected to the pixel

electrode 41. Therefore, *Adachi* teaches drive circuits 12x, 12y (at least part of the circuit unit) drive the pixel electrodes 41 (the display electrodes), via the scanning lines 17a-17c, the data lines 18a-18b, and the TFTs. Sechen, ¶¶74-75.

【図 2】



wiring lines for driving the circuit unit and the display electrodes;

Adachi discloses this limitation. Sechen, ¶¶76-79.

Adachi teaches a “common wiring for supplying power to the scanning line drive circuit and a common wiring for supplying power to the signal line drive circuit.” Sechen, ¶77; *Adachi*, ¶[0007].

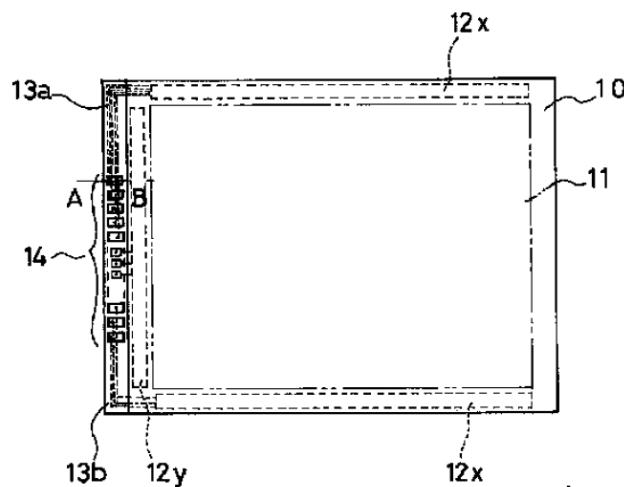
Adachi discloses a “plurality of common wirings connected to the scanning line drive circuit or the signal line drive circuit.” Sechen, ¶78; *Adachi*, ¶[0008].

Adachi discloses “wiring group 13a” and “wiring 28.” Sechen, ¶78; *Adachi*, ¶[0017], ¶[0035] (13b refers to a wiring group). These wirings drive the drive circuits, which drive the display electrodes. Sechen, ¶¶77-79.

a plurality of lead wiring lines provided on the extending portion and that are led from one of the sides of the wiring lines to the extending portion; and

Adachi discloses this limitation. Sechen, ¶¶80-82.

【図 1】

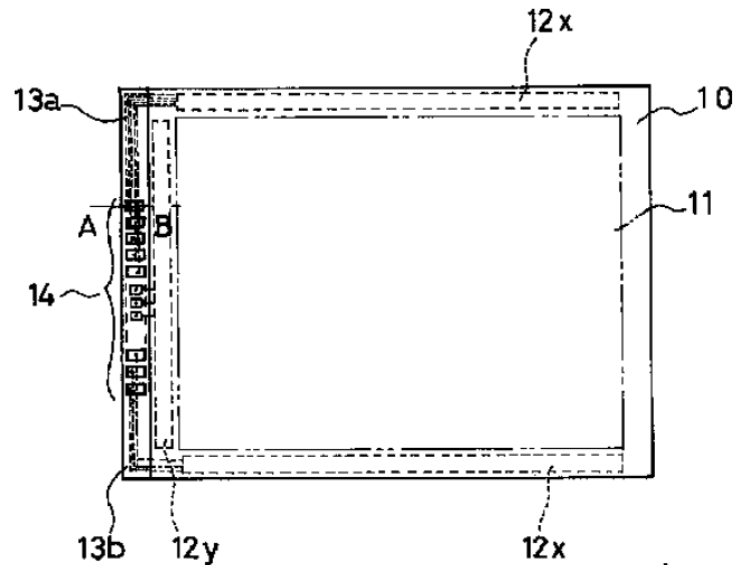


Adachi Figure 1 teaches segments of the wirings in the wiring group 13a/13b are led from one of the sides of the wirings to the extending portion and extend on the extending portion. Sechen, ¶¶81-82.

a plurality of external connecting terminals provided on the extending portion,

Adachi discloses this limitation. Sechen, ¶¶83-85.

【図 1】



Adachi discloses “external connection terminal group 14 including external connection terminals” including terminal 29. Sechen, ¶¶84-85; *Adachi*, ¶¶[0015], [0020]. *Adachi* Figure 1 shows a plurality of terminals in the external connecting terminal group 14 are provided on the extending portion of substrate 25. Sechen, ¶¶84-85.

each of the external connecting terminals overlapping with the plurality of lead wiring lines in plan view.

Adachi discloses this limitation. Sechen, ¶¶86-92.

Adachi teaches that “the external connection terminal 29 connected to the wiring 28 is arranged to cover all wirings of the wiring group 13a.” Sechen, ¶¶87-88; *Adachi*, ¶[0017]. *Adachi* Figure 3 illustrates this teaching:

【図 3】

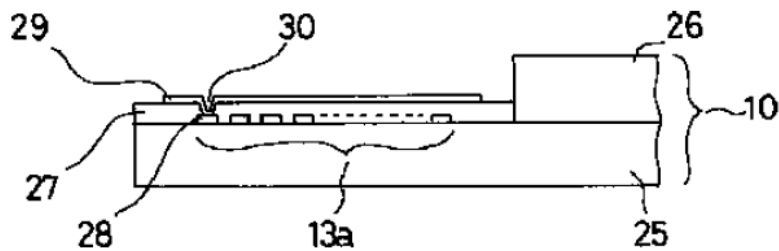
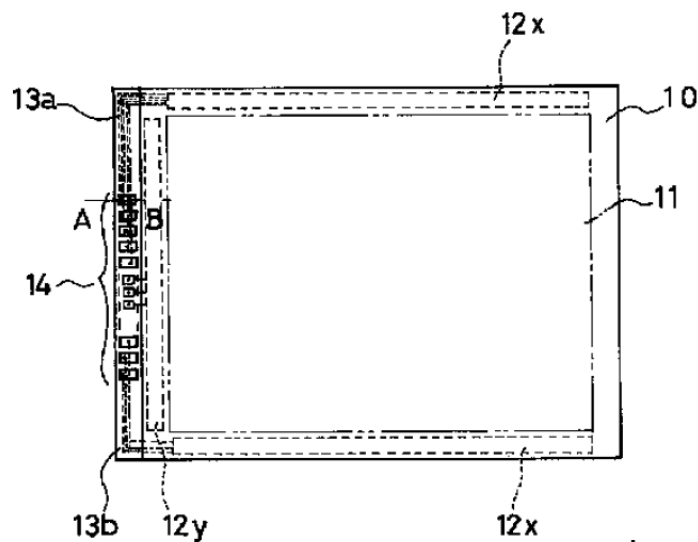


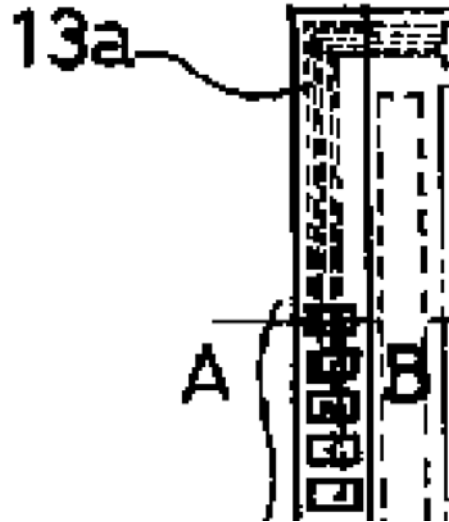
Figure 3 shows external connection terminal 29 overlapping with all the lead wirings in the wiring group 13a. Sechen, ¶88.

In addition, *Adachi* Figure 1 teaches that the external connection terminals in external connection terminal group 14 overlap with the lead wiring lines in the wiring group 13a/13b. Sechen, ¶¶89-90.

【図 1】

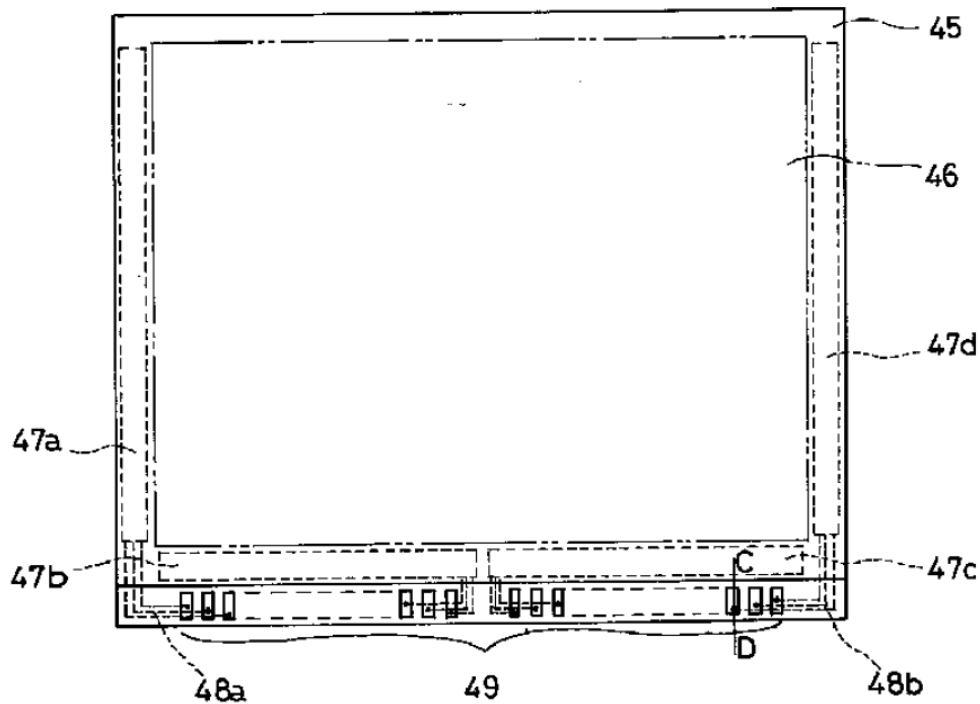


The below enlargement of the upper-left corner of Figure 1 clearly shows this arrangement. Sechen, ¶¶89-90.



Adachi Figure 6 also teaches that the external connection terminals in the external connection terminal group overlap with the plurality of lead wiring lines in the wiring group 48a/48b. *Sechen*, ¶¶91-92; *Adachi*, ¶[0035].

【図 6】



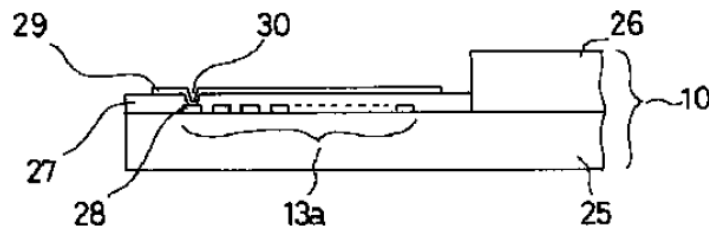
2. Claim 2

Claim 2 depends from claim 1 with the further limitation:

wherein the external connecting terminals and the lead wiring lines are laminated with an interlayer insulating film interposed therebetween,

Adachi discloses this limitation. Sechen, ¶¶93-95.

【図 3】



Adachi Figure 3 teaches “the wiring group 13a formed on the array substrate 25 and connected to the drive circuit 12x is covered with the interlayer insulating film 27.” Sechen, ¶94; *Adachi*, ¶[0017]. In addition, the external connection terminals 29 are formed on the interlayer insulating film 27. Sechen, ¶94. Thus, in the liquid crystal display element 10 of *Adachi*, the external connection terminals 29 and the lead wiring lines (as segments of the wirings in the wiring group 13a/13b) are laminated with the interlayer insulating film 27 interposed therebetween. Sechen, ¶¶94-95.

each of the external connecting terminals being electrically connected with a corresponding one of the lead wiring lines and being electrically isolated from others of the plurality of lead wiring lines by the interlayer insulating film.

Adachi discloses this limitation. Sechen, ¶¶96-98.

Adachi teaches that wiring 28 of the wiring group 13a and the external connection terminal 29 are electrically connected to each other via the contact hole 30 and a plurality of terminals each connected to one different wiring. Sechen, ¶¶97-98; *Adachi*, ¶[0017]. *Adachi* Figure 3 discloses that external connection terminal 29 shown is electrically isolated from others of the wirings in the wiring group 13a/13b by the interlayer insulating film 27. Sechen, ¶¶97-98.

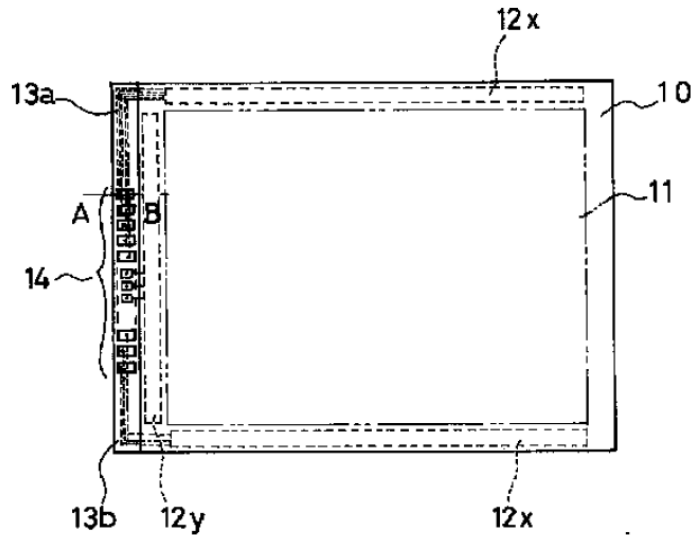
3. Claim 3

Claim 3 depends from claim 1 with the further limitation:

wherein the plurality of external connecting terminals are arranged in a direction along the one side, and the plurality of lead wiring lines extend in the direction along the one side and

Adachi discloses this limitation. Sechen, ¶¶99-102.

【図 1】



Adachi Figure 1 discloses the plurality of external connecting terminals in the external connecting terminal group 14 are arranged along one edge of the extending portion of the substrate (in the up-down direction). Sechen, ¶¶100-101. *Adachi* claims where plurality of external connection terminals are arranged substantially linearly on the side of the insulating substrate. *Id.*

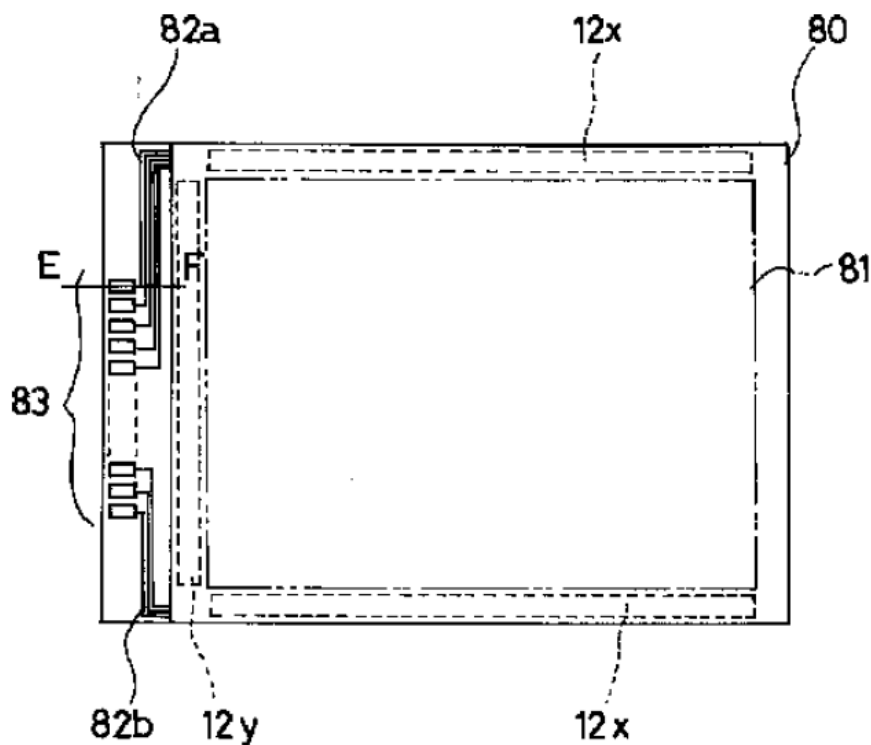
Adachi Figure 1 teaches the plurality of lead wiring lines (segments of the wirings in the wiring group 13a/13b) also extend in the up-down direction in the figure. *Id.*

are correspondingly connected to edges of the external connecting terminals in a direction intersecting the direction along the one side.

Adachi discloses this limitation. Sechen, ¶¶103-104.

Figure 8 of *Adachi* shows the configuration of another example LCD. As shown in Figure 8, the segments of wirings in wiring groups 82a and 82b (which are “lead wiring lines”) extend in the up-down direction and eventually are connected to edges of corresponding external connection terminals in the external connection group 83 in a direction intersecting the up-down direction (the direction along the one side). *Id.*

【図 8】



4. Claim 4

Claim 4 depends from claim 1 with the further limitation:

wherein the plurality of external connecting terminals are arranged in a direction along the one side, and the plurality of lead wiring lines extend in the direction along the one side and

Adachi discloses this limitation for the reasons set forth in regard to claim 3.

are correspondingly connected to the external connecting terminals in a region where the lead wiring lines and the external connecting terminals intersect each other in plan view.

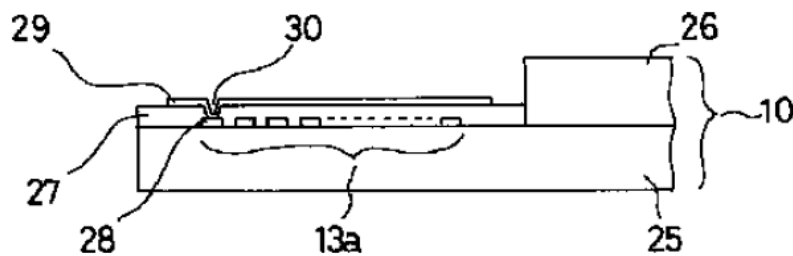
Adachi discloses this limitation. Sechen, ¶¶106-108.

Adachi Figure 1 (enlarged version below) discloses that the plurality of lead wiring lines (segments of the wirings in the wiring group 13a/13b) are correspondingly connected to the external connection terminals in the external connection terminal group 14 in a region where the segments of the wirings and the external connecting terminals intersect each other in plan view. Sechen, ¶106.



Adachi Figure 3 teaches that the wiring 28 of the wiring group 13a and the external connection terminal 29 are electrically connected to each other via the contact hole 30. Sechen, ¶¶107-108; *Adachi*, ¶[0017].

【図 3】



5. **Claim 9**

An electronic apparatus comprising the electro-optical device according to claim 1.

Adachi discloses claim 9. Sechen, ¶¶109-110.

Adachi discloses a display device. Display device is an electronic apparatus.

The display device of *Adachi* includes the liquid crystal display element 10. *Id.*

B. *Adachi* in Combination with *Takezawa* Renders Obvious Claim 8.

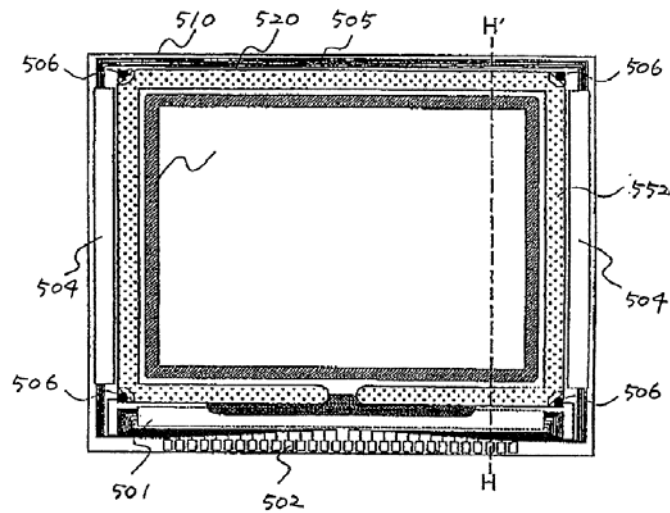
1. **Claim 8**

Claim 8 depends from claim 1 with the further limitation:

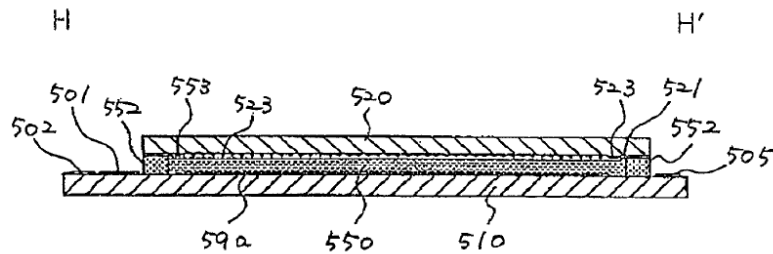
a sealant that bonds edges of opposite surfaces of the pair of substrates to each other so as to form an internal space between the pair of substrates; and

Takezawa discloses this limitation. Sechen, ¶¶112-114.

[FIG. 6]



[FIG. 7]



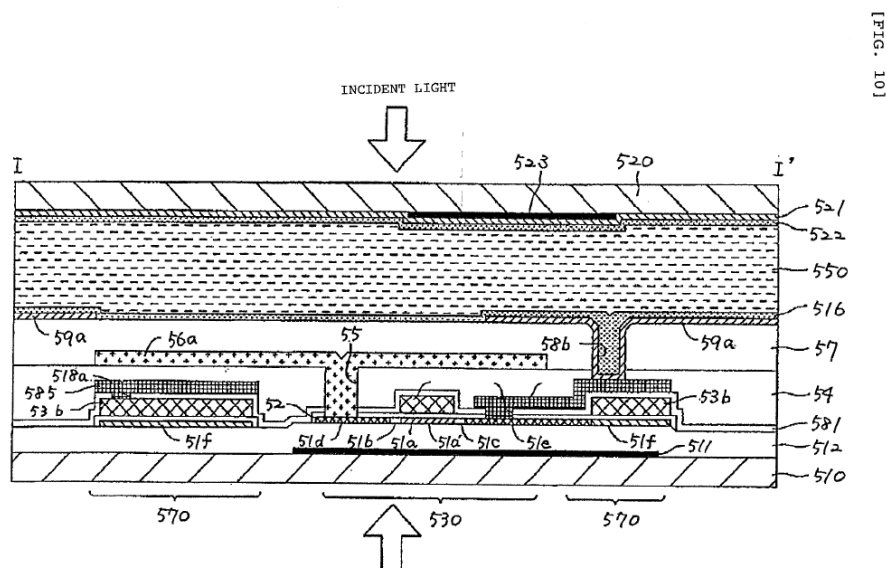
Takezawa Figure 7 shows a liquid crystal panel that includes a base substrate 510 and a counter substrate 520. *Takezawa* explains that base and counter substrates are bonded together by a sealant to form a “space surrounded by the base substrate 510, the counter substrate 520, and the sealant 552.” Sechen, ¶113; *Takezawa*, ¶[0072]. As shown in Figure 7, the sealant bonds along the edges of opposite surfaces of the base substrate and the counter substrate, and the internal space is formed between the base substrate and the counter substrate. Sechen, ¶¶113-114.

an electro-optical material that is held in the internal space,

Takezawa discloses that liquid crystals are sealed in the space surrounded by the base substrate, the counter substrate, and the sealant. Sechen, ¶¶115-116; *Takezawa*, ¶[0072].

wherein the display electrodes and a part of the circuit unit are disposed to face the internal space.

Takezawa Figure 10 discloses pixel electrode 59a and various components of the circuit unit, such as TFT 530 and data line 56a, are disposed to face the internal space that holds the liquid crystals 550. Sechen, ¶117. These elements correspond to the '913 patent's description of a circuit unit: "electronic elements, such as TFTs or the like, the wiring lines, such as ... data lines, and the like ... correspond to a specified example of 'circuit unit'." '913 patent, 7:56-61. Sechen, ¶117.



A POSITA would have found it obvious to combine *Adachi* and *Takezawa*. Sechen, ¶¶118-119. Specifically, a POSITA would have found it obvious to implement *Takezawa*'s formation of the gap between the substrates and structural layout of the pixel electrodes and circuit unit with *Adachi*'s display device. *Id.* A POSITA would have been motivated to combine *Takezawa*'s structure with *Adachi*'s display device in order to accommodate the liquid crystals such that the liquid crystals in the gap can be controlled by the pixel electrodes to orient as needed and hence the display device can display images. *Id.* Further, as both *Adachi* and *Takezawa* relate to displays, and specifically LCDs, a POSITA would have found it straightforward to combine *Takezawa*'s formation of the gap between the substrates and structural layout of the pixel electrodes and circuit unit with *Adachi*'s display device with predictable results. *Id.*

C. *Adachi* in Combination with *Aruga* Renders Obvious Claim 10.

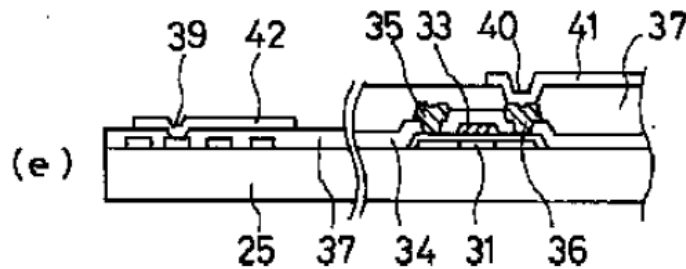
1. Claim 10

Claim 10 depends from claim 2 with the further limitation:

the external connecting terminals being formed from the same film as a first conductive film constituting the circuit unit,

Adachi in light of *Aruga* teaches and renders obvious claim 10. Sechen, ¶¶120-125.

Adachi discloses external connection terminals can be formed from the same film as a conductive film constituting the pixel electrode. *Adachi* teaches that an ITO film can be formed and patterned to form pixel electrodes 41 and terminals 42. Sechen, ¶120; *Adachi*, ¶[0019], Fig. 4(e).



Aruga discloses an electro-optical device. *Aruga*, Title. *Aruga* further discloses that the electro-optical device includes “[a] chip connecting wiring 25 ... serv[ing] to connect [a] data line 22 to [an] X driver IC 52.” Sechen, ¶121; *Aruga*, ¶[0033]. According to the ’913 patent, “all of ... the wiring lines, such as scanning lines, data lines, and the like ... correspond to a specified example of ‘circuit unit.’” ’913 patent, 7:58-61. Therefore, the chip connecting wiring 25 can be considered part of the circuit unit. Sechen, ¶121.

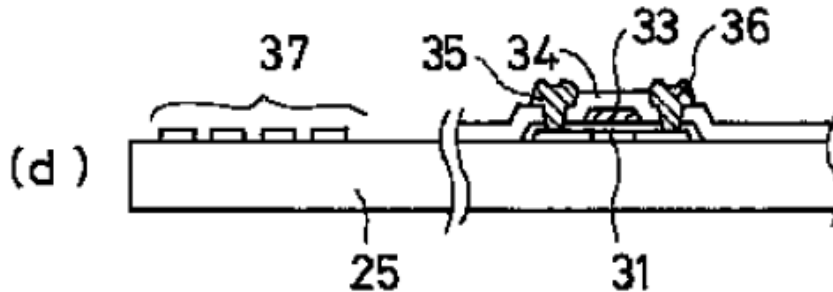
Aruga further discloses that “the chip connecting wiring 25 is formed during a step for forming pixel electrodes 23; this step comprises patterning of [an] ITO layer” and “[a]ccordingly, the chip connecting wiring 25 is composed of ITO as is the pixel electrode 23.” *Aruga*, ¶[0033]. Sechen, ¶122.

Thus, as *Adachi* discloses that the external connection terminals can be formed from a same film as the pixel electrode, and *Aruga* discloses that the pixel electrode can be formed from a same film as the chip connecting wiring, which is a conductive film constituting the circuit unit, it would be obvious to a POSITA to modify the teaching of *Adachi* to form the external connection terminals from the same film as a conductive film constituting the circuit unit. Sechen, ¶123.

Further, a POSITA would have found it obvious to combine *Adachi* and *Aruga*. Sechen, ¶¶124-125. Specifically, a POSITA would have found it obvious to implement *Aruga*'s chip connecting wiring formed from the same film as a conductive film constituting the pixel electrode with *Adachi*'s display device in which the external connection terminals are formed from a same film as a conductive film constituting the pixel electrode, resulting in the external connection terminals of *Adachi* being formed from the same film as the conductive film constituting the chip connecting wiring, which is part of the circuit unit. *Id.* A POSITA would have been motivated to combine *Aruga*'s structure with *Adachi*'s display device in order reduce the number of layers and processing steps and hence simplify manufacturing and reduce cost. *Id.* Further, as both *Adachi* and *Aruga* relate to displays, and specifically LCDs, a POSITA would have found it straightforward to combine *Aruga*'s structure with *Adachi*'s display device with predictable results. *Id.*

and the lead wiring lines being formed from the same film as a second conductive film constituting the circuit unit.

Adachi discloses this limitation. Sechen, ¶¶126-128.



Adachi teaches that an aluminum layer can be formed, and patterned to form the drain electrode 35, the source electrode 36, and the wiring group 37 integrated with the signal line in the same process. Sechen, ¶127; *Adachi*, ¶[0019]; Figure 4(d). The drain electrode 35 and the source electrode 36 are each a conductive film constituting the TFT. Sechen, ¶127.

D. *Sekado* Anticipates Claims 1-6 and 9.

1. Claim 1

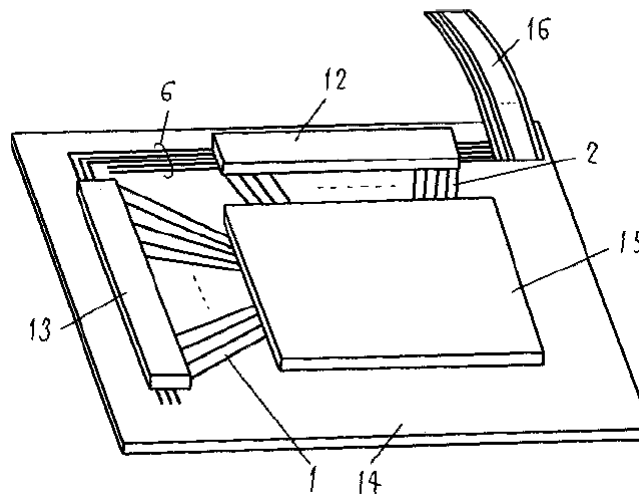
An electro-optical device comprising:

Sekado discloses a liquid crystal display device, which is an electro-optical device. Sechen, ¶129; *Sekado*, Title.

a pair of substrates that are disposed to face each other with a predetermined gap therebetween,

Sekado discloses this limitation. Sechen, ¶¶130-132.

【第5図】



Sekado discloses an insulating substrate 14 and a color filter 15. Sechen, ¶131; *Sekado*, p.3, 1.7-9. *Sekado* Figure 5 teaches the insulating substrate 14 and color filter 15 are disposed to face each other. Sechen, ¶131. *Sekado* discloses that “[l]iquid crystals are sealed in to a gap formed by a color filter 15 bonded to the insulating substrate 14.” Sechen, ¶132; *Sekado*, p.3, 1.7-9.

one substrate of the pair of substrates including an extending portion that extends from the other substrate on one side in plan view;

Sekado discloses this limitation. Sechen, ¶¶133-135.

Sekado Figure 5 discloses insulating substrate 14 has an extending portion that extends from the color filter 15 on one side (upper side). *Id.*

display electrodes that are provided on the one substrate;

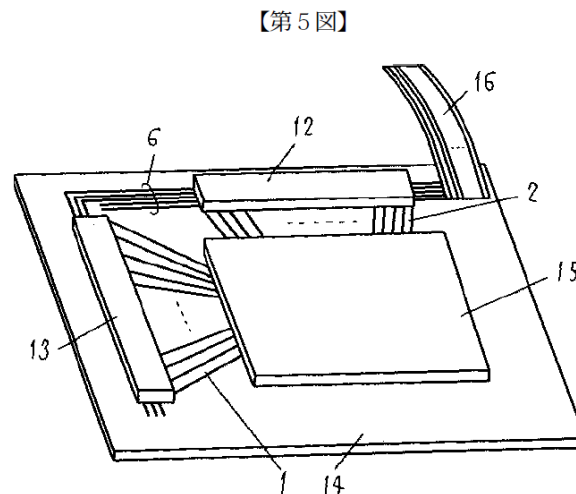
Sekado discloses this limitation. Sechen, ¶¶136-138.

Sekado discloses an array of pixel electrodes arranged in a matrix, thin film

transistors disposed close to and connected to the pixel electrodes, signal lines connected to source electrodes of the thin film transistors, and scanning lines connected to gate electrodes of the thin film transistors on one substrate of the substrates. Sechen, ¶137. Further, *Sekado* Figure 4 discloses an active liquid crystal circuit in which a switching element 3 of a field-effect transistor and a liquid crystal cell 4 are arranged at each intersection of scanning lines 1 and signal lines 2 on an insulating substrate 14. Sechen, ¶¶137-138; *Sekado*, p.2, ll.40-42.

a circuit unit that is provided on the one substrate so as to drive the display electrodes;

Sekado discloses this limitation. Sechen, ¶¶139-142.



Sekado discloses a circuit unit including various circuits/circuit components, such as a scanning line driving driver 13 and a signal line driving driver 12. Sechen, ¶140; *Sekado*, p.2, l.45. *Sekado* Figure 5 discloses a scanning line driving driver 13 and a signal line driving driver 12 being on the insulating substrate 14.

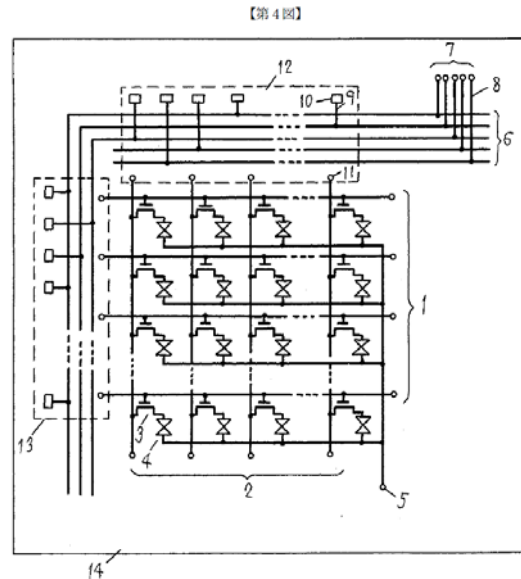
Sechen, ¶140.

Sekado further discloses that “[t]he signal line driving driver IC 12 and the scanning line driving driver IC 13 are respectively mounted and connected to the signal line 2 and the scanning line 1.” Sechen, ¶141; *Sekado*, p.3, ll.9-10. *Sekado* teaches a switching element 3 of a field-effect transistor and a liquid crystal cell 4 are arranged at each intersection of scanning lines 1 and signal lines 2 on an insulating substrate 14, and that the transistors (switching elements 3) are “connected to the pixel electrodes.” Sechen, ¶141; *Sekado*, p.2, ll.40-42; claim 1; Fig. 4. *Sekado* teaches driver ICs 12 and 13 “supply signals to the signal lines and the scanning lines on the substrate.” Sechen, ¶141; *Sekado*, claim 1. That is, in *Sekado*, the driver ICs 12 and 13 (i.e., the circuit unit or part of the circuit unit) drive the pixel electrodes via the signal lines 2, the scanning lines 1, and the transistors 3. Sechen, ¶¶141-142.

wiring lines for driving the circuit unit and the display electrodes;

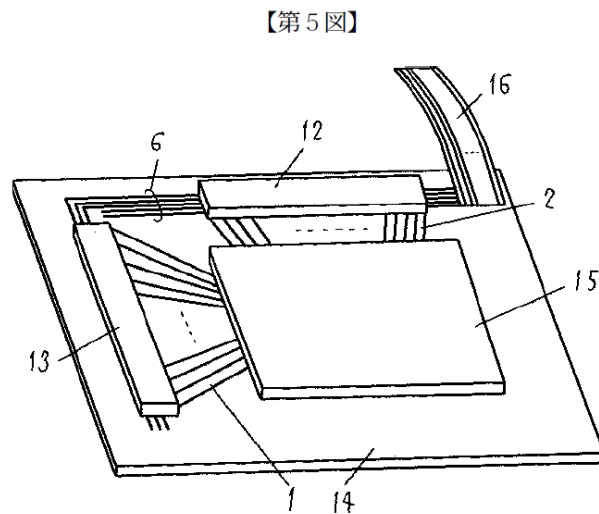
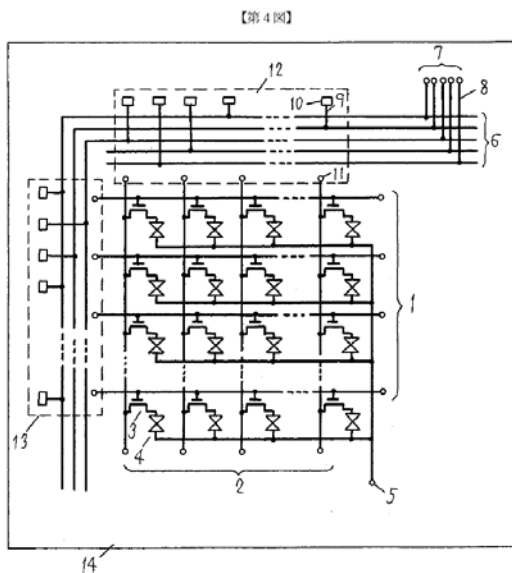
Sekado discloses this limitation. Sechen, ¶¶143-145.

Sekado Figure 4 discloses driver driving wirings 6 which are wired to supply signals to the scanning line driving driver 13 and the signal line driving driver 12. Sechen, ¶144; *Sekado*, p.2, ll.44-45; Fig. 4. In *Sekado*, the wirings 6 supply signals to drive the driver ICs 12 and 13 (circuit unit or part of the circuit unit), and thus drive the pixel electrodes via the driver ICs 12 and 13. Sechen, ¶¶144-145.



a plurality of lead wiring lines provided on the extending portion and that are led from one of the sides of the wiring lines to the extending portion; and

Sekado discloses this limitation. Sechen, ¶¶146-148.



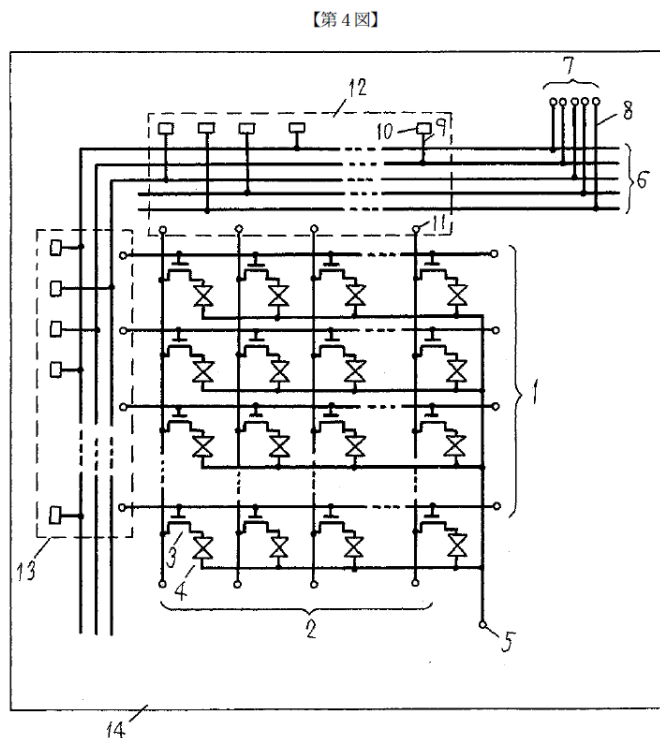
Sekado Figures 4 and 5 disclose that segments of the wirings 6 are provided on the extending portion and are led from one of the sides of the wirings to the extending portion. *Id.*

a plurality of external connecting terminals provided on the extending portion,

Sekado discloses this limitation. Sechen, ¶¶149-152.

Sekado discloses connection terminals 10 and extraction wirings 9 for connecting the lead line wirings (segments of wirings 6) to the connection terminals 10. A connection terminal 10 and a corresponding extraction wiring 9 form an external connecting terminal. Sechen, ¶150.

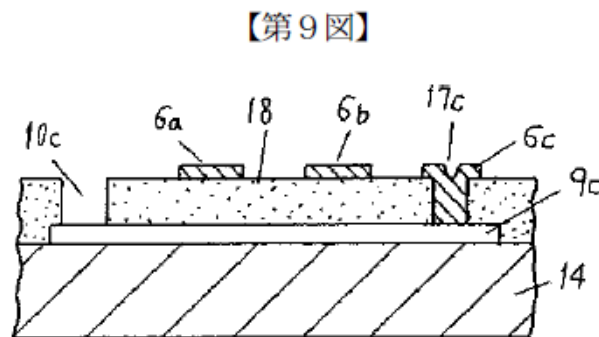
Sekado Figure 4 discloses that the location of connection terminals 10 and extraction wirings 9 overlaps with the location of driver IC 12. *Sekado* Figure 4 discloses that driver IC 12 is provided on the extending portion. Sechen, ¶151. Therefore, connection terminals 10 and extraction wirings 9 (the external connecting terminals) are provided on the extending portion. Sechen, ¶¶151-152.



each of the external connecting terminals overlapping with the plurality of lead wiring lines in plan view.

Sekado discloses this limitation. Sechen, ¶¶153-155.

Sekado Figure 4 discloses that the external connecting terminals (pairs of connection terminal 10 and extraction wiring 9) overlap with the lead wiring lines (segments of wirings 6) in plan view. Sechen, ¶154. *Sekado* Figure 9 provides a cross-sectional view in which 10c and 9c are an example of the external connecting terminal and 6a-6c are examples of the lead wiring lines. Sechen, ¶¶154-155; *Sekado*, p.4, ll.30-31.



2. Claim 2

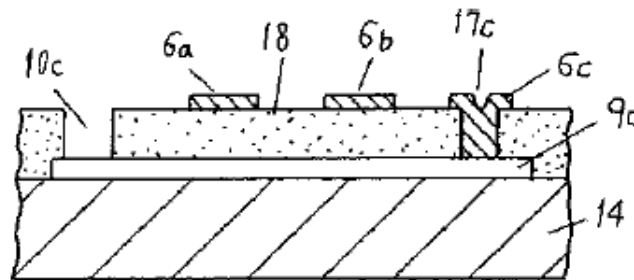
The electro-optical device according to claim 1, wherein the external connecting terminals and the lead wiring lines are laminated with an interlayer insulating film interposed therebetween,

Sekado discloses this limitation. Sechen, ¶¶156-158.

Sekado Figure 9 discloses connection terminal 10c/extraction wiring 9c (the external connecting terminal) and segments of wirings 6a-6c (lead wiring lines) are

laminated with an insulating layer 18 interposed therebetween. Sechen, ¶157-158;
Sekado, p.3, ll.21-24.

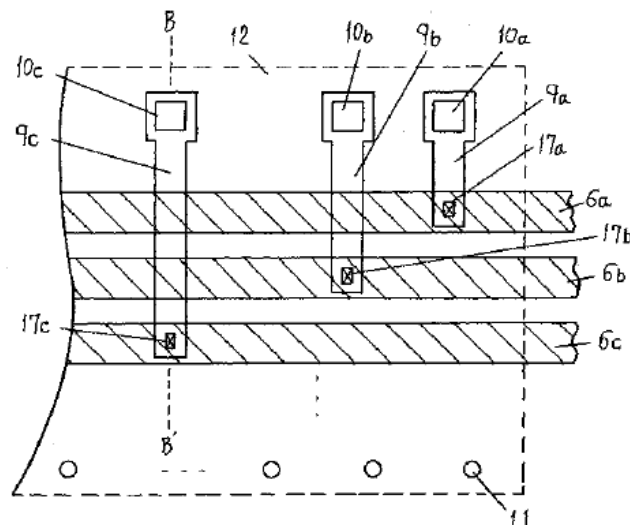
【第9図】



each of the external connecting terminals being electrically connected with a corresponding one of the lead wiring lines and being electrically isolated from others of the plurality of lead wiring lines by the interlayer insulating film.

Sekado discloses this limitation. Sechen, ¶¶159-161.

【第8図】



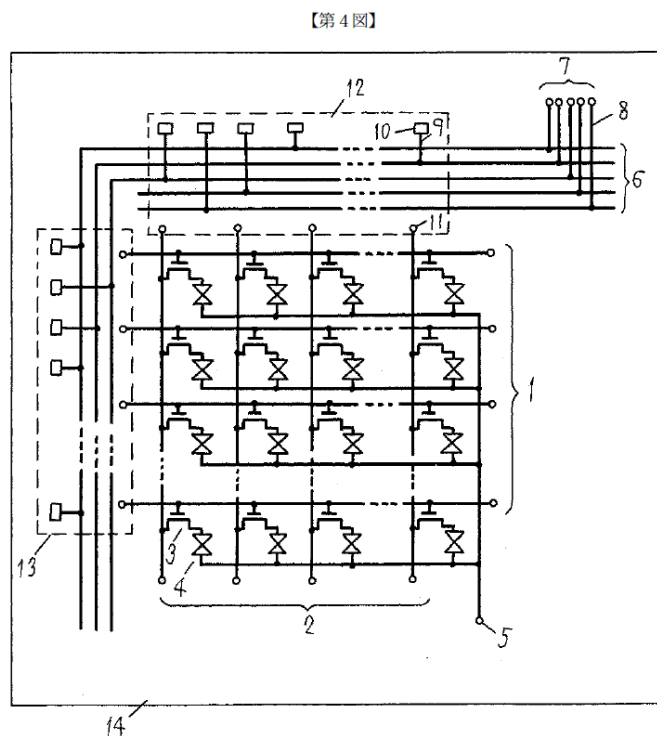
Sekado Figure 8 discloses that wirings 6-a, b, c and the driver driving side extraction wirings 9-a, b, c are electrically connected by contacts 17-a, b, c.

Sechen, ¶160: *Sekado*, p.3, ll.20-21. *Sekado* Figure 9 teaches that the extraction wiring 9c is electrically connected with corresponding wiring 6c and is electrically isolated from wirings 6a and 6b by the insulating layer 18. Sechen, ¶¶160-161.

3. Claim 3

The electro-optical device according to claim 1, wherein the plurality of external connecting terminals are arranged in a direction along the one side, and

Sekado discloses this limitation. Sechen, ¶¶162-164.



Sekado Figure 4 discloses a plurality of external connecting terminals (extraction wirings 9/connection terminals 10) are arranged in left-right direction, *i.e.*, a direction along the upper side (the one side). *Id.*

the plurality of lead wiring lines extend in the direction along the one side and

Sekado Figure 4 discloses a plurality of lead wiring lines (segments of the wirings 6) that extend in the left-right direction *i.e.*, a direction along the upper side (the one side). Sechen, ¶¶165-166.

are correspondingly connected to edges of the external connecting terminals in a direction intersecting the direction along the one side.

Sekado Figures 4 and 8 disclose that each lead wiring line (segment of wiring 6) is connected to an edge of a corresponding external connecting terminal (extraction wiring 9/connection terminal 10), where the edge is an edge in an up-down direction, *i.e.*, a direction intersecting the left-right direction in FIGs. 4 and 8 (the direction along the one side). Sechen, ¶¶167-168; *Sekado*, Figs. 4, 8.

4. Claim 4

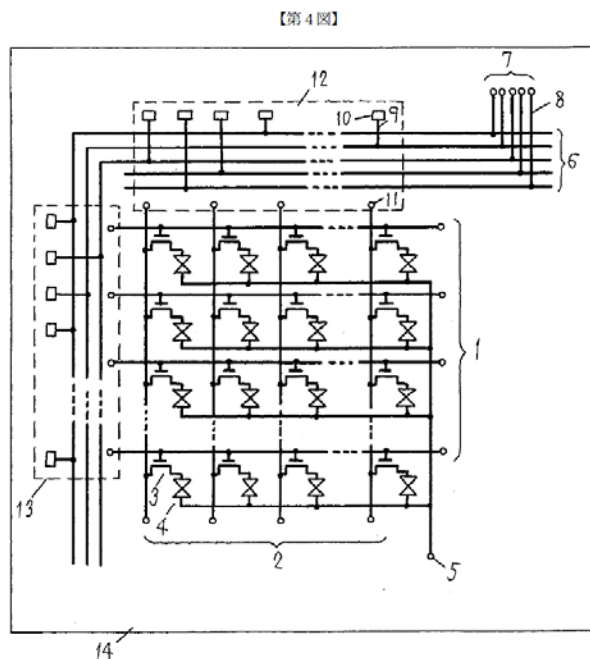
The electro-optical device according to claim 1, wherein the plurality of external connecting terminals are arranged in a direction along the one side, and the plurality of lead wiring lines extend in the direction along the one side and

Sekado discloses this limitation as set forth above in regard to claim 3.

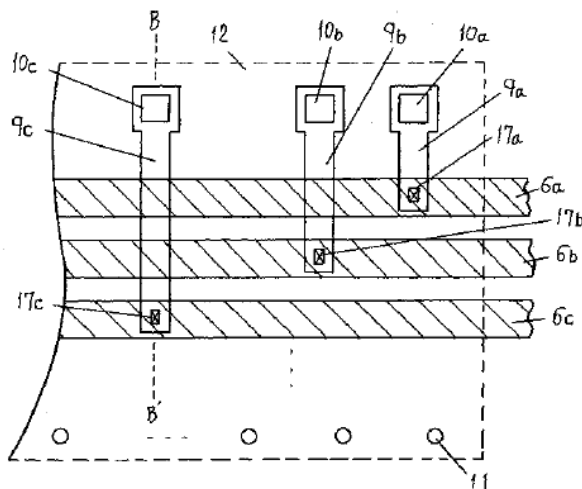
are correspondingly connected to the external connecting terminals in a region where the lead wiring lines and the external connecting terminals intersect each other in plan view.

Sekado discloses this limitation. Sechen, ¶¶170-171.

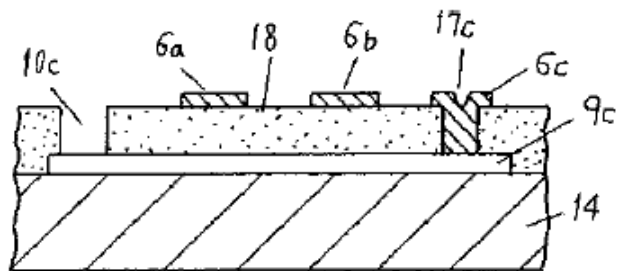
Sekado Figure 8 discloses driver driving wirings 6-a, b, c and driver driving side extraction wirings 9-a, b, c that are electrically connected by contacts 17-a, b, c. Sechen, ¶170; *Sekado*, p.3, ll.18-21. *Sekado* Figures 4, 8 and 9 teach that each lead wiring line (segment of wiring 6) is connected to a corresponding external connecting terminal (extraction wiring 9/connection terminal 10) in a region where they intersect each other in plan view. Sechen, ¶¶170-171; *Sekado*, Figs. 4, 8, 9.



【第8図】



【第9図】



5. Claim 5

An electro-optical device comprising:

Sekado discloses this limitation as set forth in regard to claim 1.

a pair of substrates that are disposed to face each other with a predetermined gap therebetween,

Sekado discloses this limitation as set forth in regard to claim 1.

one substrate of the pair of substrates including an extending portion that extends from the other substrate on one side in plan view;

Sekado discloses this limitation as set forth in in regard to claim 1.

display electrodes that are provided on the one substrate;

Sekado discloses this limitation as set forth in regard to claim 1.

a circuit unit that is provided on the one substrate so as to drive the display electrodes;

Sekado discloses this limitation as set forth in regard to claim 1.

wiring lines for driving the circuit unit and the display electrodes;

Sekado discloses this limitation as set forth in regard to claim 1.

a plurality of lead wiring lines provided on the extending portion and that are led from one of the sides of the wiring lines to the extending portion; and

Sekado discloses this limitation as set forth in regard to claim 1.

a plurality of external connecting terminals provided on the extending portion,

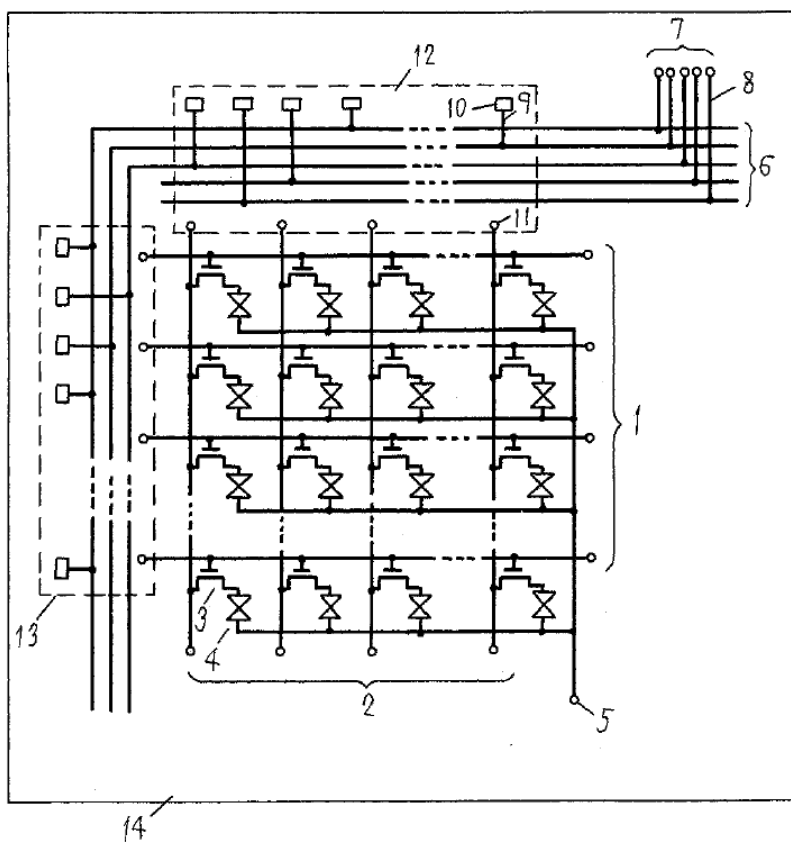
Sekado discloses this limitation as set forth in regard to claim 1.

each of the external connecting terminals overlapping with the circuit unit in plan view.

Sekado discloses this limitation. Sechen, ¶¶180-182.

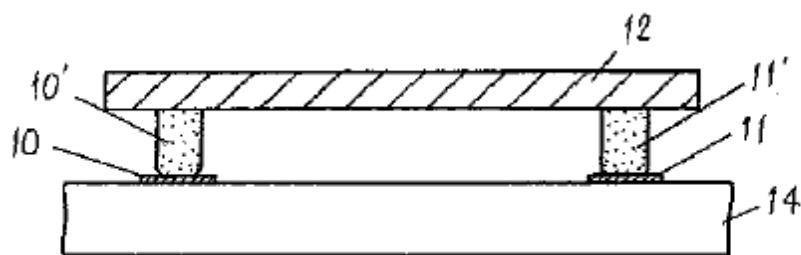
Sekado Figure 4 teaches that the external connecting terminals (pairs of connection terminal 10 and extraction wiring 9) overlap with the circuit unit (signal line driving driver 12) in plan view. Sechen, ¶181. *Sekado* Figure 7 discloses the external connecting terminals (pairs of connection terminal 10 and extraction wiring 9) overlapping with the circuit unit. Sechen, ¶¶181-182.

【第4図】



【第7図】

10' --- ドライバ-IC 入力パッド
11' --- ドライバ-IC 出力パッド



6. Claim 6

**The electro-optical device according to claim 5,
wherein the circuit unit is electrically connected to
terminals for supplying an image signal among the plurality
of external connecting terminals and has a driving circuit,
which is driven by the supplied image signal, and**

Sekado discloses this limitation. Sechen, ¶¶183-185.

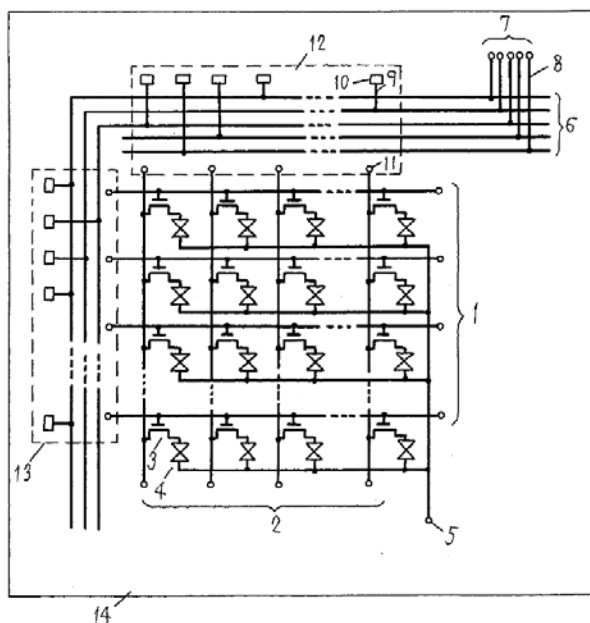
Sekado discloses a signal line driving driver 12, which is a driving circuit.

Sechen, ¶184; *Sekado*, p.3, ll.15-16. *Sekado* Figure 4 teaches that connection terminals 10 are connected via extraction wirings 9 to wirings 8, which supply signals to driver driving wirings 6. Sechen, ¶184; *Sekado*, p.3, l.2. Thus, the signals are supplied to the connection terminals 10/extraction wirings 9 via the wirings 8 and 6, and the connection terminals 10/extraction wirings 9 supply the signals to and drive the signal line driving driver 12. Sechen, ¶¶184-185.

**at least a part of the driving circuit overlaps the external
connecting terminals in plan view.**

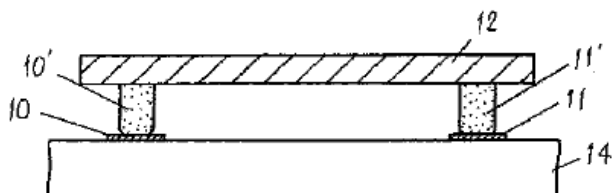
Sekado Figures 4 and 7 disclose a part of the signal line driving driver 12 overlaps the connection terminals 10/extraction wirings 9 in plan view. Sechen, ¶¶186-187.

【第4図】



【第7図】

10' --- ドライバ-IC 入力パッド
11' --- ドライバ-IC 出力パッド



7. Claim 9

An electronic apparatus comprising the electro-optical device according to claim 1.

Sekado discloses using “a liquid crystal display device that can obtain a good television image.” *Sekado*, p.2, 1.25. Thus, *Sekado* discloses an apparatus (television) that includes the electro-optical device of claim 1. Sechen, ¶¶188-189.

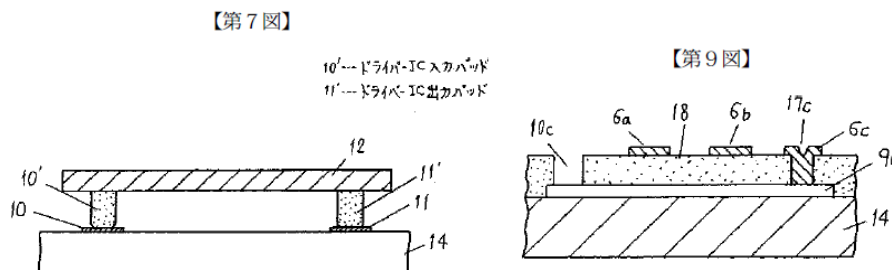
E. Sekado in Combination with Aruga Renders Obvious Claim 7.

1. Claim 7

The electro-optical device according to claim 5,

wherein the external connecting terminals and the part of the circuit unit are laminated with an interlayer insulating film interposed therebetween,

Sekado in combination with *Aruga* renders obvious this limitation. Sechen, ¶¶190-196.

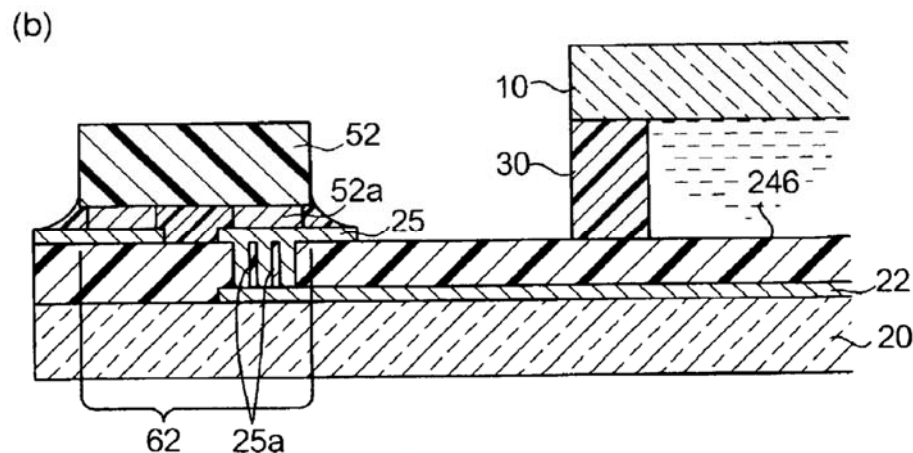


Sekado Figure 7 discloses a signal line driving driver 12 is formed over the external connecting terminal. *Sekado* Figure 9 teaches an insulating layer 18 is formed on the external connecting terminal (connection terminal 10/extraction wiring 9). Sechen, ¶¶191-192.

Sekado teaches an interlayer insulating film (insulating layer 18) is interposed between the external connecting terminals (connection terminals 10/extraction wirings 9) and the part of the circuit unit (signal line driving driver 12) that overlaps with the external connecting terminals. Sechen, ¶193.

Further, *Aruga* discloses: “A resin or mold seals the connecting portion between the X driver IC 52 and the chip connecting wiring 25” (*Aruga*, ¶[0044]),

thus “moisture is inhibited from reaching the data lines 22 through the contact holes 25a and corrosion of the data lines 22 can be reliably prevented,” (*Aruga*, ¶[0045]). Sechen, ¶194. In *Aruga*, layer 246 is also an insulating layer, similar to layer 18 in *Sekado*. Thus, *Aruga*’s underling conducting layer 22 and IC 52 are laminated with an interlayer insulating film (resin+layer 246) interposed therebetween. *Aruga*, Fig. 7(b) (below); Sechen, ¶194.

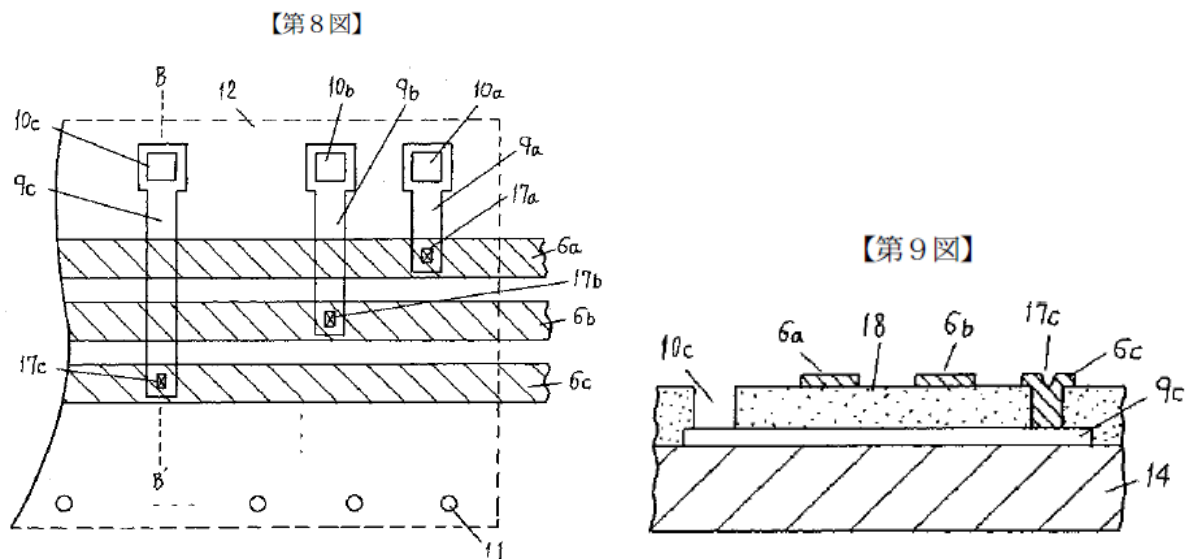


A POSITA would have found it obvious to implement *Aruga*’s insulating layer inbetween insulating interlayer 18 and part of the circuit unit 12 of *Sekado*’s display device. Sechen, ¶¶195-196. A POSITA would have been motivated to combine *Aruga*’s insulating layer into *Sekado*’s display device in order to inhibit moisture and prevent corrosion of at least the underlying terminals as taught by *Aruga*. *Id.* Further, as both *Sekado* and *Aruga* relate to LCDs, a POSITA would have found it straightforward to combine *Aruga*’s insulating layer inbetween *Sekado*’s insulating interlayer and circuit unit with predictable results. *Id.*

each of the external connecting terminals being electrically connected with a corresponding one of the lead wiring lines and being electrically isolated from others of the plurality of lead wiring lines by the interlayer insulating film.

Sekado discloses this limitation. Sechen, ¶¶197-199.

Sekado discloses wirings 6-a, b, c and driver driving side extraction wirings 9-a, b, c are electrically connected by contacts 17-a, b, c, respectively. Sechen, ¶198; *Sekado*, p.3, ll.20-21; Fig. 8. *Sekado* Figure 9 teaches that the extraction wiring 9c is electrically connected with corresponding wiring 6c and is electrically isolated from wirings 6a and 6b by the insulating layer 18. Sechen, ¶¶198-199.



F. *Sekado* in Combination with *Takezawa* Renders Obvious Claim 8.

1. Claim 8

The electro-optical device according to claim 1, further comprising:

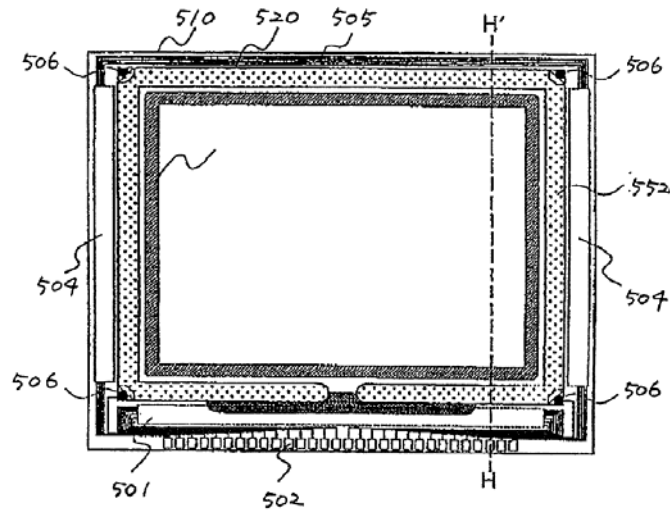
a sealant that bonds edges of opposite surfaces of the pair of substrates to each other so as to form an internal space between the pair of substrates; and

Sekado in combination with *Takezawa* discloses this limitation. Sechen, ¶¶200-204.

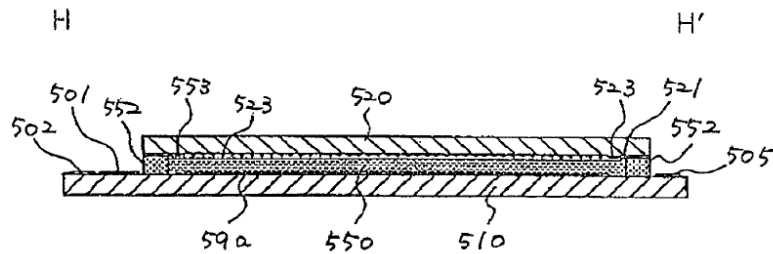
Sekado teaches that “[l]iquid crystals are sealed in to a gap formed by a color filter 15 bonded to the insulating substrate 14.” *Sekado*, p.3, ll.7-8. A POSITA would understand “bonded” to mean closed together with a sealant. Sechen, ¶201. An internal space between the color filter 15 and the insulating substrate 14 is inherent to accommodate the liquid crystal. Sechen, ¶201. The ’913 patent describes the known art as comprising substrates that face each other with a predetermined gap between them, which are bonded to each other by a sealant so as to form an internal space with electro-optical material sealed in it. ’913 patent, 1:16-25; Sechen, ¶201.

Alternatively, *Takezawa* discloses a liquid crystal panel (an electro-optical device) that includes a pair of substrates and a sealant bonding the edges of opposite surfaces of the substrates to form an internal space. Sechen, ¶¶202-203.

[FIG. 6]



[FIG. 7]



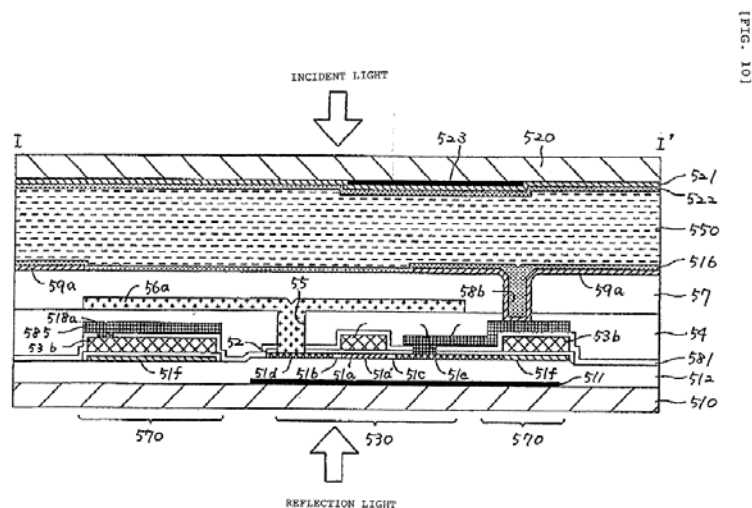
Takezawa Figure 7 shows a liquid crystal panel that includes a base substrate 510 and a counter substrate 520. *Takezawa* explains that base and counter substrates are bonded together by a sealant to form a “space surrounded by the base substrate 510, the counter substrate 520, and the sealant 552.” Sechen, ¶¶202-203; *Takezawa*, ¶[0072]. *Takezawa* discloses that sealant 552 is provided on the base substrate 510 along the edges thereof. Sechen, ¶¶202-203; *Takezawa*, ¶[0073]. A POSITA would have combined *Sekado* with *Takezawa* for the reasons set forth below. Sechen, ¶¶209-210.

an electro-optical material that is held in the internal space,

Sekado teaches: “Liquid crystals are sealed in to a gap formed by a color filter 15 bonded to the insulating substrate 14.” Sechen, ¶¶205-207; *Sekado*, p.3, ll.7-8. Similarly, *Takezawa* discloses that liquid crystals 550 are sealed in the space surrounded by the base substrate 510, the counter substrate 520, and the sealant 552. Sechen, ¶¶205-207; *Takezawa*, ¶[0072]. A POSITA would have combined *Sekado* with *Takezawa* for the reasons set forth below. Sechen, ¶¶209-210.

wherein the display electrodes and a part of the circuit unit are disposed to face the internal space.

Takezawa Figure 10 discloses pixel electrode 59a and various components of the circuit unit, such as TFT 530 and data line 56a, are disposed to face the internal space that holds the liquid crystals 550. Sechen, ¶¶208.



A POSITA would have found it obvious to combine *Sekado* and *Takezawa*. Sechen, ¶¶209-210. A POSITA would have found it obvious to implement

Takezawa's sealant and structure to form an internal space between the substrates with *Sekado*'s display device. *Id.* A POSITA would have been motivated to combine *Takezawa*'s structure with *Sekado*'s display device in order to seal the liquid crystals in the internal space. *Id.* Further, as both *Sekado* and *Takezawa* relate to displays, and specifically LCDs, a POSITA would have found it straightforward to combine *Takezawa*'s structure to apply a sealant to bond edges of opposite surfaces of the pair of substrates to each other to form an internal space between the pair of substrates with *Sekado*'s display device with predictable results. *Id.*

G. *Sekado* in Combination with *Kim* Renders Obvious Claim 10.

1. Claim 10

**The electro-optical device according to claim 2,
the external connecting terminals being formed from the
same film as a first conductive film constituting the circuit
unit, and the lead wiring lines being formed from the same
film as a second conductive film constituting the circuit
unit.**

Sekado in view of *Kim* teaches and renders obvious claim 10. Sechen,
¶¶211-217.

Kim discloses a liquid crystal display device. *Kim*, Title. Sechen, ¶211. The liquid crystal display device “ha[s] a driving circuit” and “an outer circuit and the

driving circuit are connected to each other by a pad.” Sechen, ¶211; *Kim*, 1:27-29.

The pads of *Kim* are external connecting terminals. Sechen, ¶211.

Kim discloses a plurality of pads 41 and wires 42 connected to each of a plurality of the pads 41 are formed in a connecting part of outer circuit 40. Sechen, ¶212; *Kim*, 3:64-67. Further, *Kim* teaches the pads located at the side portions of the connecting part are arranged in a row-like fashion and connected to the driving circuit by the first wire 42 which is bent or angled toward the driving circuit at a certain point or region. Sechen, ¶212; *Kim*, 4:14-18. *Kim* discloses a first wire 42 that extends in a direction perpendicular to the pad 41. Sechen, ¶212; *Kim*, 4:67-5:1. At least the segments of the wires 42 connected to the pads 41 constitute lead wiring lines. As shown in, e.g., FIGs. 4 and 5 of *Kim*, which are plan views, the pads 41 overlap with the segments of the plurality of wires 42. Sechen, ¶212.

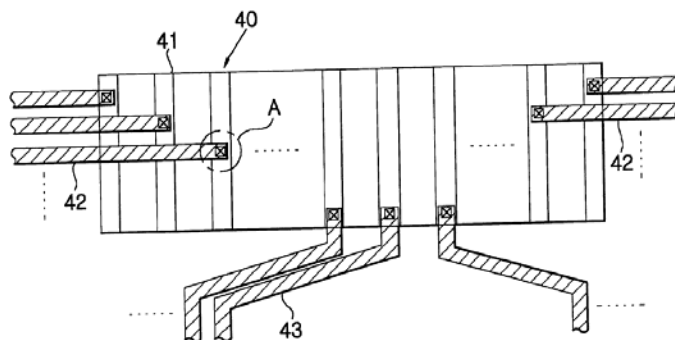


FIG.5

Pad 101 in *Kim* Figures 10 and 11A corresponds to pad 41 in *Kim* Figure 5 and constitutes external connecting terminal, and wire 105 in Figures 10 and 11A corresponds to wire 42 in Figure 5 and constitutes lead wiring line. Sechen, ¶¶213-

214. *Kim* Figure 11A discloses the lead wiring line (105) is above the external connecting terminal (101), which is similar to the structure in *Sekado*. Sechen, ¶¶212-214; *Sekado*, Fig. 9.

According to *Kim*, “pad 101 is formed preferably by photolithography after a first conductive layer has been formed,” where “[t]he first conductive layer is used in forming source and drain electrodes or the data line.” Sechen, ¶215; *Kim*, 6:27-33. Further, *Kim* teaches that “first wire 105 is formed preferably by photolithography after a second conductive layer has been formed,” where “[t]he second conductive layer is used in forming the gate electrode or the gate line.” Sechen, ¶215; *Kim*, 6:37-43; claim 6.

Although *Sekado* does not explicitly mention how the wirings 6 (lead wiring lines) and the connection terminals 10/extraction wirings 9 (external connecting terminals) are formed, because of the structural similarity between *Sekado*’s device and *Kim*’s device, it would be obvious to a POSITA to apply the method disclosed in *Kim* to the device of *Sekado*, to form the wirings 6 and the connection terminals 10/extraction wirings 9 from same films as two conductive films (first conductive film and second conductive film) constituting the circuit unit, respectively. Sechen, ¶¶216-217. A POSITA would have been motivated to combine *Kim*’s structure with *Sekado*’s display device in order to reduce the number of layers and processing steps and hence simplify manufacturing and reduce cost. *Id.* A POSITA

would have found it straightforward to make this combination with predictable results. *Id.*

H. *Sekado* in Combination with *Aruga* and *Kim* Renders Obvious Claim 11.

1. Claim 11

**The electro-optical device according to claim 7,
the external connecting terminals being formed from the
same film as a first conductive film constituting the circuit
unit.**

Sekado in view of *Aruga* and *Kim* teaches and renders obvious claim 11.

Sechen, ¶¶218-221.

As set forth in regard to claim 10, *Kim* discloses a configuration similar to that of *Sekado*, in which the external connecting terminals overlap with the lead wiring lines in plan view. Sechen, ¶218.

According to *Kim*, “pad 101 is formed preferably by photolithography after a first conductive layer has been formed,” where “[t]he first conductive layer is used in forming source and drain electrodes or the data line.” Sechen, ¶219; *Kim*, 6:27-33; claim 5. That is, *Kim* discloses that the pad 101 (external connecting terminal) is formed from the same film as a conductive film constituting the circuit unit. Sechen, ¶219.

Although *Sekado* does not explicitly mention how the connection terminals 10/extraction wirings 9 (external connecting terminals) are formed, because of the

structural similarity between *Sekado*'s device and *Kim*'s device, it would be obvious to a POSITA to apply the method disclosed in *Kim* to the device of *Sekado*, to form the connection terminals 10/extraction wirings 9 from the same film as a conductive film constituting the circuit unit. Sechen, ¶¶220-221; ¶¶216-217.

I. Takezawa in Combination with Kim Renders Obvious Claims 1-4 and 8-10.

1. Claim 1

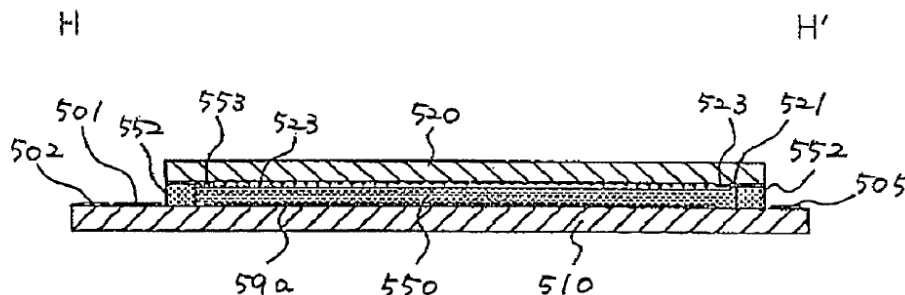
An electro-optical device comprising:

Takezawa discloses a liquid crystal panel 411, which is an electro-optical device. Sechen, ¶¶222-223; *Takezawa*, ¶[0071], Figs. 6, 7.

a pair of substrates that are disposed to face each other with a predetermined gap therebetween,

Takezawa discloses this limitation. Sechen, ¶¶224-226.

[FIG. 7]

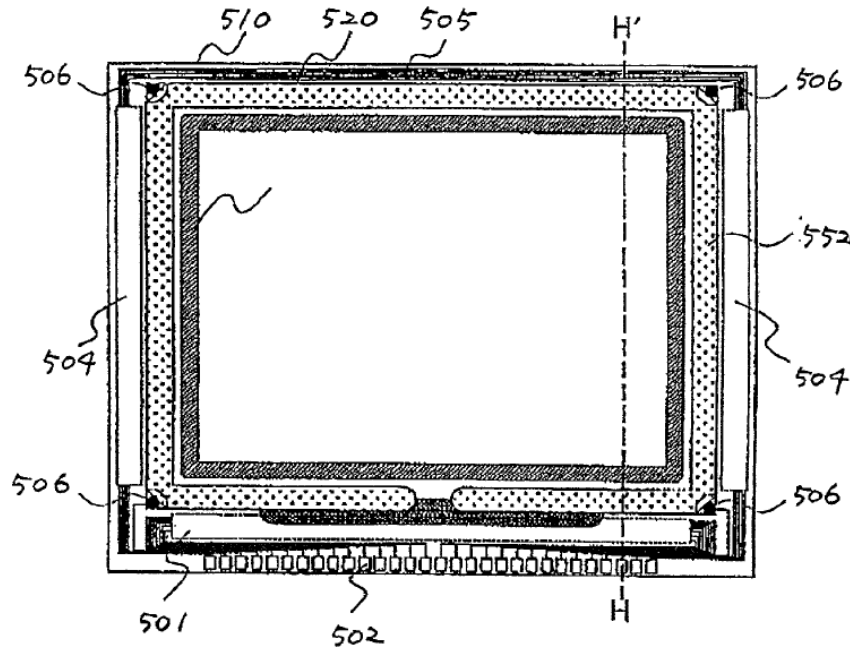


Takezawa Figure 7 discloses a liquid crystal panel includes a base substrate 510 and a counter substrate 520, which are disposed to face each other with a predetermined gap between them. Sechen, ¶¶224-226; *Takezawa*, ¶[0072].

**one substrate of the pair of substrates including an
extending portion that extends from the other substrate on
one side in plan view;**

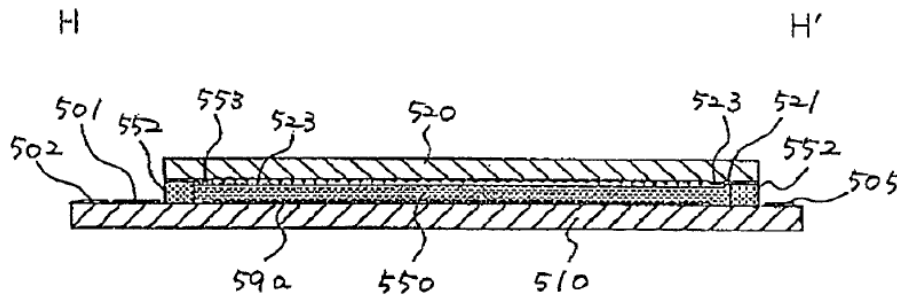
Takezawa discloses this limitation. Sechen, ¶¶227-229.

[FIG. 6]



Takezawa Figure 6, which is a plan view, discloses base substrate 510 with an extending portion that extends from the counter substrate 520 on one side (bottom side). *Takezawa*, Fig. 6. *Takezawa* Figure 7, which is a cross-sectional view, further teaches the same extending portion of the base substrate 510 that extends from the counter substrate 520. Sechen, ¶¶227-229.

[FIG. 7]

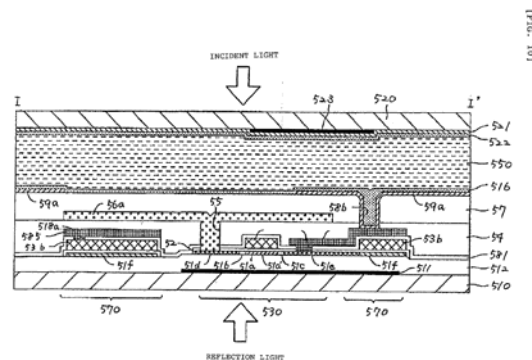
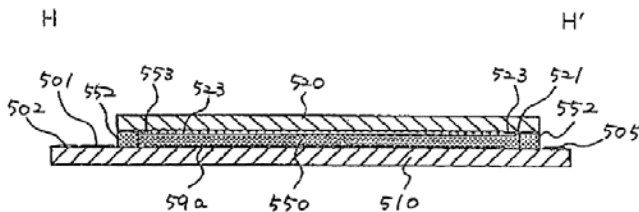


display electrodes that are provided on the one substrate;

Takezawa discloses this limitation. Sechen, ¶¶230-232.

Takezawa teaches a plurality of pixel electrodes 59a in a matrix arrangement in the image display area of the liquid crystal panel. *Takezawa*, ¶[0076]. *Takezawa* Figures 7 and 10 disclose the pixel electrodes 59a being provided on the base substrate 510. Sechen, ¶¶230-232.

[FIG. 7]



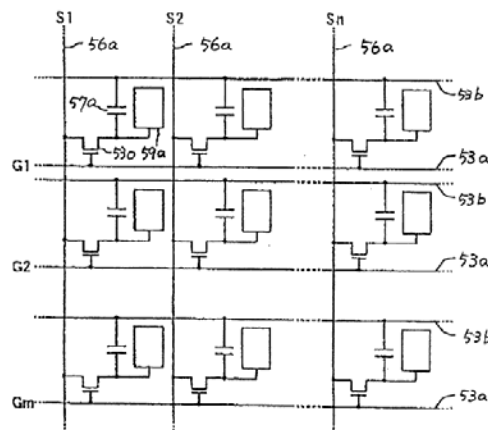
a circuit unit that is provided on the one substrate so as to drive the display electrodes;

Takezawa discloses this limitation. Sechen, ¶¶233-235.

Takezawa teaches data line drive circuit 501 that is provided along one side of the base substrate 510. *Takezawa* further teaches that data line drive circuit 501

drives data lines 56a by supplying image signals to data lines 56a. Sechen, ¶¶233-235; *Takezawa*, ¶[0074]; Fig. 6. *Takezawa* Figure 8 shows that the data lines 56a are coupled to the pixel electrodes 59a via corresponding TFTs 530. Thus, the image signals provided by the data line drive circuit 501 are further provided to drive the pixel electrodes 59a via the data lines 56a and the TFTs 530. Sechen, ¶¶233-235; *Takezawa*, Fig. 8.

[FIG. 8]



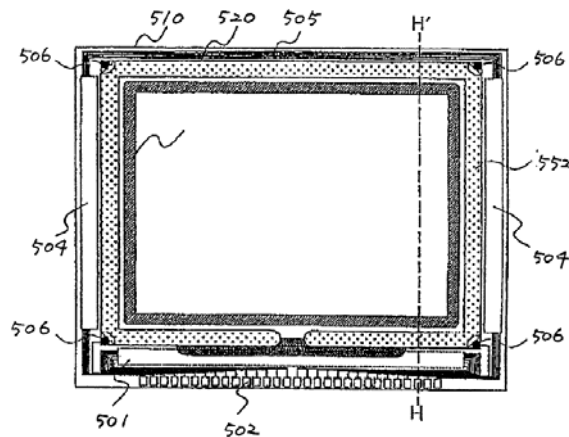
wiring lines for driving the circuit unit and the display electrodes;

Takezawa discloses this limitation. Sechen, ¶¶236-238.

Takezawa discloses a plurality of data lines 56a for transmitting image signals to the pixel electrodes 59a so as to drive the pixel electrodes 59a.

Takezawa, ¶[0074]; Figs. 6, 8. *Takezawa* Figure 6 shows a plurality of wiring lines coupled to the data line drive circuit 501. Sechen, ¶¶236-238.

[FIG. 6]



a plurality of lead wiring lines provided on the extending portion and that are led from one of the sides of the wiring lines to the extending portion; and

Takezawa discloses this limitation. Sechen, ¶¶239-241.

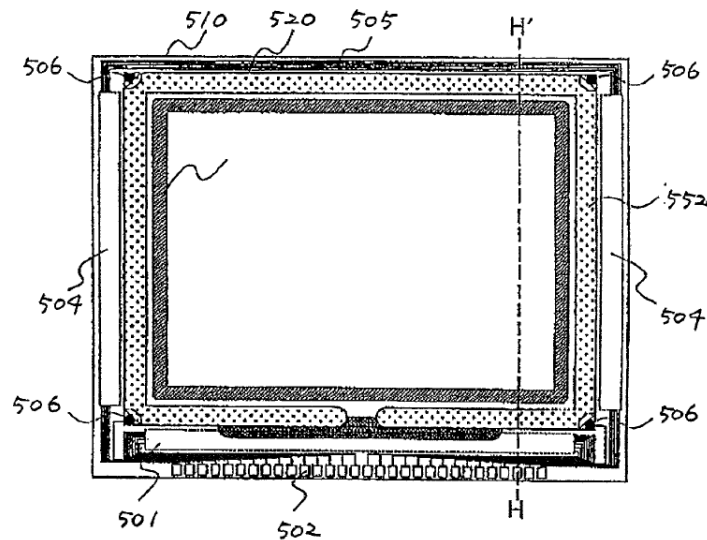
Takezawa Figure 6 shows segments of the wiring lines are led from one of the sides of the wirings to the extending portion and extend on the extending portion. *Id.*

a plurality of external connecting terminals provided on the extending portion,

Takezawa discloses this limitation. Sechen, ¶¶242-244.

Takezawa teaches that “external circuit connection terminal[s] 502 are provided along one side of the base substrate 510.” *Takezawa*, ¶[0074]. *Takezawa* Figure 6 shows the plurality of external circuit connection terminals are provided on the extending portion. Sechen, ¶¶242-244.

[FIG. 6]

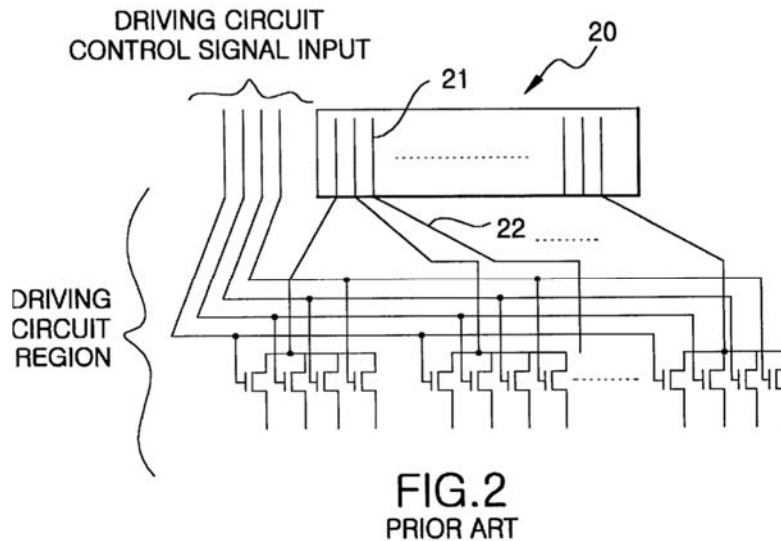


each of the external connecting terminals overlapping with the plurality of lead wiring lines in plan view.

Kim discloses this limitation. Sechen, ¶¶245-250.

Kim discloses an LCD device. *Kim*, Title. *Kim* teaches that the LCD device “ha[s] a driving circuit” and “an outer circuit and the driving circuit are connected to each other by a pad.” *Kim*, 1:27-29. *Kim*’s pads are external connecting terminals. Sechen, ¶245.

Kim teaches a conventional LCD (Figure 2 below) where a “plurality of pads 21 are formed in a connecting part of the outer circuit 20. Each pad 21 is connected to each chip of the driving circuit which is a data outer circuit source (not shown in the drawing) and receives a data driving signal. Each data driving signal diverges at the driver and then carries the data signal to the pixel array.” Sechen, ¶247; *Kim*, 1:38-48.



Kim further teaches an LCD with a plurality of pads 41 and wires 42 connected to each of a plurality of the pads 41 in a connecting part of outer circuit 40. Sechen, ¶248; *Kim*, 3:64-67. *Kim* further teaches pads located at the side portions of the connecting part are arranged in a row-like fashion and connected to the driving circuit by first wire 42. *Kim*, 4:14-18. “[T]he first wire 42 extends in a direction perpendicular to the pad 41.” Sechen, ¶248; *Kim*, 4:67-5:1. The segments of the wires 42 connected to the pads 41 constitute lead wiring lines. Sechen, ¶248. *Kim* Figures 4 and 5, which are plan views, teach that pads 41 overlap with the segments of the plurality of wires 42. Sechen, ¶248.

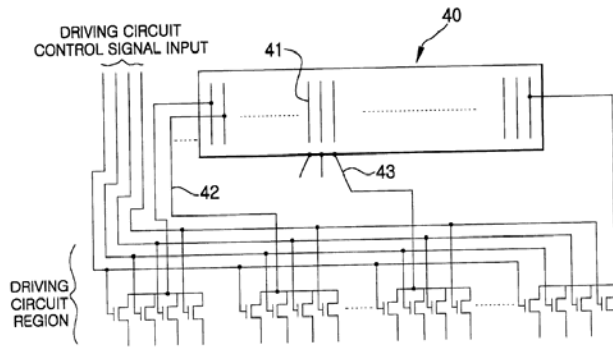


FIG. 4

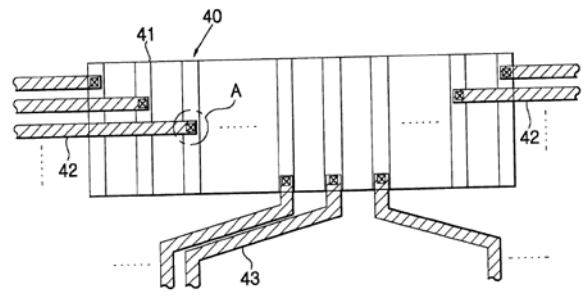


FIG. 5

Kim teaches that with its arrangement the wires are not necessarily formed as a long-line type and the space occupied by the wires is reduced as compared to conventional art, and enough space is provided to prevent electrical short. Sechen, ¶¶249-250; *Kim*, 4:23-26. Therefore, a POSITA would have been motivated to modify the arrangement of the external circuit connection terminals and lead wiring lines of *Takezawa* according to *Kim*'s disclosures, resulting in overlapping between the external circuit connection terminals and the lead wiring lines in plan view. Sechen, ¶¶249-250. A POSITA would have found making this combination to be straightforward with predictable results. *Id.*

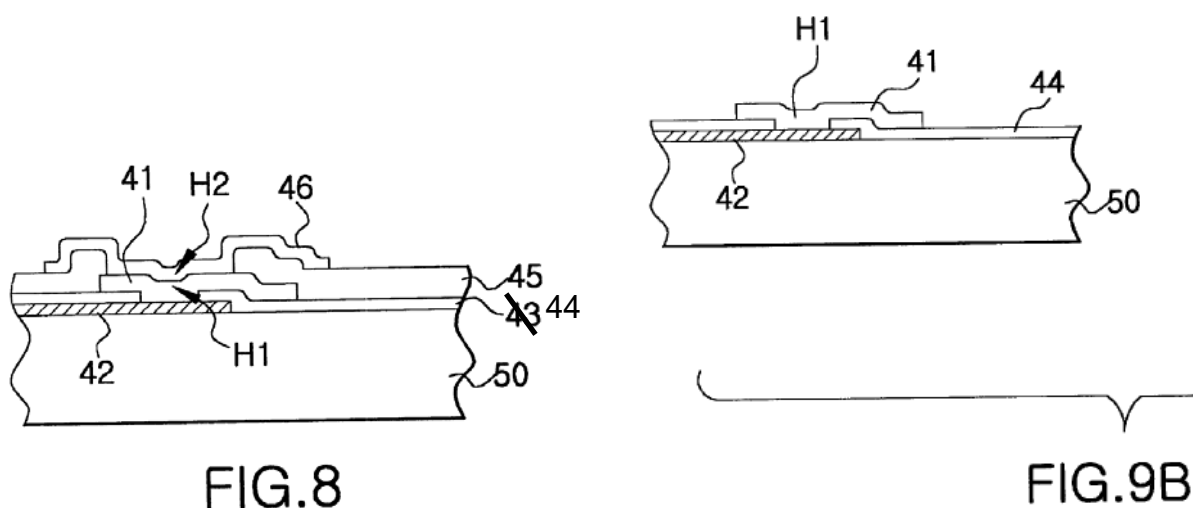
2. Claim 2

The electro-optical device according to claim 1,

wherein the external connecting terminals and the lead wiring lines are laminated with an interlayer insulating film interposed therebetween,

Kim discloses this limitation. Sechen, ¶¶251-255.

Kim teaches that on first wire 42 a first insulating layer 44 is formed, on which a pad 41 of the outer circuit connecting part is contacted with and connected to the first wire 42. *Kim*, 4:61-65; Fig. 8. *Kim* Figures 8 and 9B show pad 41 and first wire 42 are laminated, and the first insulating layer is interposed between them. Sechen, ¶252



Kim teaches another embodiment in which first wire 105 is formed above pad 101, with a first insulating layer 102 interposed therebetween. Sechen, ¶253; *Kim*, 6:9-14; Fig. 11A.

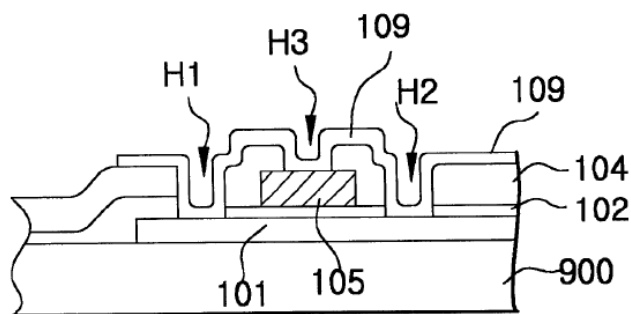
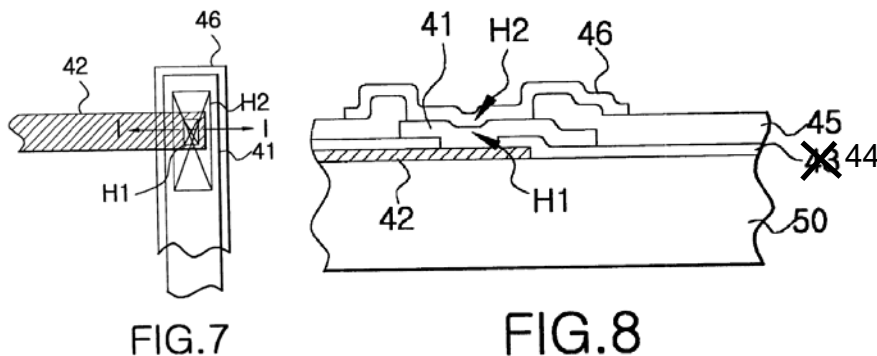


FIG. 11A

each of the external connecting terminals being electrically connected with a corresponding one of the lead wiring lines and being electrically isolated from others of the plurality of lead wiring lines by the interlayer insulating film.

Kim discloses this limitation. Sechen, ¶¶256-261.



Kim Figures 7 and 8 teach that on the first insulating layer 44, a pad 41 of the outer circuit connecting part (an external connecting terminal) is contacted with and connected to the first wire 42 (lead wiring line) via contact hole H1. Further, *Kim* discloses that on a first wire 42, a first insulating layer 44 is formed with contact hole H1 which exposes a portion of the first wire 42. *Kim*, 4:59-65; Sechen, ¶¶256-257.

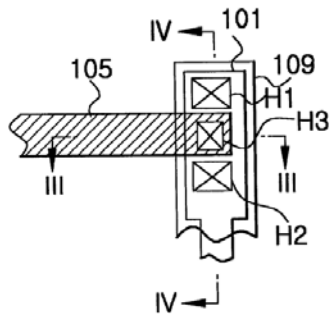


FIG. 10

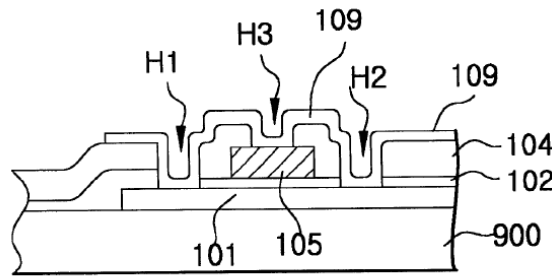


FIG. 11A

Kim Figures 10 and 11A disclose a pad 101 (the external connecting terminal) with a first insulating layer 102 that has contact holes H1, H2. Sechen, ¶258. There is a first wire 105 formed on the first insulating layer 102. There is a second insulating layer 104 that covers the whole surface of the substrate but exposes portions of pad 101 through a first contact hole H1 and a second contact hole H2 and a portion of the first wire 105 through a third contact hole H3. On the second insulating layer 104, an ITO layer 109 connected to pad 101 via the first and second contact holes H1 and H2 and connected to the first wire 105 via the third contact hole H3 is formed. Sechen, ¶258; *Kim*, 6:9-23. Thus, pad 101 (external connecting terminal) is electrically connected to the corresponding first wire 105 (lead wiring line) via the first and second contact holes H1 and H2, the ITO layer 109, and the third contact hole H3. Sechen, ¶258.

Kim Figures 5, 7, and 8 teach that pads 41 are electrically connected with a corresponding one of the first wires 42 via a corresponding contact hole H1, with

no contact holes between a pad 41 and others of the first wires 42. Sechen, ¶259; *Kim*, Figs. 5, 7, 8. As such, *Kim* teaches that the first insulating layer 44 electrically isolates each pad 41 (external connecting terminal) from others of the first wires 42 (lead wiring lines). Sechen, ¶259.

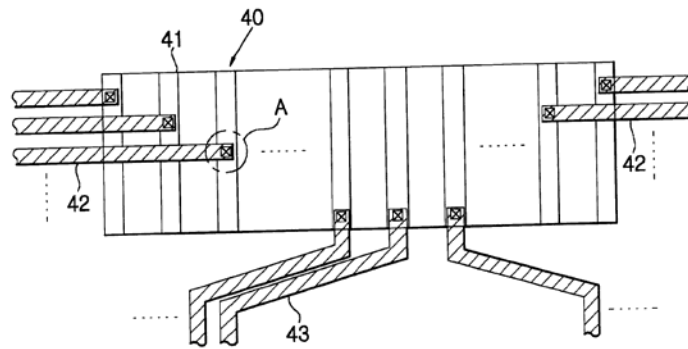


FIG. 5

A POSITA would have found it obvious to implement *Kim*'s insulating layer in *Takezawa*'s display device. Sechen, ¶¶254-255; ¶¶260-261. A POSITA would have been motivated to combine *Kim*'s insulating layer into *Takezawa*'s display device once *Kim*'s overlapping structure is adopted in *Takezawa*'s display device, in order to separate overlapping conductive layers that need to be electrically isolated from each other. *Id.* A POSITA would have also been motivated to apply *Kim*'s contact holes in the insulating layer to provide electrical connection between two conductive layers that need to be electrically connected. *Id.* Further, as both *Takezawa* and *Kim* relate to LCDs, a POSITA would have found it straightforward

to combine *Kim*'s insulating layer in *Takezawa*'s device with predictable results.

Id.

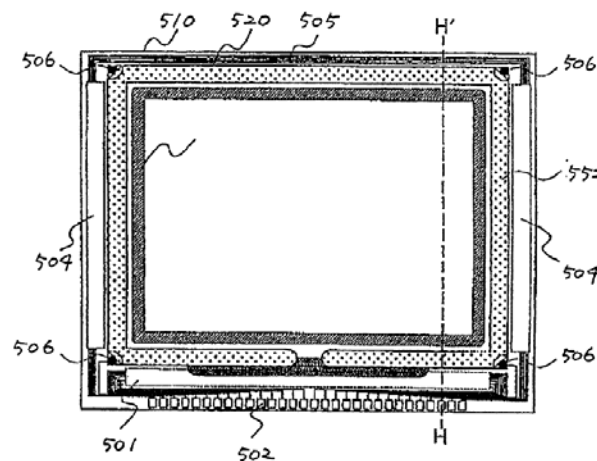
3. Claim 3

The electro-optical device according to claim 1,

wherein the plurality of external connecting terminals are arranged in a direction along the one side, and the plurality of lead wiring lines extend in the direction along the one side and

Takezawa discloses this limitation. Sechen, ¶¶262-265.

[FIG. 6]



Takezawa Figure 6 discloses a plurality of external circuit connection terminals 502 are arranged in a left-right direction, *i.e.*, a direction along the bottom side (the one side). Sechen, ¶¶262-265.

Takezawa Figure 6 discloses that the plurality of lead wiring lines (segments of the wirings lines in the extending portion) also extend in the left-right direction, *i.e.*, a direction along the bottom side (the one side). Sechen, ¶¶262-265.

are correspondingly connected to edges of the external connecting terminals in a direction intersecting the direction along the one side.

Takezawa discloses this limitation. Sechen, ¶¶266-268.

Takezawa Figure 6 discloses the lead wiring lines are connected to the edges of corresponding external circuit connection terminals 502 in a direction intersecting the left-right direction, *i.e.*, a direction along the bottom side (the one side). *Id.*

4. Claim 4

The electro-optical device according to claim 1, wherein the plurality of external connecting terminals are arranged in a direction along the one side, and the plurality of lead wiring lines extend in the direction along the one side and

Takezawa discloses this limitation as set forth in regard to claim 3.

are correspondingly connected to the external connecting terminals in a region where the lead wiring lines and the external connecting terminals intersect each other in plan view.

Kim discloses this limitation. Sechen, ¶¶270-273.

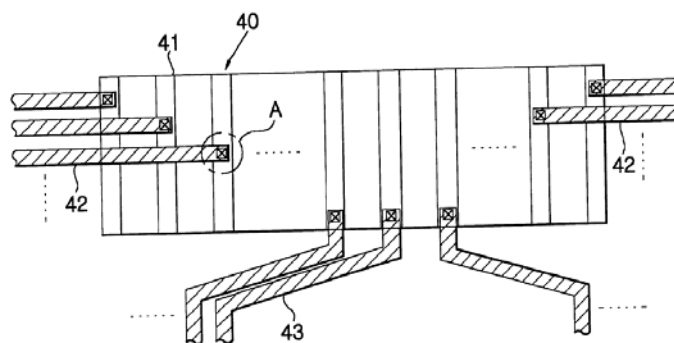


FIG. 5

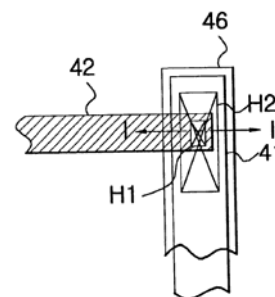


FIG. 7

Kim Figures 5 and 7 teach a plurality of first wires 42 (lead wiring lines) are correspondingly connected to the pads 41 (external connecting terminals) via contact holes H1 in a region where the first wires 42 and the pads 41 intersect each other in plan view. *Id.*

A POSITA would combine *Takezawa* and *Kim* for the reasons set for in claim 1. Sechen, ¶¶272-273; ¶¶249-250.

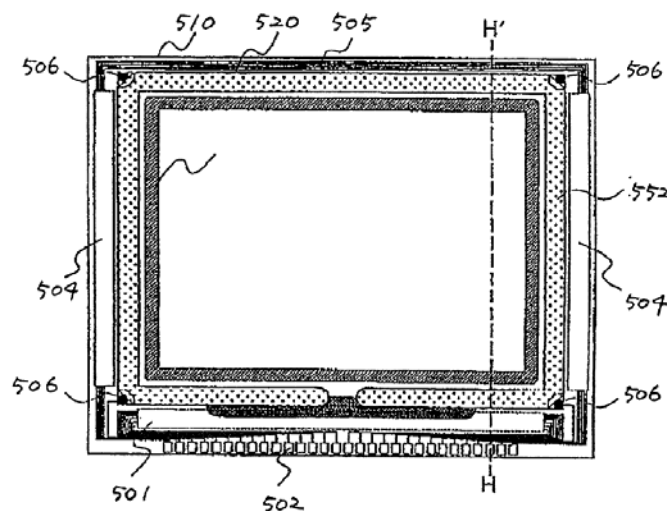
5. Claim 8

The electro-optical device according to claim 1, further comprising:

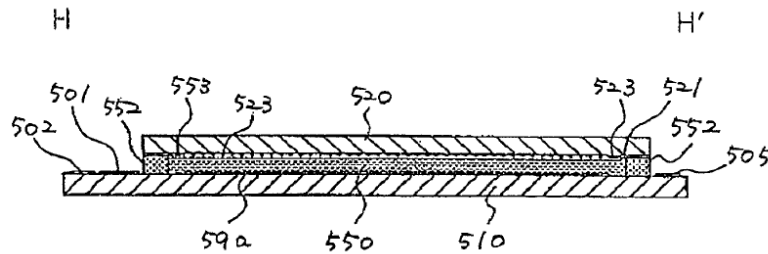
a sealant that bonds edges of opposite surfaces of the pair of substrates to each other so as to form an internal space between the pair of substrates; and

Takezawa discloses this limitation. Sechen, ¶¶274-277.

[FIG. 6]



[FIG. 7]



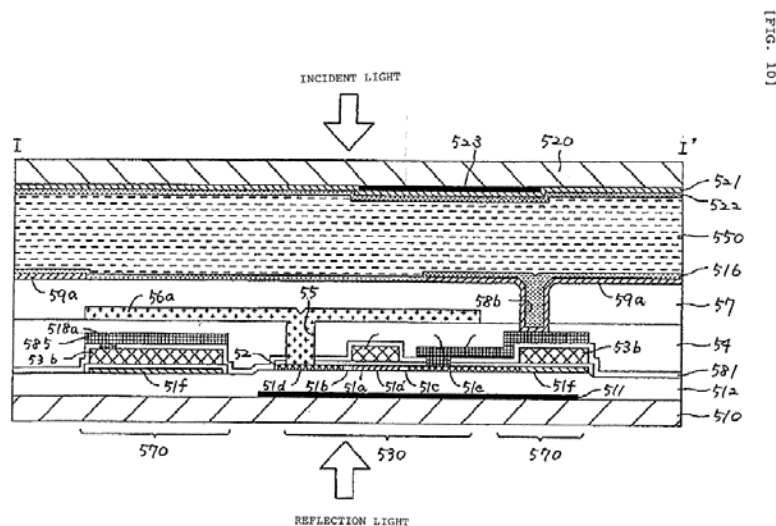
Takezawa Figure 7 shows a liquid crystal panel that includes a base substrate 510 and the counter substrate 520. *Takezawa* explains that base and counter substrates are bonded together by a sealant 552 to form a “space surrounded by the base substrate 510, the counter substrate 520, and the sealant 552. Sechen, ¶275; *Takezawa*, ¶[0072]. *Takezawa* Figure 7 shows the sealant 552 bonds the edges of the opposite surfaces of the base substrate 510 and the counter substrate 520, and an internal space is formed between base substrate 510 and counter substrate 520. Sechen, ¶¶275. *Takezawa* discloses that the sealant 552 is provided along the edges of base substrate 510. *Takezawa*, ¶[0073]; Figs. 6, 7; Sechen, ¶¶274-277.

an electro-optical material that is held in the internal space,

Takezawa discloses that liquid crystals 550 are sealed in the space surrounded by the base substrate 510, the counter substrate 520, and the sealant 552. Sechen, ¶¶278-279; *Takezawa*, ¶[0072].

wherein the display electrodes and a part of the circuit unit are disposed to face the internal space.

Takezawa Figure 10 discloses pixel electrode 59a and components of the circuit unit, such as TFT 530 and data line 56a, are disposed to face the internal space that holds the liquid crystals 550. According to the '913 patent, “electronic elements, such as TFTs or the like, the wiring lines, such as ... data lines, and the like ... correspond to a specified example of ‘circuit unit’.” ’913 patent, 7:56-61. Sechen, ¶¶280-0281.



6. Claim 9

An electronic apparatus comprising the electro-optical device according to claim 1.

Takezawa discloses a projector. *Takezawa*, Abstract. A projector is an electronic apparatus. '913 patent, 1:12-14. The projector of *Takezawa* includes the liquid crystal panel. Sechen, ¶¶282-283.

7. Claim 10

The electro-optical device according to claim 2, the external connecting terminals being formed from the same film as a first conductive film constituting the circuit unit,

Kim discloses this limitation. Sechen, ¶¶284-287.

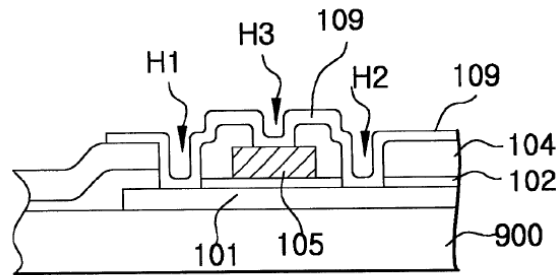


FIG. 11A

Kim teaches pad 101 is formed preferably by photolithography after a first conductive layer has been formed, where the first conductive layer is used in forming source and drain electrodes or the data line. *Kim*, 6:27-33; claim 5; Sechen, ¶¶284-287.

A POSITA would have found it obvious to implement *Kim's* method of using two conductive layers to form the wirings and the connection terminals of *Takezawa* from the same films as the two conductive films (first conductive film and second conductive film) constituting the circuit unit, respectively, with *Takezawa's* display device. A POSITA would have been motivated to combine *Kim's* method with *Takezawa's* device in order to reduce the number of layers and processing steps and hence simplify manufacturing and reduce cost. Further, as

both *Takezawa* and *Kim* relate to LCDs, a POSITA would have found it straightforward to combine *Kim*'s method to create the structure of *Takezawa*'s device with predictable results. Sechen, ¶¶286-287.

**and the lead wiring lines being formed from the same film
as a second conductive film constituting the circuit unit.**

Kim discloses a first wire 105 is formed preferably by photolithography after a second conductive layer has been formed, where the second conductive layer is used in forming the gate electrode or the gate line. Sechen, ¶¶288-290; *Kim*, 6:37-43; claim 6.

For the reasons set forth in the above claim limitation, a POSITA would have found it obvious to combine *Takezawa* and *Kim*. Sechen, ¶¶289-290; ¶286.

J. *Takezawa* in Combination with *Yoneda* Renders Obvious Claims 5 and 6.

1. Claim 5

An electro-optical device comprising:

Takezawa discloses this limitation as set forth in claim 1.

**a pair of substrates that are disposed to face each other with
a predetermined gap therebetween,**

Takezawa discloses this limitation as set forth in claim 1.

**one substrate of the pair of substrates including an
extending portion that extends from the other substrate on
one side in plan view;**

Takezawa discloses this limitation as set forth in claim 1.

display electrodes that are provided on the one substrate;

Takezawa discloses this limitation as set forth in claim 1.

**a circuit unit that is provided on the one substrate so as to
drive the display electrodes;**

Takezawa discloses this limitation as set forth in claim 1.

**wiring lines for driving the circuit unit and the display
electrodes;**

Takezawa discloses this limitation as set forth in claim 1.

**a plurality of lead wiring lines provided on the extending
portion and that are led from one of the sides of the wiring
lines to the extending portion; and**

Takezawa discloses this limitation as set forth in claim 1.

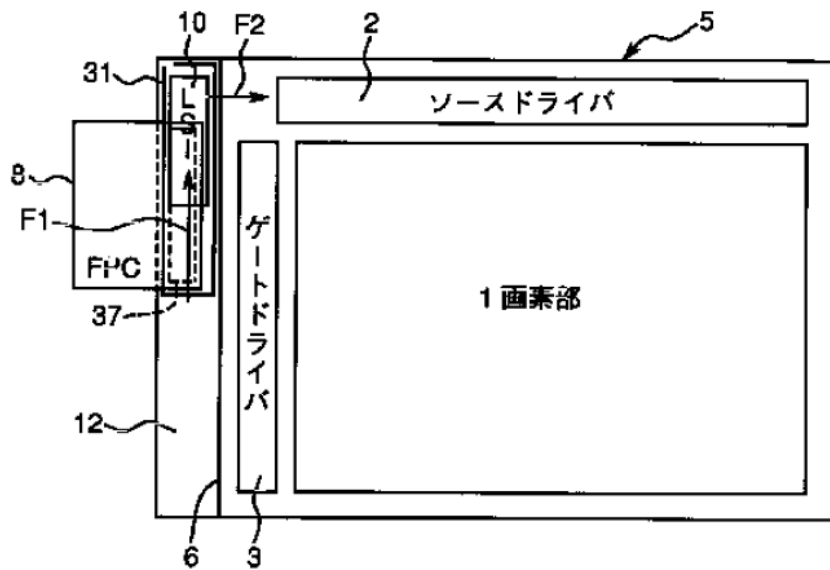
**a plurality of external connecting terminals provided on the
extending portion,**

Takezawa discloses this limitation as set forth in claim 1.

**each of the external connecting terminals overlapping with
the circuit unit in plan view.**

Yoneda discloses this limitation. Sechen, ¶¶299-305.

【図3】



Yoneda discloses an image display device. Sechen, ¶300; *Yoneda*, Title and Abstract. *Yoneda* discloses “a polysilicon TFT liquid crystal display device, in which ... a source driver 2 and a gate driver 3 are formed on a same TFT substrate 5,” where the TFT substrate 5 has an “adjacent region 12 ... protruding outside the counter substrate (not shown).” *Yoneda*, ¶[0022]; Fig. 3. *Yoneda*’s adjacent region 12 constitutes the claimed extending portion. Sechen, ¶300.

Yoneda further teaches external connection terminals 37 formed in the adjacent region 12 (extending portion). Sechen, ¶301; *Yoneda*, ¶[0032]; Fig. 3.

Yoneda discloses a video signal from the outside is transmitted through the flexible wiring board 8, the external connection terminal 7, the integrated circuit 10, and the source driver 2 in this order,” and “[t]he integrated circuit 10 has a

circuit for converting a video signal input from the flexible wiring board 8 via the external connection terminal 7 into a signal to be supplied to the source driver (data driver) 2.” Sechen, ¶302; *Yoneda*, ¶[0024].

A POSITA would have found it obvious to combine *Takezawa* and *Yoneda*. Sechen, ¶¶303-305. As shown in FIG. 3 of *Yoneda*, the external connecting terminals 37 overlap with the integrated circuit 10 in a plan view. According to *Yoneda*, with this arrangement, “the flexible wiring board 8, the integrated circuit 10 ... are arranged in approximately half the area of the adjacent area 12, so that the video signal transmission path can be shortened.” Sechen, ¶¶303; *Yoneda*, ¶[0032].

Therefore, a POSITA would have been motivated to modify the arrangement of the external circuit connection terminals 502 and the circuit unit (e.g., data line drive circuit 501) of *Takezawa* according to the disclosure of *Yoneda*, resulting in overlapping between the external circuit connection terminals 502 and the circuit unit in plan view. Sechen, ¶¶303-305. Specifically, a POSITA would have found it obvious to implement *Yoneda*’s arrangement of the external connecting terminals and circuit unit with *Takezawa*’s display device. *Id.* A POSITA would have been motivated to combine *Yoneda*’s structure with *Takezawa*’s display device in order to minimize the size of the extending portion of the array substrate. *Id.* Further, as both *Takezawa* and *Yoneda* relate to displays, and specifically LCDs, a POSITA would have found it straightforward to combine *Yoneda*’s arrangement of the

external connecting terminals and circuit with *Takezawa*'s display device with predictable results. *Id.*

2. Claim 6

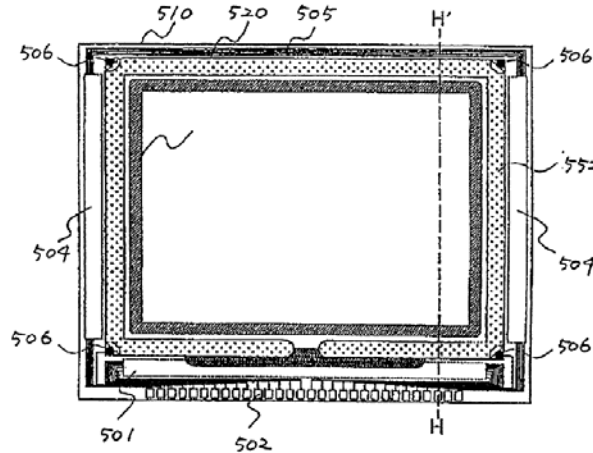
The electro-optical device according to claim 5,

wherein the circuit unit is electrically connected to terminals for supplying an image signal among the plurality of external connecting terminals and has a driving circuit, which is driven by the supplied image signal, and

Takezawa alone discloses or in light of *Yoneda* teaches and renders obvious this limitation of claim 6. Sechen, ¶¶306-309.

Takezawa discloses a circuit unit with data line drive circuit 501. *Takezawa* Figure 6 teaches that among the plurality of external circuit connection terminals 502, some terminals are for the data line drive circuit 501. Sechen, ¶306; *Takezawa*, ¶[0074]. In particular, *Takezawa* discloses that: “[The] data line drive circuit 501 ... drives data lines 56a by supplying image signals to the data lines 56a.” *Takezawa*, ¶[0074]; Sechen, ¶¶306, 308.

[FIG. 6]



Alternatively, *Yoneda* also discloses that a video signal from the outside is transmitted through flexible wiring board 8, external connection terminal 7, integrated circuit 10, and source driver 2. *Yoneda* discloses that “[t]he integrated circuit 10 has a circuit for converting a video signal input from the flexible wiring board 8 via the external connection terminal 7 into a signal to be supplied to the source driver (data driver) 2.” Sechen, ¶307; *Yoneda*, ¶[0024]. Thus, *Yoneda*’s integrated circuit 10 is a driving circuit. Sechen, ¶307.

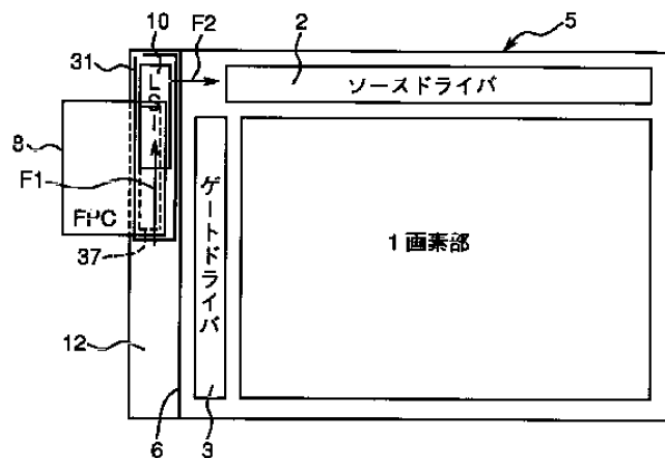
A POSITA would have combined *Takezawa* and *Yoneda* for the reasons set forth in claim 5. Sechen, ¶309; ¶¶303-04.

at least a part of the driving circuit overlaps the external connecting terminals in plan view.

Takezawa in light of *Yoneda* teaches and renders obvious this limitation of claim 6. Sechen, ¶¶310-312.

Yoneda Figure 3 shows that at least a part of the integrated circuit 10 (driving circuit) overlaps the external connection terminals 37 in plan view. Sechen, ¶¶310-312.

【図3】



A POSITA would have been motivated to modify the arrangement of the external circuit connection terminals and the data line drive circuit of *Takezawa* according to the disclosure of *Yoneda*, resulting in overlapping between the external circuit connection terminals and at least a part of the data line drive circuit in plan view. In addition, a POSITA would have been motivated to combine *Takezawa* with *Yoneda* for the reasons set forth in regard to claim 5. Sechen, ¶¶311-312.

K. Takezawa in Combination with Yoneda and Aruga Renders Obvious Claim 7.

1. Claim 7

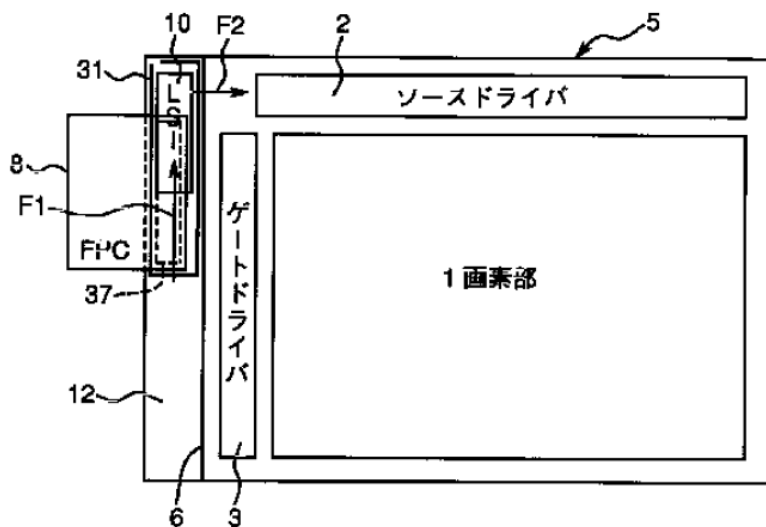
The electro-optical device according to claim 5,

wherein the external connecting terminals and the part of the circuit unit are laminated with an interlayer insulating film interposed therebetween,

Takezawa in combination *Yoneda* and *Aruga* teaches and renders obvious this limitation of claim 7. *Sechen*, ¶¶313-317.

Yoneda Figure 3 shows the external connection terminals 37 and the integrated circuit 10 are laminated. *Sechen*, ¶¶313-314.

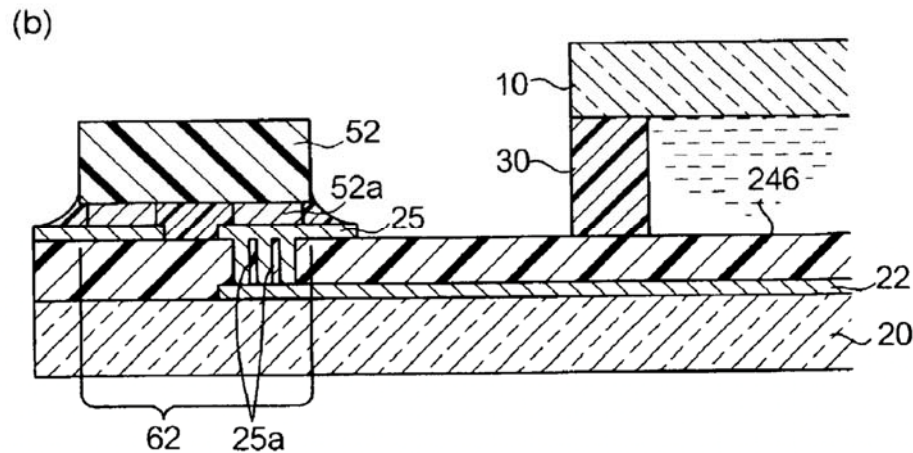
【図3】



Further, *Aruga* discloses: “A resin or mold seals the connecting portion between the X driver IC 52 and the chip connecting wiring 25” thereby “moisture is inhibited from reaching the data lines 22 through the contact holes 25a and

corrosion of the data lines 22 can be reliably prevented.” *Aruga*, ¶¶[0045]-[0046].

Thus, *Aruga*’s underling conducting layer 22 and IC 52 are laminated with an interlayer insulating film (resin+layer 246) interposed therebetween. *Aruga*, Fig. 7(b) (below); Sechen, ¶315.

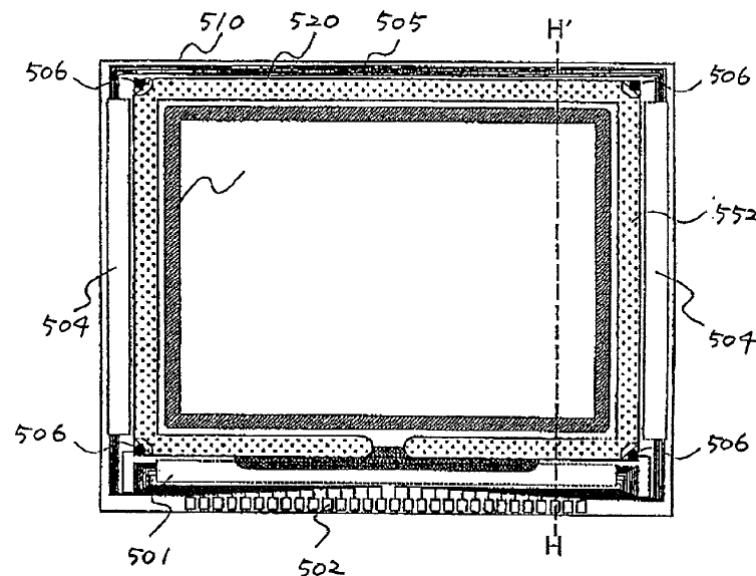


A POSITA would have found it obvious to combine *Takezawa* and *Yoneda* with *Aruga*. Sechen, ¶¶316-317. Specifically, a POSITA would have found it obvious to implement *Aruga*’s insulating layer in between *Yoneda*’s external connection terminals and circuit unit. *Id.* A POSITA would have been motivated to combine *Aruga*’s insulating layer with *Takazawa*’s and *Yoneda*’s devices in order to inhibit moisture and prevent corrosion of at least the terminals as taught by *Aruga*. *Id.* Further, as *Takezawa*, *Yoneda*, and *Aruga* relate to displays, and specifically LCDs, a POSITA would have found it straightforward to combine *Aruga*’s insulating layer with *Takazawa*’s and *Yoneda*’s devices with predictable results. *Id.*

each of the external connecting terminals being electrically connected with a corresponding one of the lead wiring lines and being electrically isolated from others of the plurality of lead wiring lines by the interlayer insulating film.

Takezawa discloses each of the external connecting terminals being electrically connected with a corresponding one of the lead wiring lines and being electrically isolated from others of the plurality of lead wiring lines by the interlayer insulating film. *Sechen*, ¶¶318-320.

[FIG. 6]



Takezawa Figure 6 discloses that each external connecting terminal (external circuit connection terminal 502) is electrically connected with a corresponding lead wiring line (segment of the wiring line that is led from one side of the wiring). For the reasons set forth above, a POSITA would have been motivated to combine *Takezawa* with the teachings of *Yoneda* and *Aruqa* to laminate the external

connection terminals and part of the circuit unit with an interlayer insulating film.

As a result, each external connecting terminal would be electrically isolated from other lead wiring lines. Sechen, ¶¶318-320.

L. *Takezawa* in Combination with *Yoneda*, *Aruga*, and *Tanaka* Renders Obvious Claim 11.

1. Claim 11

The electro-optical device according to claim 7, the external connecting terminals being formed from the same film as a first conductive film constituting the circuit unit.

Takezawa in view of *Yoneda*, *Aruga*, and *Tanaka* teaches and renders obvious claim 11. Sechen, ¶¶321-325.

Tanaka discloses a liquid crystal display with external connecting terminals being formed from the same film as a first conductive film constituting the circuit unit. *Tanaka* discloses that the liquid crystal display includes “external connection terminals 6 for inputting signals from an external drive circuit.” *Tanaka*, ¶[0020]; Sechen, ¶¶321-322. *Tanaka* teaches that “[t]he external connection terminals 6 are formed of the same electrode materials when the pixel portion 2, the scanning line driving circuit 3, and the signal line driving circuit 4 are formed.” *Id.*

Tanaka teaches that with its method the external connection terminals are more resistive to corrosion and hence disconnection due to corrosion can be prevented so that an LCD device with excellent reliability and durability can be obtained. *Tanaka*, ¶¶[0031], [0038]; Sechen, ¶323.

A POSITA would have been motivated to apply the terminal structure disclosed in *Tanaka* to the device of *Takezawa*, to form the external circuit connection terminals 502 from the same film as a conductive film constituting the circuit unit, so as to obtain a more reliable and durable liquid crystal display device. Sechen, ¶¶324-325. Further, as both *Takezawa* and *Tanaka* relate to displays, and specifically LCDs, a POSITA would have found it straightforward to combine the terminal structure disclosed in *Tanaka* with *Takazawa*'s device with predictable results. *Id.*

M. *Hirosue* Anticipates Claims 5 and 6.

1. Claim 5

An electro-optical device comprising:

Hirosue discloses a display device, which is an electro-optical device.

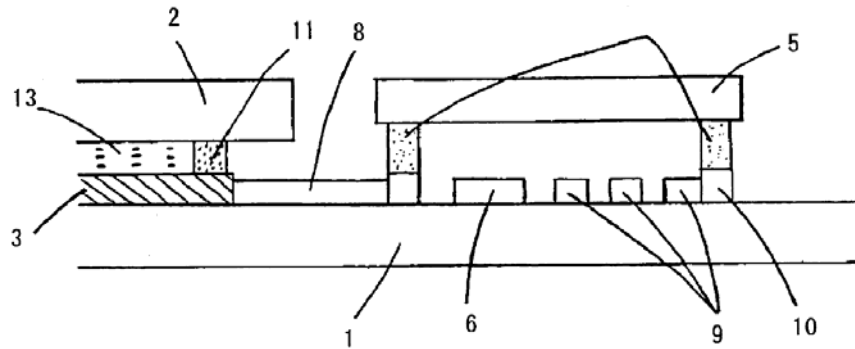
Hirosue, Abstract; Sechen, ¶¶326-327.

a pair of substrates that are disposed to face each other with a predetermined gap therebetween,

Hirosue discloses this limitation. Sechen, ¶¶328-330.

Hirosue teaches that in Figures 1 and 2, element "1 denotes an insulating substrate ..., 2 denotes an opposing substrate." *Hirosue*, ¶[0035]; Sechen, ¶329. As shown in Figure 2 of *Hirosue* (below), the insulating substrate 1 and the opposing substrate 2 are disposed to face each other with a predetermined gap therebetween. Sechen, ¶329-330.

FIG. 2



one substrate of the pair of substrates including an extending portion that extends from the other substrate on one side in plan view;

Hirosue discloses that the insulating substrate includes an extending portion that extends from the opposing substrate on one side in plan view. Sechen, ¶¶331-333.

Hirosue Figure 1, which is a plan view, teaches the insulating substrate 1 has an extending portion that extends from the opposing substrate 2 on one side (bottom side). Sechen, ¶332. *Hirosue* Figure 2, which is a cross-sectional view, also clearly shows the extending portion of the insulating substrate 1 that extends from the opposing substrate 2. Sechen, ¶¶331-333.

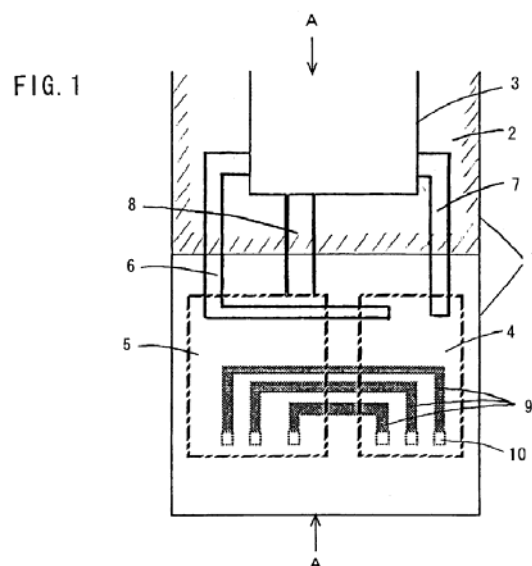
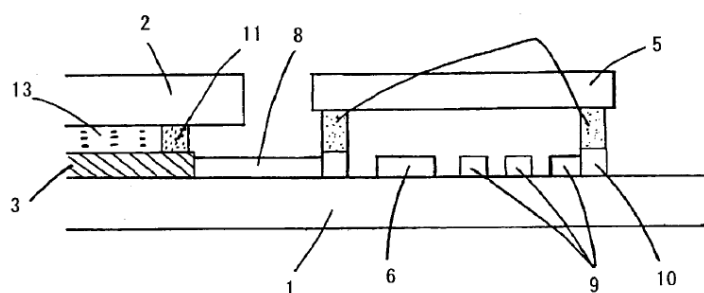


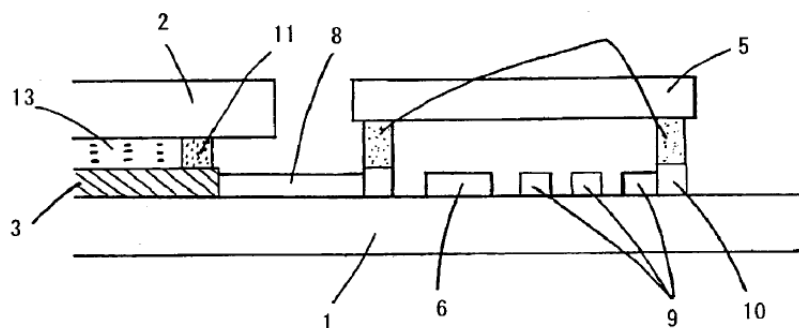
FIG. 2



display electrodes that are provided on the one substrate;

Hirosue discloses that the display device includes display electrodes that are provided on the substrate. Sechen, ¶¶334-336.

FIG. 2

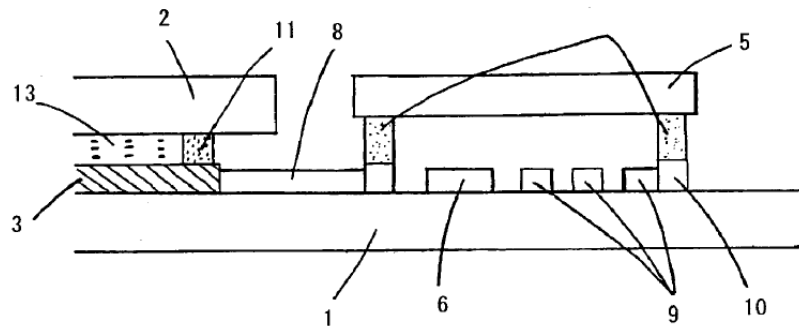


Hirosue teaches that in Figures 1 and 2, element “3 denotes a display region that comprises pixel electrodes.” *Hirosue*, ¶[0035]. According to the ’913 patent, “pixel electrodes ... are examples of ‘display electrodes’.” ’913 patent, 7:20-21. *Hirosue* Figure 2 teaches the display region 3 including the pixel electrodes is provided on the insulating substrate 1. Sechen, ¶¶334-336.

a circuit unit that is provided on the one substrate so as to drive the display electrodes;

Hirosue discloses this limitation. Sechen, ¶¶337-340.

FIG. 2

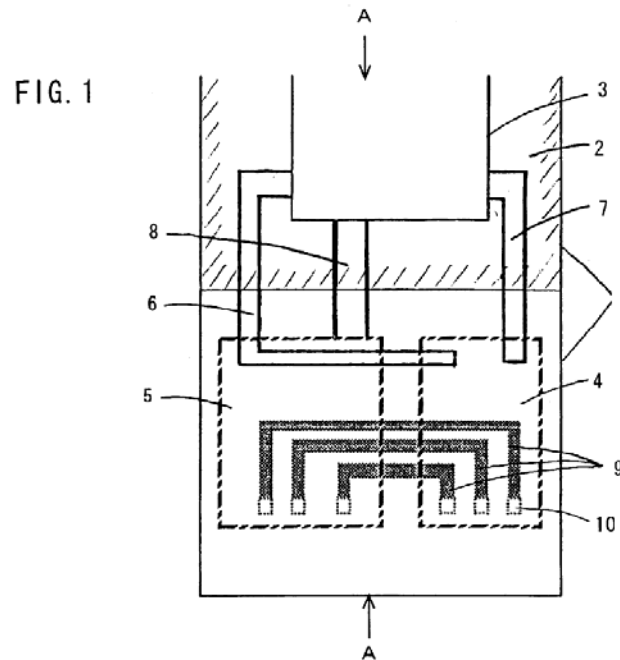


Hirosue teaches that in Figures 1 and 2, element “4 denotes a scan line driver circuit, 5 denotes a signal line driver circuit.” *Hirosue*, ¶[0035]. According to the ’913 patent, “all of ... circuits ... including the scanning line driving circuits 104 and the data line driving circuit 101a correspond to a specified example of ‘circuit unit’.” ’913 patent, 7:58-61; Sechen, ¶338.

Hirosue Figure 2 teaches the scan line driver circuit 4 and the signal line driver circuit 5 are provided on the insulating substrate 1. Sechen, ¶¶339-340.

wiring lines for driving the circuit unit and the display electrodes;

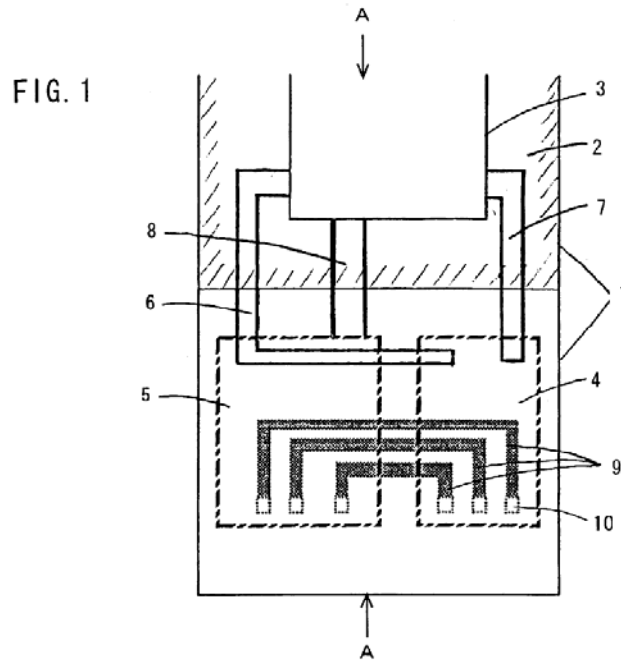
Hirosue discloses this limitation. Sechen, ¶¶341-343.



Hirosue teaches that in Figures 1 and 2, element “6 denotes a group of lines that connects scan lines on one side of the display region and a scan line driver circuit, 7 denotes a group of lines that connects scan lines on a side that lies opposite to the one side of the display region and the scan line driver circuit, 8 denotes a group of lines that connects the signal lines of the display region and the signal line driver circuit; 9 denotes connecting lines that connects the scan line driver circuit and the signal line driver circuit.” *Hirosue*, ¶[0035]; Sechen, ¶¶341-343. Thus, *Hirosue* discloses wiring lines that drive the circuit unit and the display electrodes. Sechen, ¶¶341-343.

a plurality of lead wiring lines provided on the extending portion and that are led from one of the sides of the wiring lines to the extending portion; and

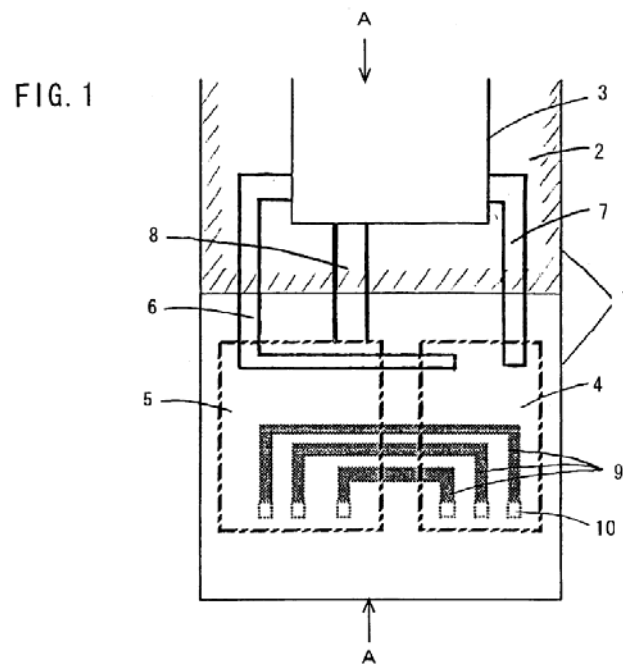
Hirosue discloses this limitation. Sechen, ¶¶344-346.



Hirosue Figure 1 teaches segments of at least the lines 9, that extend in the up-down direction in Figure 1, are provided on the extending portion, and are led from one of the sides of the lines to the extending portion and extend on the extending portion. *Id.*

a plurality of external connecting terminals provided on the extending portion,

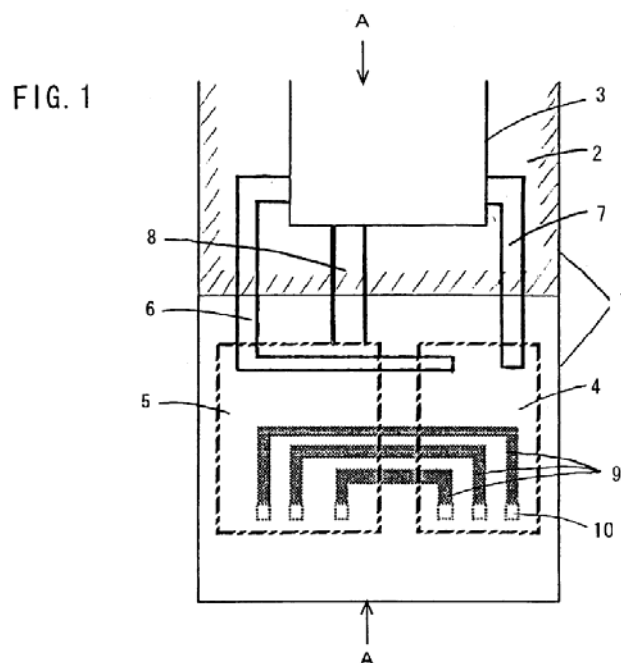
Hirosue discloses this limitation. Sechen, ¶¶347-349.



Hirosue teaches that in Figures 1 and 2, element “10 denotes driver-circuit connecting terminals which are formed on the insulating substrate.” *Hirosue*, ¶[0035]. *Hirosue* Figure 1 shows the plurality of connecting terminals 10 are provided on the extending portion. *Sechen*, ¶¶347-349.

each of the external connecting terminals overlapping with the circuit unit in plan view.

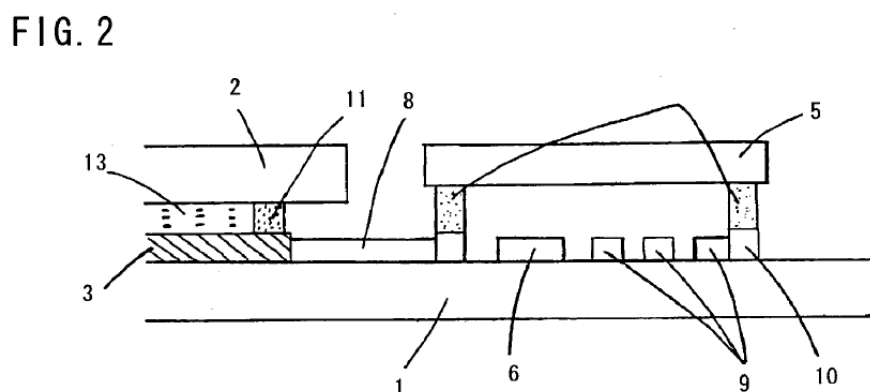
Hirosue discloses this limitation. *Sechen*, ¶¶350-353.



Hirosue Figure 1 is a plan view of an LCD device. *Hirosue*, ¶[0021].

Hirosue Figure 1 shows the connecting terminals 10 overlap with the scan line driver circuit 4 and the signal line driver circuit 5. Sechen, ¶¶350-353.

The overlapping relationship between the connecting terminals 10 and, for example, the signal line driver circuit 5 is also shown in *Hirosue* Figure 2. Sechen, ¶¶350-353.



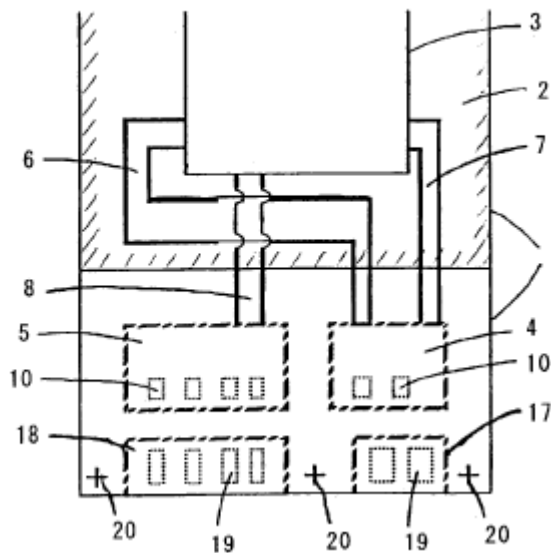
2. Claim 6

The electro-optical device according to claim 5,

wherein the circuit unit is electrically connected to terminals for supplying an image signal among the plurality of external connecting terminals and has a driving circuit, which is driven by the supplied image signal, and

Hirosue discloses this limitation. Sechen, ¶¶354-358.

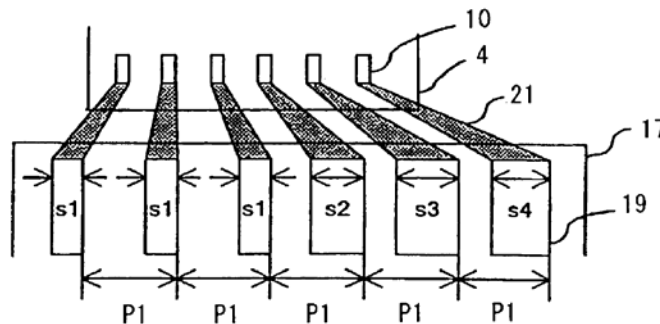
FIG. 5



The circuit unit in *Hirosue* has the signal line driver circuit 5. As shown above in *Hirosue* Figure 5, among the plurality of driver-circuit connecting terminals 10, some terminals are for the signal line driver circuit 5. Corresponding connecting terminals 19 for FPC 18 are also provided on the insulating substrate 1, where FPC 18 “supplies a signal line potential from outside the liquid crystal panel.” *Hirosue*, ¶[0045]; Sechen, ¶355.

Hirosue Figures 7-9 (Figure 7 reproduced below as an example), disclose the connection between the scan line driver circuit 4 and an FPC 17 that supplies a scan line potential via FPC connecting terminals 19, connecting lines 21, and driver-circuit connecting terminals 10. *Hirosue*, ¶[0049]; Sechen, ¶356. *Hirosue* further states that “the constitution of the present embodiment can be used for either one of: the connecting wiring between the scan line driver circuit and the scan line potential supply FPC, and the connecting wiring between the signal line driver circuit and the signal line potential supply FPC.” *Hirosue*, ¶[0053]; Sechen, ¶356.

FIG. 7

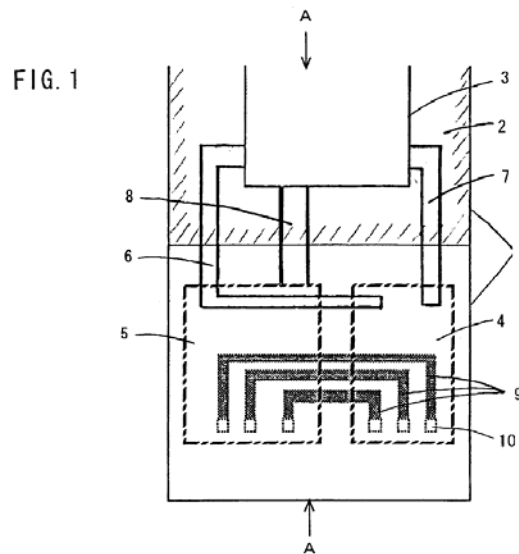


Thus, in *Hirosue*, the circuit unit has the signal line driver circuit 5 electrically connected to some of the driver-circuit connecting terminals 10, which supply the signal line potential (image signal) received from the signal line potential supply FPC 18 and the signal line potential is for driving the signal line driver circuit 5. Sechen, ¶¶357-358.

at least a part of the driving circuit overlaps the external connecting terminals in plan view.

Hirosue discloses this limitation. Sechen, ¶¶359-361.

Hirosue Figures 1 and 5 disclose a part of the signal line driver circuit 5 overlaps the driver-circuit connecting terminals 10 in plan view. Sechen, ¶¶359-361.



N. *Hirosue* in Combination with *Aruga* Renders Obvious Claim 7.

1. Claim 7

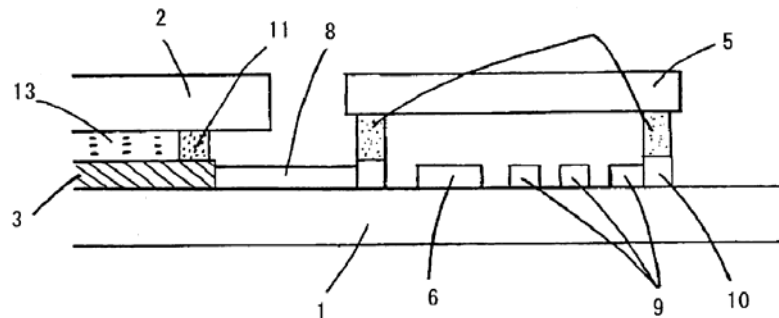
Claim 7 depends from Claim 5 with the further limitation:

wherein the external connecting terminals and the part of the circuit unit are laminated with an interlayer insulating film interposed therebetween,

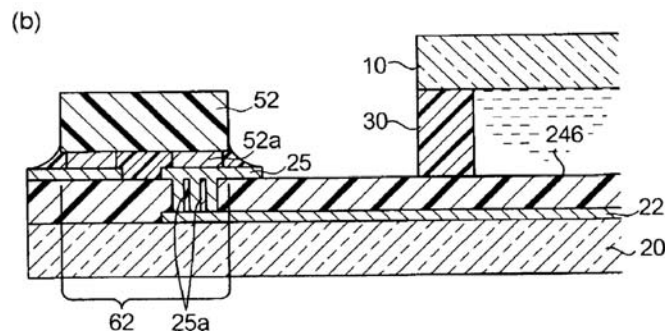
Hirosue in view of *Aruga* teaches and renders obvious this limitation of claim 7. Sechen, ¶¶362-366.

Hirosue Figure 2 shows the signal line driver circuit 5 is arranged over the external driver-circuit connecting terminals 10. Sechen, ¶¶362-363.

FIG. 2



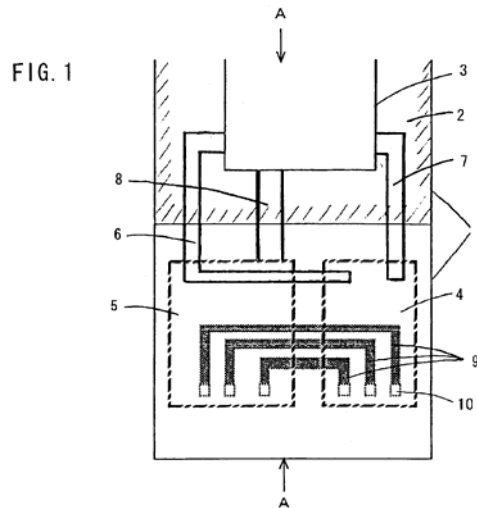
Further, *Aruga* discloses: “A resin or mold seals the connecting portion between the X driver IC 52 and the chip connecting wiring 25” thereby “moisture is inhibited from reaching the data lines 22 through the contact holes 25a and corrosion of the data lines 22 can be reliably prevented.” *Aruga*, ¶¶[0044]-[0045]. Thus, *Aruga*’s underling conducting layer 22 and IC 52 are laminated with an interlayer insulating film (resin+layer 246) interposed therebetween. *Aruga*, Fig. 7(b) (below); Sechen, ¶364.



A POSITA would have found it obvious to combine *Hirosue* with *Aruga*. Sechen, ¶¶365-366. Specifically, a POSITA would have found it obvious to implement *Aruga*'s insulating layer inbetween *Hirosue*'s external connection terminals and circuit unit. *Id.* A POSITA would have been motivated to combine *Aruga*'s insulating layer with *Hirosue*'s device in order to inhibit moisture and prevent corrosion of at least the terminals as taught by *Aruga*. *Id.* Further, as both *Hirosue* and *Aruga* relate to displays, and specifically LCDs, a POSITA would have found it straightforward to combine *Aruga*'s insulating layer with *Hirosue*'s device with predictable results. *Id.* Therefore, it would be obvious to a POSITA to have the external driver-circuit connecting terminals 10 and the signal line driver circuit 5 of *Hirosue* laminated with each other with an interlayer insulating film interposed therebetween as suggested by *Aruga*. *Id.*

each of the external connecting terminals being electrically connected with a corresponding one of the lead wiring lines and being electrically isolated from others of the plurality of lead wiring lines by the interlayer insulating film.

Hirosue in combination with *Aruga* teaches and renders obvious this limitation. Sechen, ¶¶367-369.



As shown in Figure 1 of *Hirosue*, each external connecting terminal (connecting terminal 10) is electrically connected with a corresponding lead wiring line (segment of line 9 that extends in the up-down direction in Fig. 1). Sechen, ¶¶368. *Hirosue* discloses that each external connecting terminal is electrically isolated from other lead wiring lines. *Hirosue*, Fig. 1; Sechen, ¶¶368. For the reasons set forth above, a POSITA would have been motivated to combine *Hirosue* with the teachings of *Aruga* to laminate the external connection terminals and part of the circuit unit with an interlayer insulating film. Sechen, ¶¶367-369; 365. As a result, each external connecting terminal would be electrically isolated from other lead wiring lines. ¶¶367-369.

O. *Hirosue* in Combination with *Aruga* and *Tanaka* Renders Obvious Claim 11.

1. Claim 11

Claim 11 depends from claim 7 with the further limitation:

the external connecting terminals being formed from the same film as a first conductive film constituting the circuit unit.

Hirosue in view of *Aruga* and *Tanaka* teaches and renders obvious the limitation of claim 11. Sechen, ¶¶370-374.

Tanaka discloses that the liquid crystal display includes “external connection terminals 6 for inputting signals from an external drive circuit.” *Tanaka*, ¶[0020]; *Tanaka* teaches that “external connection terminals 6 are formed of the same electrode materials when the pixel portion 2, the scanning line driving circuit 3, and the signal line driving circuit 4 are formed.” *Tanaka*, ¶[0020]; Sechen, ¶371.

Tanaka teaches that with its method the external connection terminals are more resistive to corrosion and hence disconnection due to corrosion can be prevented so that an LCD device with excellent reliability and durability can be obtained. *Tanaka*, ¶¶[0031], [0038]; Sechen, ¶372.

A POSITA would have been motivated to apply the terminal structure disclosed in *Tanaka* to the device of *Hirosue*, to form the external circuit connection terminals from the same film as a conductive film constituting the circuit unit, so as to obtain a more reliable and durable liquid crystal display device. Sechen, ¶¶373-374. Further, as both *Hirosue* and *Tanaka* relate to displays, and specifically LCDs, a POSITA would have found it straightforward to

combine the terminal structure disclosed in *Tanaka* with *Hirosue*'s device with predictable results. *Id.*

VII. GROUNDS FOR STANDING

Petitioner certifies that the '913 patent is available for IPR and that Petitioner is not barred or estopped from requesting IPR of the '913 patent challenging the claims on the grounds in this Petition.

VIII. CONCLUSION

Petitioner requests IPR and cancellation of the challenged claims because they are unpatentable under 35 U.S.C. §§102 and/or 103 based on the foregoing grounds.

IX. MANDATORY NOTICES

A. Real Parties-in-Interest

The real parties-in-interest are HKC Corp. Ltd., Chongqing HKC Optoelectronics Technology Co., Ltd., and HKC Overseas Ltd.

B. Related Matters

Crystal Leap has asserted the '913 patent against the parties-in-interest on September 30, 2022, in *Crystal Leap Zrt v. HKC Corp. Ltd., Chongqing HKC Optoelectronics Technology Co., Ltd., and HKC Overseas Ltd.*, Case No. 2:22-cv-00382 (E.D. Tex.).

C. Lead and Back-Up Counsel, and Service Information

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Petitioner consents to electronic service at the email addresses listed above.

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

This petition complies with the requirements of 37 C.F.R. § 42.24. As calculated by the word count feature of Microsoft Word, it contains 13,974 words, excluding the words contained in the following: Table of Contents, List of Exhibits, Mandatory Notices, Certification Under § 42.24(d), and Certificate of Service.

Dated: February 3, 2023

Respectfully submitted,

/Wenye Tan/
Wenye Tan (Reg. No. 55,662)
Li Jiang (Reg. No. 74,191)

CERTIFICATE OF SERVICE

The undersigned certifies that the foregoing Petition for *Inter Partes* Review, the associated Powers of Attorney, and Exhibits 1001-1014 are being served on February 3, 2023, by Priority Mail Express or by means at least as fast and reliable as Priority Mail Express at the following address of record for the subject patent.

Public PAIR Address	Current Business Address
OLIFF PLC P.O. BOX 320850 ALEXANDRIA, VA 22320-4850	OLIFF PLC 11 Canal Center Plaza, Suite 200 ALEXANDRIA, VA 22314

Courtesy copies of the same documents were served on February 3, 2023 by Priority Mail Express or by means at least as fast and reliable as Priority Mail Express at the following address of record for litigation counsel:

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