



US008755000B2

(12) **United States Patent**
Lin

(10) **Patent No.:** **US 8,755,000 B2**
(45) **Date of Patent:** ***Jun. 17, 2014**

(54) **DISPLAY PANEL WITH TEST SHORTING BAR**

(75) Inventor: **Jian-Hong Lin**, Taipei County (TW)

(73) Assignee: **Au Optronics Corporation**, Hsinchu (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/471,425**

(22) Filed: **May 14, 2012**

(65) **Prior Publication Data**

US 2012/0268434 A1 Oct. 25, 2012

Related U.S. Application Data

(62) Division of application No. 12/369,748, filed on Feb. 12, 2009, now Pat. No. 8,208,084.

(30) **Foreign Application Priority Data**

Jul. 16, 2008 (TW) 97126985 A

(51) **Int. Cl.**

G02F 1/13 (2006.01)

G02F 1/1333 (2006.01)

G02F 1/1343 (2006.01)

(52) **U.S. Cl.**

USPC **349/54; 349/55; 349/192**

(58) **Field of Classification Search**

CPC G02F 2001/133388; G02F 1/1333;
G02F 2201/508

USPC 349/54, 192, 55

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,342,931	B2 *	1/2002	Nagata et al.	349/54
6,624,857	B1 *	9/2003	Nagata et al.	349/54
7,223,642	B2 *	5/2007	Choi	438/151
7,625,782	B2 *	12/2009	Kim	438/149
2008/0123012	A1 *	5/2008	Ohtomo	349/54
2009/0167976	A1 *	7/2009	Chung et al.	349/54
2010/0006838	A1 *	1/2010	Yoshida et al.	257/48

* cited by examiner

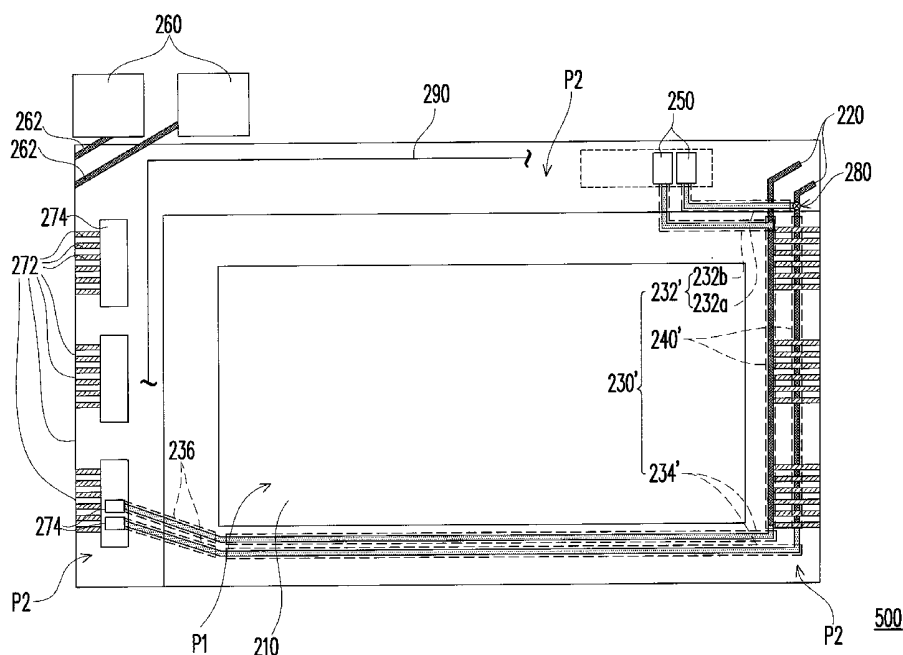
Primary Examiner — Hoan C Nguyen

(74) *Attorney, Agent, or Firm* — Jianq Chyun IP Office

(57) **ABSTRACT**

A display panel including a first substrate, a second substrate, and a liquid crystal layer. The first substrate comprises a display region and a peripheral circuit region adjacent to the display region, and the first substrate includes a pixel array, a plurality of test shorting bars, and a plurality of wires. The pixel array is disposed in the display region. The test shorting bars are disposed in the peripheral circuit region. The wires are disposed in the peripheral circuit region and electrically connected with the pixel array. Moreover, at least one wire and one of the test shorting bars respectively share a part for connecting with each other and forming a common trace. Additionally, the second substrate is disposed opposite to the first substrate. The liquid crystal layer is disposed between the first substrate and the second substrate.

7 Claims, 10 Drawing Sheets



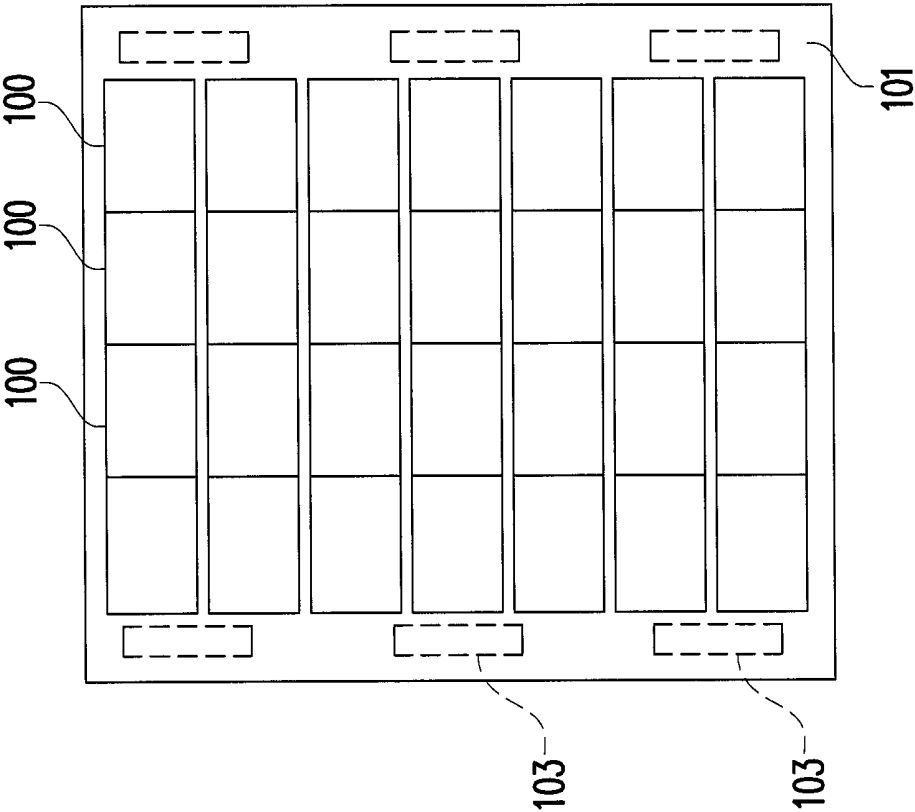
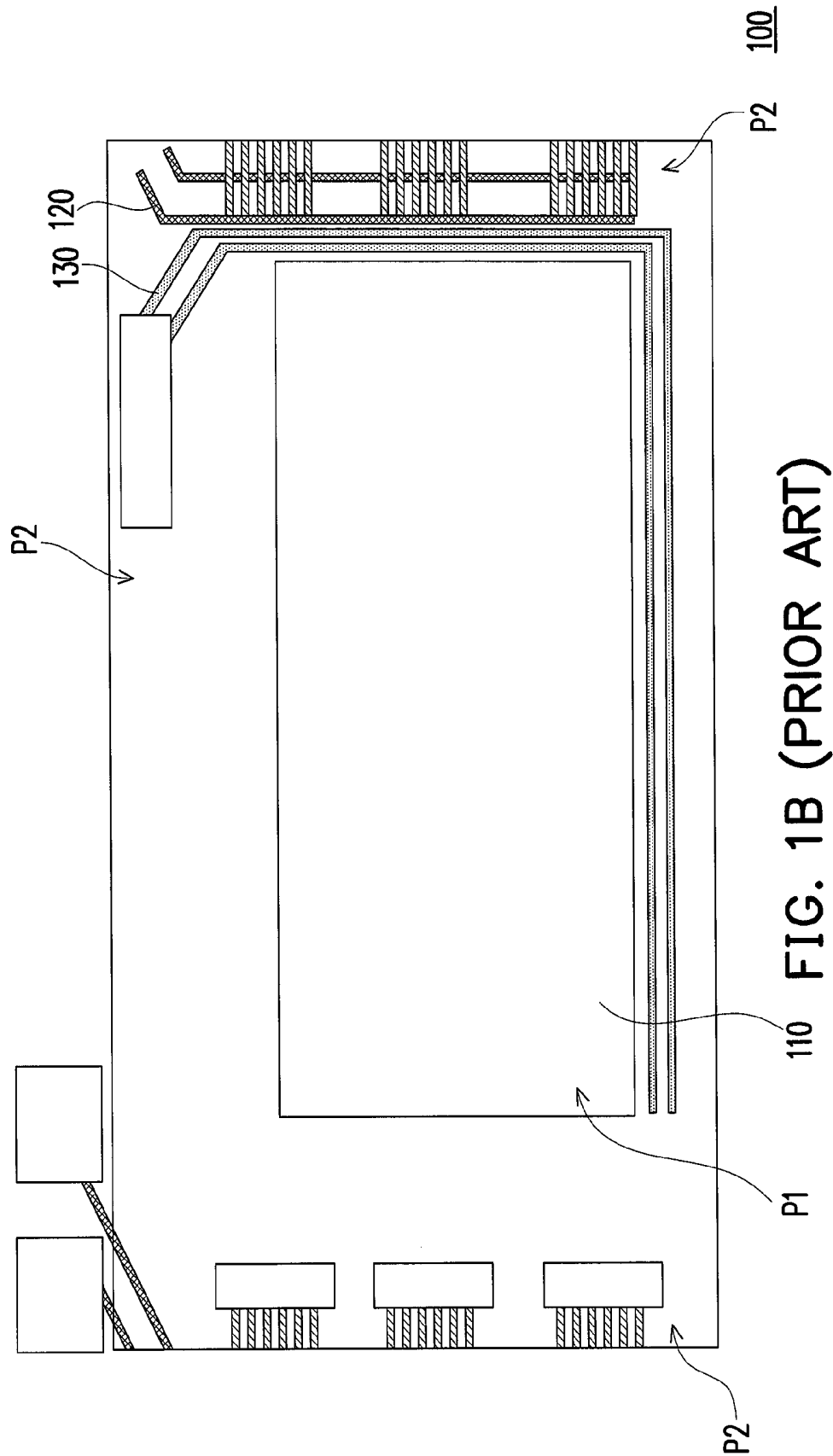


FIG. 1A (PRIOR ART)



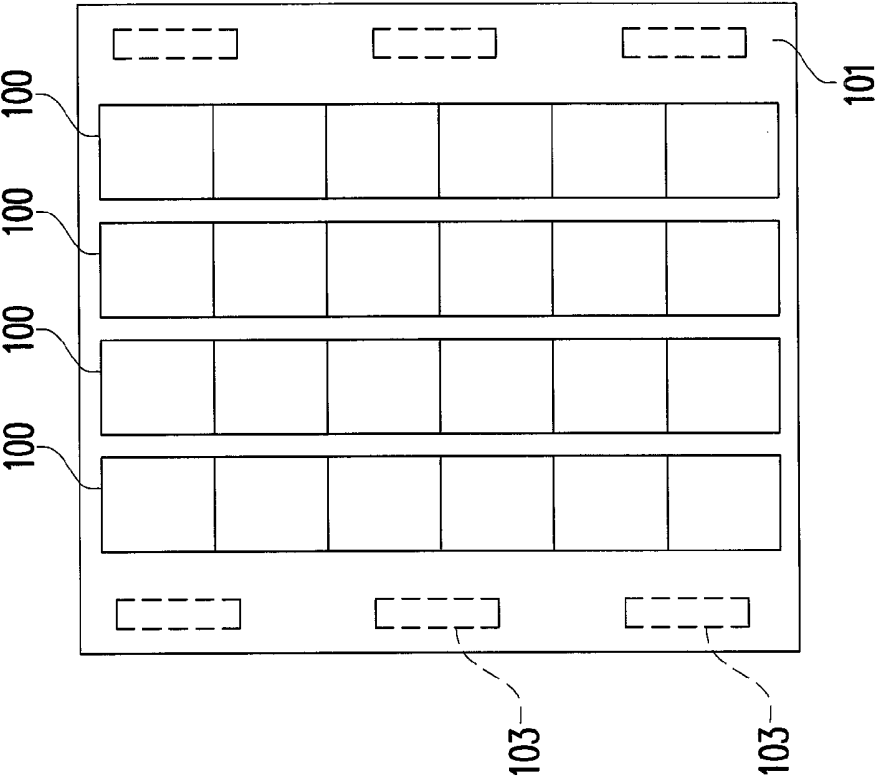
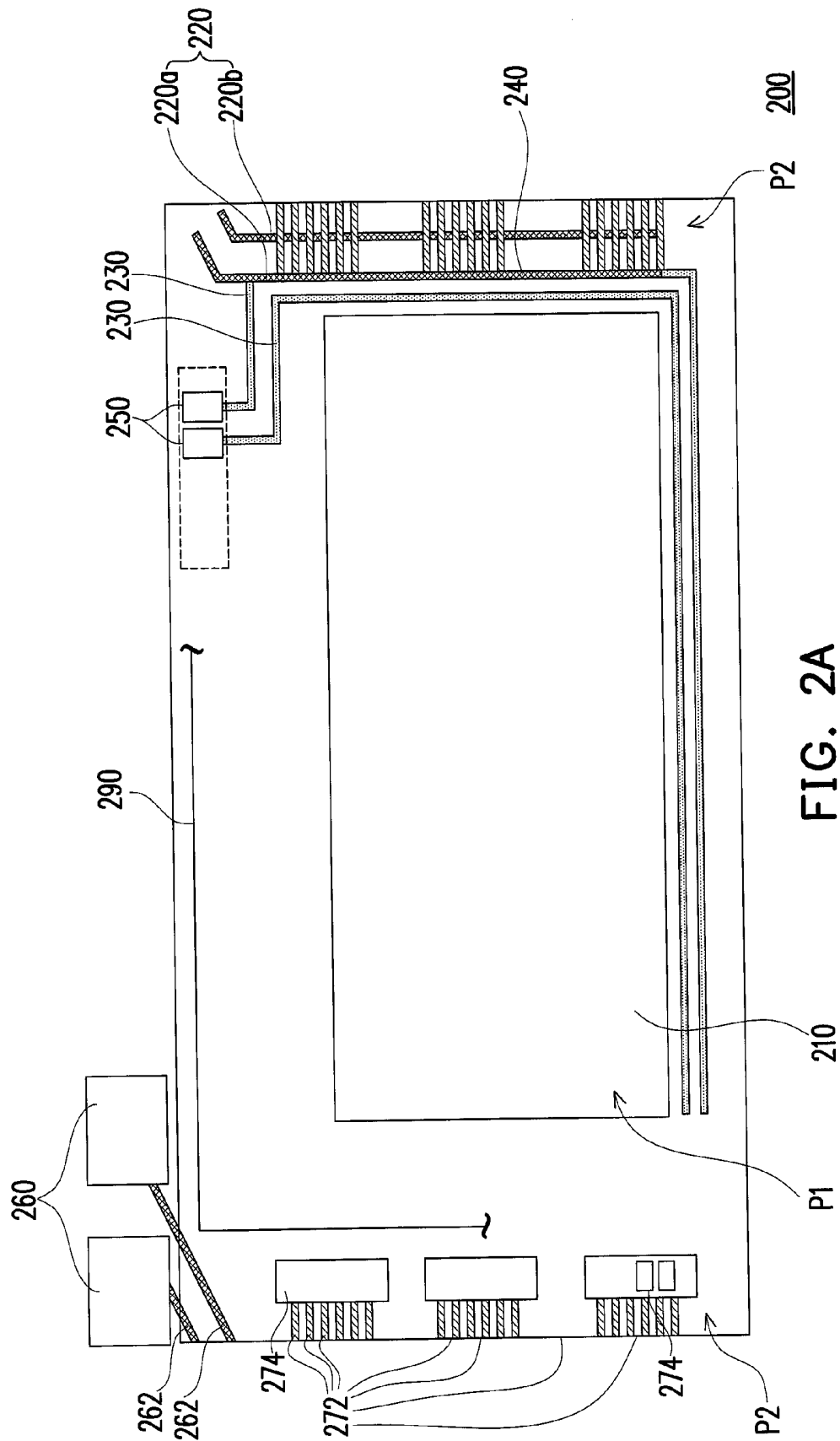


FIG. 1C (PRIOR ART)



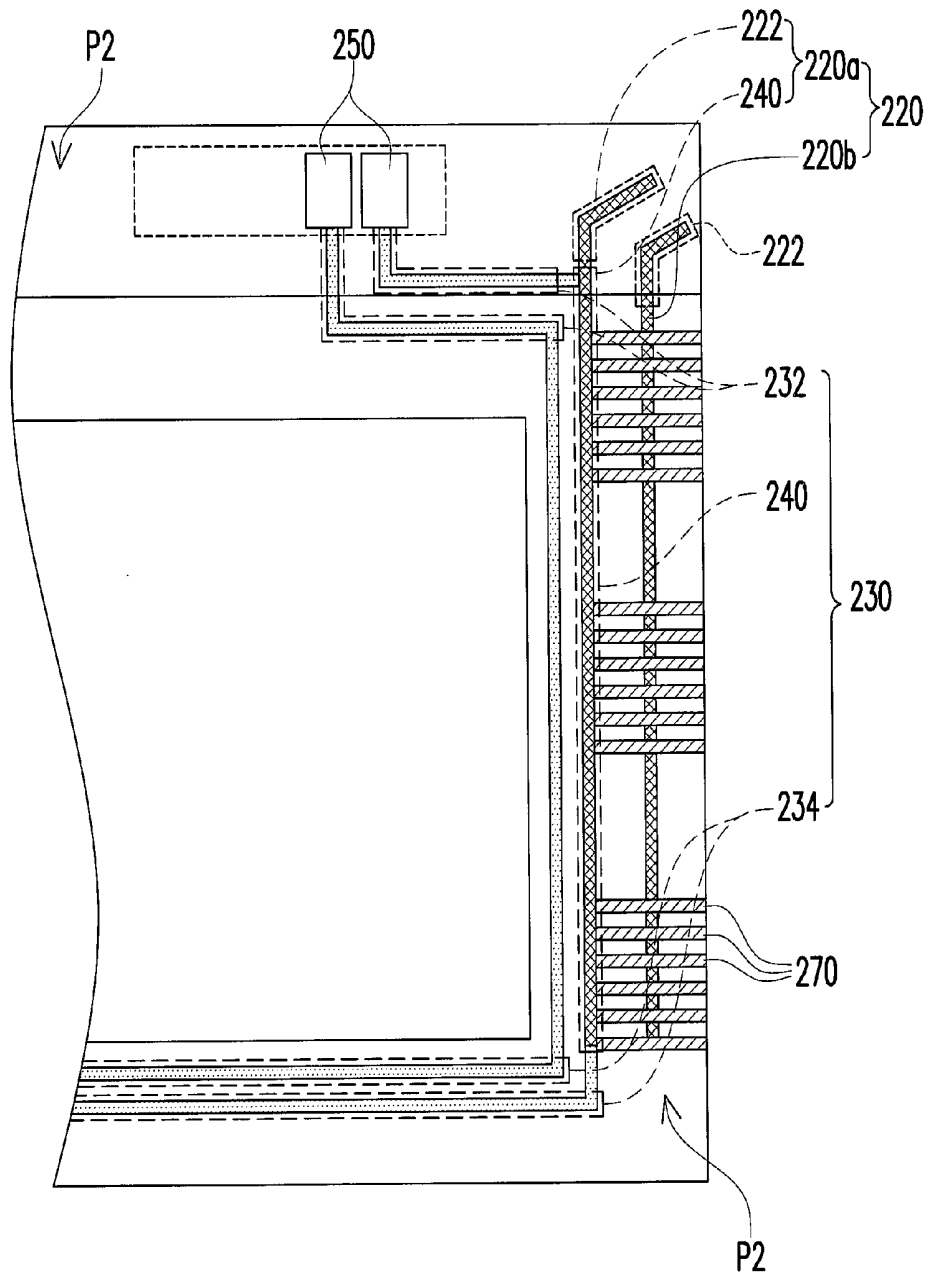


FIG. 2B

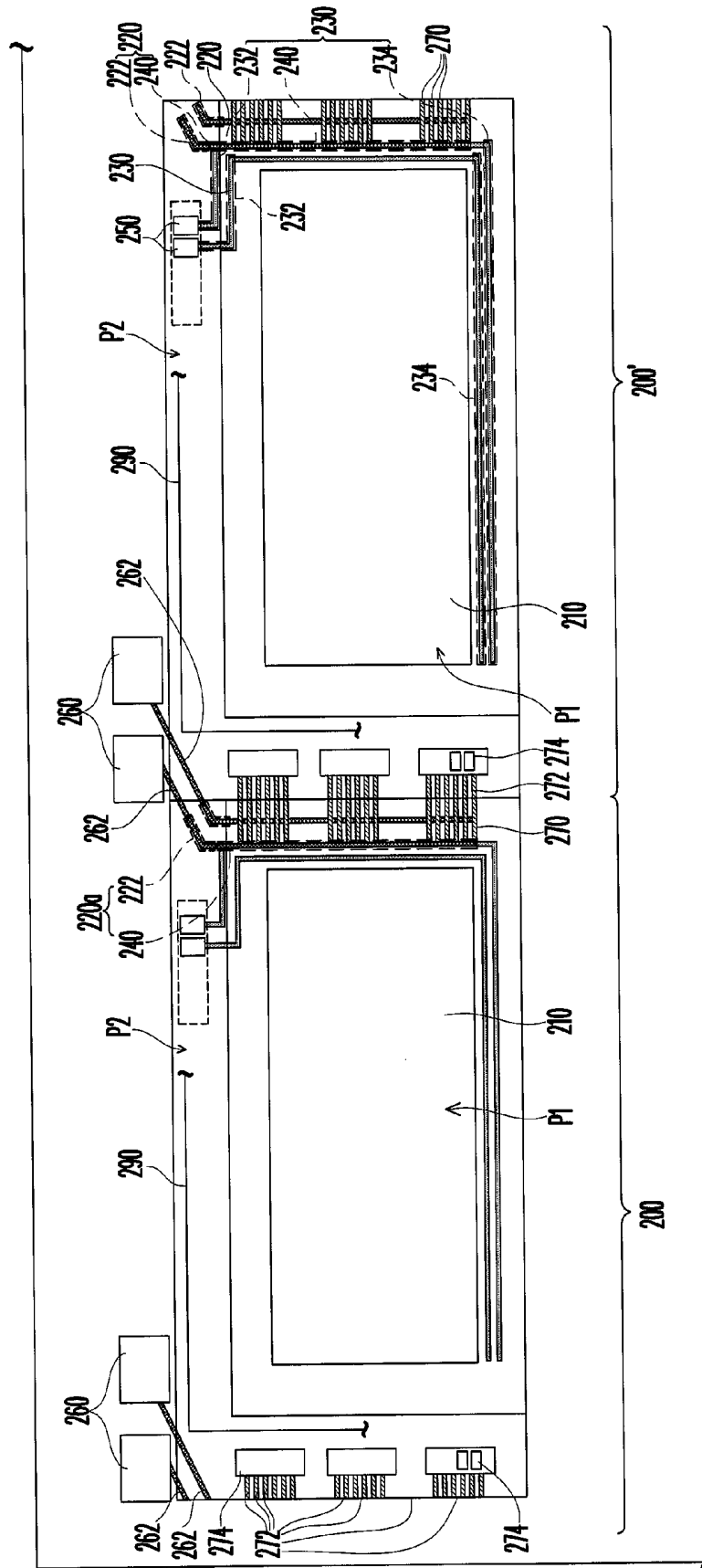
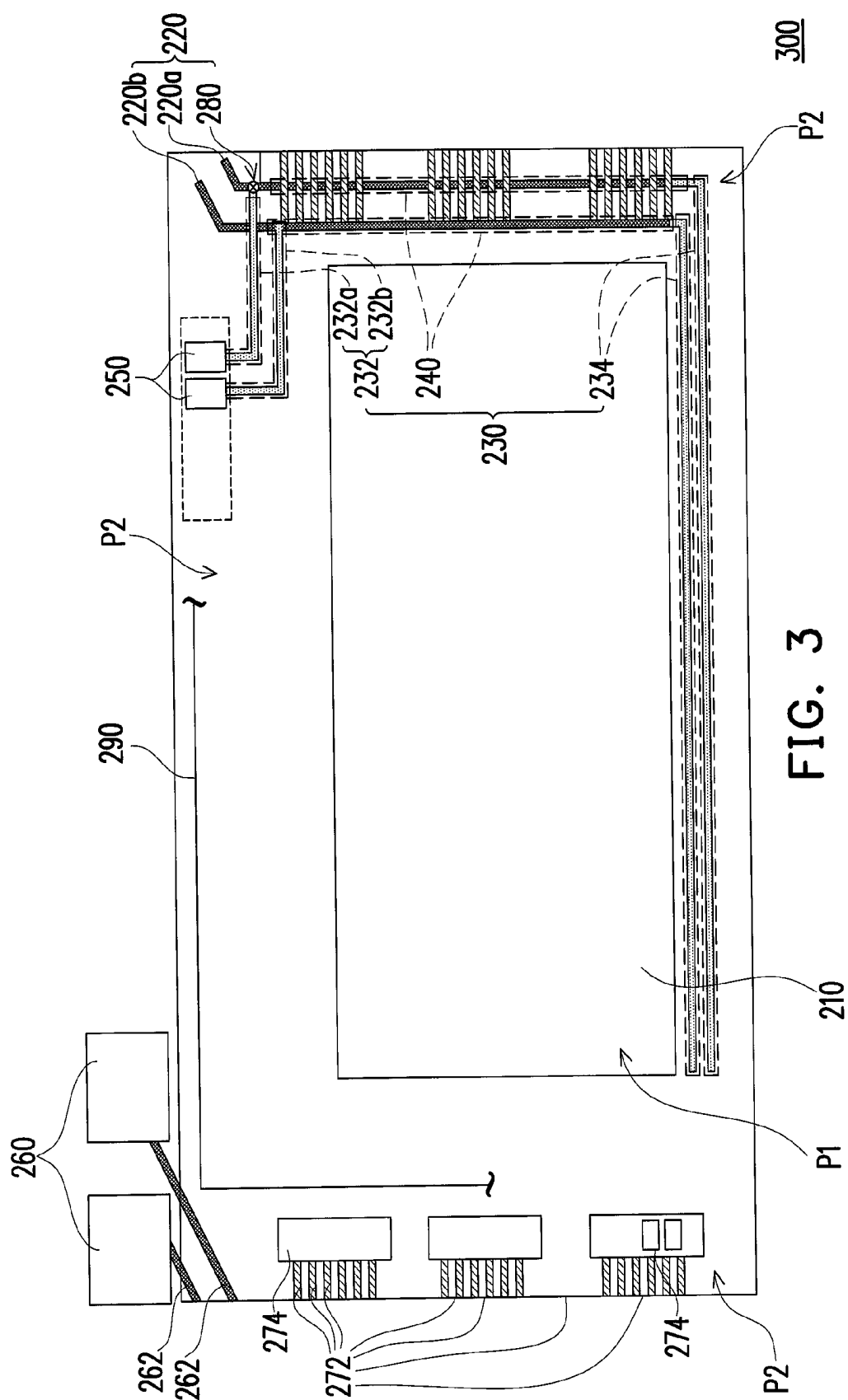
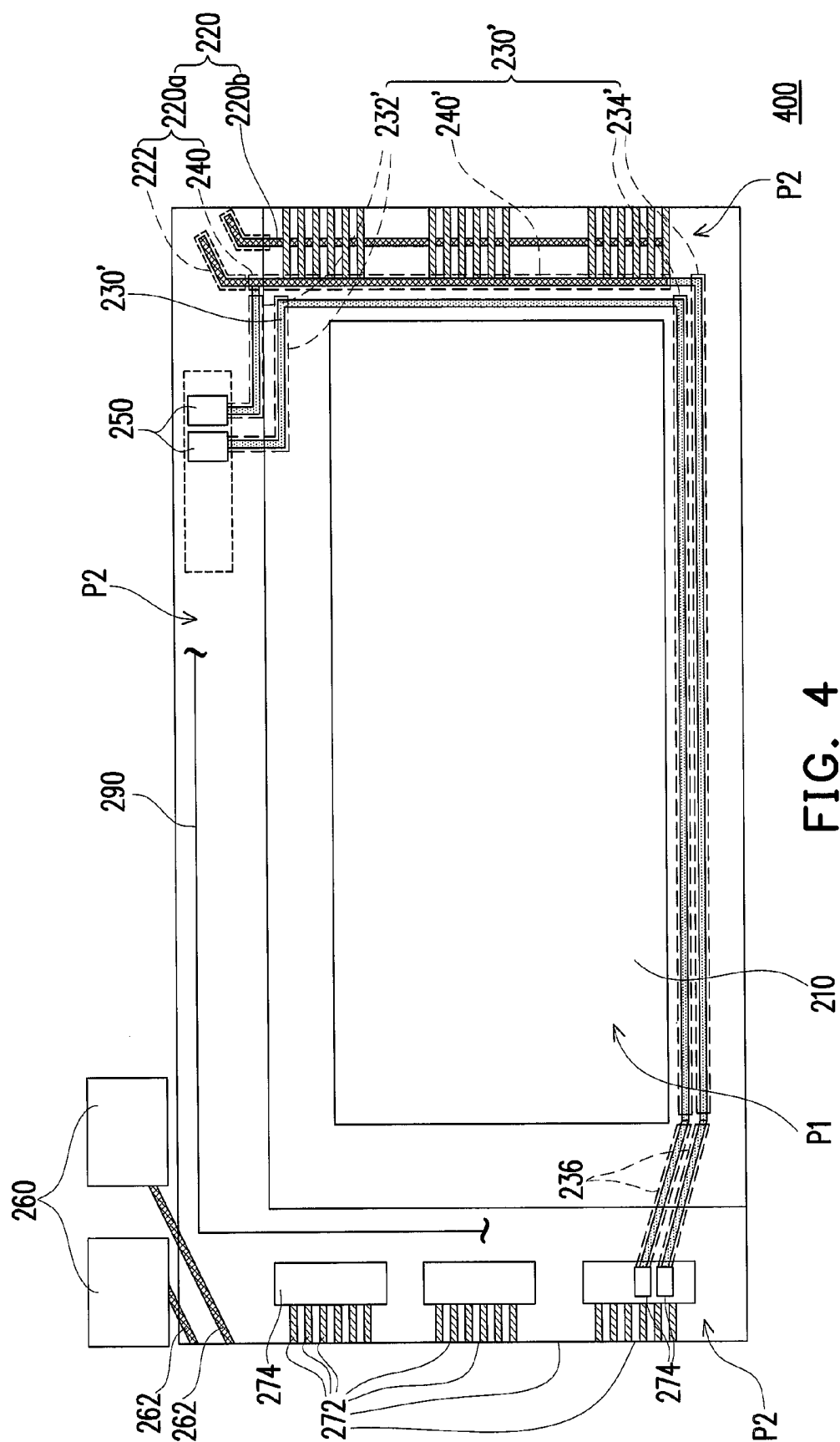
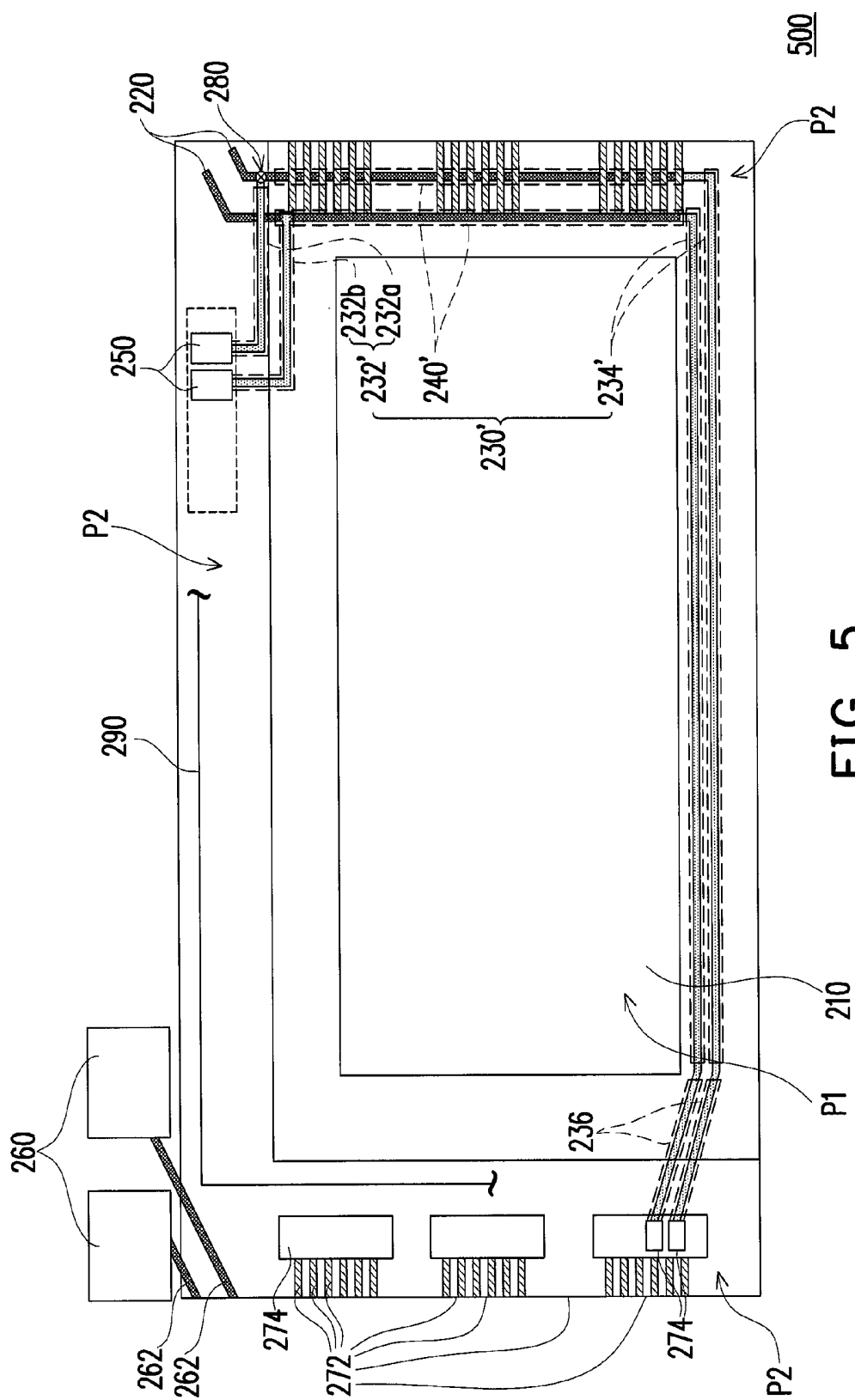


FIG. 2C







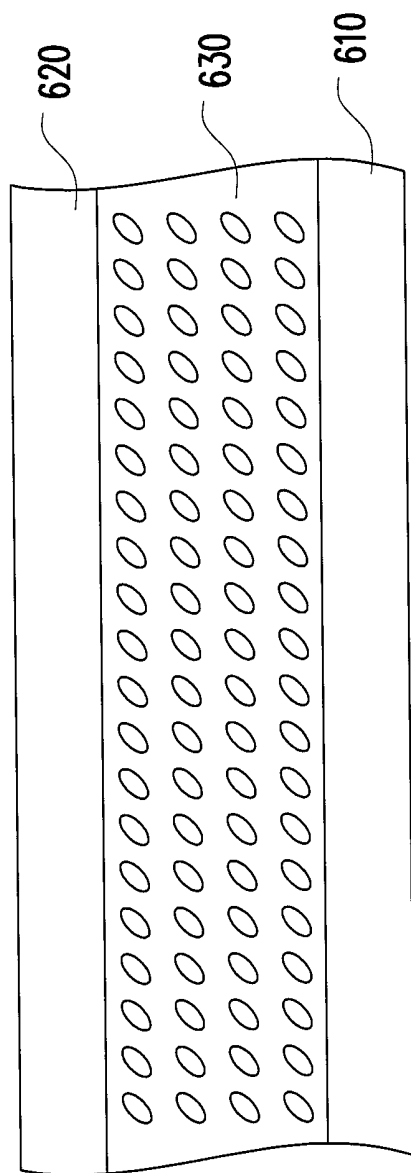


FIG. 6

600

DISPLAY PANEL WITH TEST SHORTING BAR

CROSS-REFERENCE TO RELATED APPLICATION

This application is a Divisional of and claims the priority benefit of U.S. patent application Ser. No. 12/369,748 filed on Feb. 12, 2009, now pending, which claims the priority benefits of Taiwan application Serial No. 97126985, filed Jul. 16, 2008. The entirety of the above-mentioned patent applications is hereby incorporated by reference herein and made a part of specification.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a substrate, and particularly relates to an array substrate formed by connecting at least a wire and one of a plurality of test shorting bars which share a part.

2. Description of Related Art

A liquid crystal display panel has the advantages of thin thickness, high resolution, low power consumption, and no radiation, and thus has become the mainstream among all displays panels. Additionally, as liquid crystal display panels become widely used, the haggling competition thereof is getting drastic. Hence, how to effectively reduce production costs to increase competitiveness has become the goal of the manufacturers in this field.

Generally speaking, a liquid crystal display panel is mainly formed by an array substrate, a liquid crystal layer, and a color filter substrate. Herein, in order to effectively fabricate the array substrate, a plurality of arrays is usually formed simultaneously on a mother substrate, and array test procedures and repair procedures are timely performed on each array on the mother substrate during the array process, so as to increase the yield rate thereof. After the array process is finished on the mother substrate, a cutting process is performed to the mother substrate to divide the arrays thereon from each other, so as to complete fabricating a plurality of array substrates.

FIG. 1A is a top view illustrating a plurality of array substrates formed on a mother substrate according to a conventional technique; and FIG. 1B is a top view illustrating an array substrate **100** formed after a cutting process is performed on the mother substrate in FIG. 1A. Referring to FIGS. 1A and 1B, a mother substrate **101** comprises a plurality of pixel arrays, wherein each pixel array located in an array substrate predetermined forming region **100**. After the cutting process is performed to the mother substrate **101**, each array substrate **100** having a display region **P1** and a peripheral circuit region **P2** adjacent to the display region **P1** is formed. The array substrate **100** comprises a pixel array **110**, a plurality of test shorting bars **120**, and a plurality of repair lines **130**. As shown in FIG. 1B, the pixel array **110** is disposed in the display region **P1**. The test shorting bars **120** and the repair lines **130** are disposed in the peripheral circuit region **P2**, and the repair lines **130** are electrically connected with the pixel array **110**, wherein the aforesaid array test is to test the circuit by the test shorting bars **120**. In a preferable embodiment, the mother substrate **101** comprises a plurality of alignment marks **103**. The alignment marks **103** are used for precise alignment, so as to prevent deviation from occurring when a lithographic process, an etching process, an assembling process, or other processes requiring the alignment marks **103** for precise alignment are performed on the mother substrate **101**.

In conventional technology, the arrays on the mother substrate **101** are usually arranged as dense as possible to increase the utilization of the mother substrate **101**, or the distance between the alignment marks **103** and the arrays is shortened as much as possible to reduce production costs. For example, the size of the mother substrate **101** in FIG. 1A is 1300 mm×1100 mm, and 28 array substrates **100** are arranged as a 7×4 rectangle. However, as a consequence, the positions of a portion of the array substrate predetermined forming regions **100** may become too close to the alignment marks **103** or the alignment marks **103** may fall within the array substrate predetermined forming regions **100**, which easily cause the machines to fail to catch the alignment marks **103** during the succeeding fabricating processes, such as a lithographic process, an etching process, an assembling process, or other processes requiring the alignment marks **103** for precise alignment, and result in abnormal alignment. Consequently, the fabrication of the array substrates **100** is influenced.

To solve this problem, the conventional technology applies another arrangement of the substrates **100** in the 1300 mm×1100 mm mother substrate **101**. For example, FIG. 1C illustrates another arrangement of the substrates **100**. This kind of arrangement allows a certain distance to be maintained between the positions of the array substrate predetermined forming regions **100** and the alignment marks, such that the machines can precisely identify the alignment marks **103**. However, this 6×4 arrangement of 24 pieces will reduce the production quantity. Additionally, in consideration of other process margins during the fabrication, such as effective film deposition margin, the layout of the predetermined forming region array substrates **100** on the mother substrate **101** is limited. Therefore, one of the purposes of the present invention is to reduce the region of the peripheral circuit region **P2** and decrease the overall outline of the array substrate **100**, such that the array substrates **100** can be effectively divided to improve the utilization of the mother substrate **101**, and further to reduce the costs for producing the liquid crystal display panels.

SUMMARY OF THE INVENTION

The present invention provides an array substrate including a peripheral circuit region having a smaller layout region for increasing the utilization of the substrate.

The present invention provides a display panel comprising the aforesaid array substrate for reducing production costs.

The present invention provides an array substrate including a display region and a peripheral circuit region adjacent to the display region. The array substrate comprises a pixel array, a plurality of test shorting bars, and a plurality of wires. The pixel array is disposed in the display region. The test shorting bars are disposed in the peripheral circuit region. The wires are disposed in the peripheral circuit region and electrically connected with the pixel array. Moreover, at least one wire and one of the test shorting bars respectively share a part for connecting with each other and forming a common trace.

The present invention further provides a display panel including a first substrate, a second substrate, and a liquid crystal layer. The first substrate comprises a display region and a peripheral circuit region adjacent to the display region, and the first substrate includes a pixel array, a plurality of test shorting bars, and a plurality of wires. The pixel array is disposed in the display region. The test shorting bars are disposed in the peripheral circuit region. The wires are disposed in the peripheral circuit region and electrically connected with the pixel array. Moreover, at least one wire and

one of the test shorting bars respectively share a part for connecting with each other and forming a common trace. Additionally, the second substrate is disposed opposite to the first substrate. The liquid crystal layer is disposed between the first substrate and the second substrate.

In an embodiment of the present invention, the aforesaid wires comprise a first signal source connection wire and a pixel array connection wire, wherein at least one of the wires further comprises the common trace. The common trace connects the first signal source connection wire with the pixel array connection wire. In an embodiment, the aforesaid array substrate further comprises a data driving circuit. The data driving circuit is connected with the first signal source connection wire and is adapted for transmitting driving signals. In one embodiment, a material of the first signal source connection wire, the common trace, and the pixel array wire is the same as that of the test shorting bars. In another embodiment, the aforesaid first signal source connection wire is connected with the common trace through a contact window and a material of the first signal source connection wire is different from that of the common trace. In an embodiment, the aforesaid wires comprise a second signal source connection wire. The second signal source connection wire is electrically connected with a gate driving circuit, and the gate driving circuit is adapted for transmitting driving signals.

In another embodiment of the present invention, the aforesaid test shorting bars comprise a first trace. At least one of the test shorting bars comprises the common trace and the first trace, wherein the first trace is connected with the common trace.

In an embodiment of the present invention, the aforesaid array substrate comprises at least one dummy test pad. The dummy test pad is connected with a dummy first trace. The first trace and the dummy first trace are correspondingly disposed in the peripheral circuit region adjacent to two sides of the display region respectively, and the first trace is insulated from the dummy first trace.

In an embodiment of the present invention, the aforesaid array substrate comprises a plurality of second traces, a plurality of dummy second traces, and a plurality of gate driving circuits. The second traces and the dummy second traces are respectively electrically connected with the test shorting bars and the gate driving circuits. The second traces and the dummy second traces are correspondingly disposed in the peripheral circuit region adjacent to two sides of the display region respectively, and the second traces are insulated from the dummy second traces.

In an embodiment of the present invention, the aforesaid array substrate comprises an electrostatic protection shorting bar. The electrostatic protection shorting bar is disposed in the peripheral circuit region and insulated from the test shorting bars.

To conclude, in the array substrate of the present invention, the test shorting bars and the wires in the peripheral circuit region are designed to share a part, and thus the overall region of the peripheral circuit region is reduced. In other words, the array substrate of the present invention has better substrate utilization. Therefore, the layout density on the mother substrate could be denser and the miss alignment during the array process caused from the alignment mark not identifiable could be avoided. Hence, the costs for fabricating the display panel disposed with the array substrate are lower.

To make the above and other objectives, features, and advantages of the present invention more comprehensible, preferable embodiments accompanied with figures are described in detail as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

FIG. 1A is a top view illustrating a plurality of arrays formed on a mother substrate according to a conventional technique.

FIG. 1B is a top view illustrating an array substrate formed after a cutting process is performed on the mother substrate in FIG. 1A.

FIG. 1C illustrates another arrangement of array substrates.

FIG. 2A is a top view illustrating an array substrate in the first embodiment of the present invention.

FIG. 2B is a top view illustrating a portion of the array substrate in FIG. 2A.

FIG. 2C is an enlarged view illustrating a portion of the mother substrate when array test is performed.

FIG. 3 is a top view illustrating an array substrate in the second embodiment of the present invention.

FIG. 4 is a top view illustrating an array substrate in the third embodiment of the present invention.

FIG. 5 is a top view illustrating an array substrate in the fourth embodiment of the present invention.

FIG. 6 is a schematic view illustrating a display panel in the fifth embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

First Embodiment

FIG. 2A is a top view illustrating an array substrate in the first embodiment of the present invention. Referring to FIG. 2A, an array substrate 200 comprises a display region P1 and a peripheral circuit region P2 adjacent to the display region P1. The array substrate 200 comprises a pixel array 210, a plurality of test shorting bars 220, and a plurality of wires 230 (for example, repair lines or repair wires). The test shorting bars 220 are usually used for detecting whether the arrays on a mother substrate (not shown) is electrically connected or disconnected (for example, short circuit or open-circuited). The pixel array 210 is disposed in the display region P1. The test shorting bars 220 and the wires 230 are disposed in the peripheral circuit region P2, and the wires 230 are electrically connected with the pixel array 210.

Additionally, the test shorting bars 220 can be divided into at least two types 220a and 220b, wherein at least one wire 230 and one of the test shorting bars 220 respectively share a part for connecting each other and forming a common trace 240. In this embodiment, for instance, one of the wires 230 and the test shorting bar 220a share a part which forms the common trace 240, as shown in FIG. 2A.

Specifically, FIG. 2B is a top view enlarging a portion of the array substrate in FIG. 2A. Referring to FIG. 2B, each of the test shorting bars 220 comprises a first trace 222, wherein the first trace 222 is used for transmitting test signals. In this embodiment, the test shorting bar 220a comprises the first trace 222 and the common trace 240, and the first trace 222 of the test shorting bar 220a is connected with one of the wire 230 through the common trace 240, as shown in FIG. 2B. In other words, the common trace 240 is used for transmitting driving signals and test signals.

Referring to FIG. 2B, the wires 230 comprise first signal source connection wires 232 and pixel array connection wires 234. In this embodiment, at least one repair wire 230 may

comprise the first signal source connection wire **232**, the common trace **240**, and the pixel array connection wire **234**, wherein the first signal source connection wire **232** and the pixel array connection wire **234** are respectively disposed at two sides of the common trace **240**, as shown in FIG. 2B. When a defect is detected in the pixel array **210**, a specific signal provided by data driving circuits **250** is transmitted to the pixel array **210** through the path of the wires **230**, such that the pixel array **210** with the defect can remain operable at a certain level. Hence, the wires **230** have the function of repairing the defect in the array substrate **200**. In other words, the wires **230** are also called repair lines.

For example, when open-circuited occurs in a data line of the array substrate **200**, the data line is divided into one part connected with a data driving circuit and the other part separated from the data driving circuit. By the connection of welding process, the wires **230** are able to transmit driving signals to the data lines which are separated by the open-circuited and allow the pixels in the same data line to be driven without being influenced by the open-circuited. In this embodiment, a material of the first signal source connection wires **232**, the common trace **240**, and the pixel array connection wires **234** may be the same as that of the test shorting bars **220**. The material is, for example, formed by using a first metal layer. However, this is merely one of the examples, and the present invention is not limited thereto. In other embodiments, the material of the first signal source connection wires **232**, the common trace **240**, and the pixel array connection wires **234** may be different from that of the test shorting bars **220**.

Further, referring to FIGS. 2A and 2B, the array substrate **200** comprises data driving circuits **250**. The data driving circuits **250** are connected with the first signal source connection wires **232** and adapted for transmitting a driving signal. Specifically, as described above, when open-circuited occurs in an element inside the array substrate **200**, for example the data line is in an open-circuited, the designer may use a data driving circuit connected with the data driving circuits **250** to generate proper driving signals, which are corresponding to the driving signals transmitted by the original data line, and transmit the driving signals to the wires **230** through the data driving circuits **250** and then transmit the driving signals to the element in an open-circuited through the wires **230**. Thereby, the elements connected by the same circuit can still be driven without being influenced by the open-circuited.

In this embodiment, the array substrate **200** comprises dummy test pads **260**, as shown in FIG. 2A. The dummy test pads **260** are used in the array process of the array substrate **200** for performing array test on the mother substrate through the dummy test pads **260** on a neighboring array substrate **200'**. To be more specific, FIG. 2C is an enlarged view illustrating a portion of the mother substrate when array test is performed, wherein a portion of the array substrates **200** and **200'** is completed, but a cutting process is not performed on the mother substrate yet. Referring to FIG. 2C, the dummy test pads **260** are connected with the dummy first traces **262**. The first traces **222** and the dummy first traces **262** are correspondingly disposed in the periphery circuit region P2 adjacent to two sides of the display region P1, respectively, such that the first traces **222** of the array substrate **200** are electrically connected with the dummy first traces **262** of the neighboring array substrate **200'** before the cutting process is performed, as shown in FIG. 2C. During the array test, a probe contacts the dummy test pads **260** of the array substrate **200'** to perform an electrical inspection by transmitting a signal through the dummy first traces **262** of the array substrate **200'** and the test shorting bars **220** of the array substrate **200**.

Additionally, when the cutting process is performed to form the array substrates **200** and array substrates **200'**, the first traces **222** and the dummy first traces **262** are insulated from each other, and thus the display of the array substrates **200** and **200'** is not influenced, as shown in FIG. 2A.

Then, referring to FIGS. 2A, 2B, and 2C, after the cutting process, the array substrate **200** further comprises a plurality of second traces **270**, a plurality of dummy second traces **272**, and a plurality of gate driving circuits **274**. The second traces **270** and the dummy second traces **272** are respectively electrically connected with the test shorting bars **220** and the gate driving circuits **274**. The second traces **270** are insulated from the dummy second traces **272**. The second traces **270** and the dummy second traces **272** are correspondingly disposed in the periphery circuit region P2 adjacent to two sides of the display region P1, respectively, as shown FIG. 2A. Therefore, the second traces **270** and the gate driving circuits **274** are disposed in the periphery circuit region P2, the same side with the dummy first traces **262** while opposite side to the test shorting bars **220**.

In the following paragraphs, FIG. 2C is used to describe the array test when the cutting process is not yet performed on the mother substrate. Referring to FIG. 2C, in practice, the probe (not shown) may be used to contact the aforesaid dummy test pads **260** when the array test is performed. Based on the test method and test timing, the probe may be used for outputting driving signals or receiving signals transmitted by the dummy first traces **262**. However, the present invention is not limited thereto. For instance, an electrical inspection may be performed on the array substrate **200'** by the dummy first traces **262** of the substrate **200'**, the test shorting bar **220a** of the substrate **200**, the second traces **270** of the substrate **200**, the dummy second traces **272** of the substrate **200'**, and the gate driving circuits **274** of the substrate **200'**. In this embodiment, the test shorting bar **220a** comprises the first trace **222** and the common trace **240**. Before the cutting process is performed on the mother substrate, the dummy first traces **262** of the substrate **200'** are electrically connected with the first traces **222** of the substrate **200**, and the second traces **270** of the substrate **200** are electrically connected with the dummy second traces **272** of the substrate **200'**, as shown in FIG. 2C.

In addition, the array substrate **200** comprises an electrostatic protection shorting bar **290**, as shown in FIGS. 2A and 2C. The electrostatic protection shorting bar **290** is disposed in the peripheral circuit region P2 and insulated from the test shorting bars **220**, wherein the test shorting bars **220** are mainly used for transmitting test signals, and the electrostatic protection shorting bar **290** is mainly used for discharging the electrostatic charges accumulated in the array substrate **200**. In other words, the test shorting bars **220** are different from the electrostatic protection shorting bar **290**. To be more specific, because every object has electrostatic charges, the electrostatic protection shorting bar **290** is used for preventing the array substrate **200** from being damaged by static electricity in the environment during fabrication.

The difference between the present invention and the conventional technology lies in that the wires **230** (or called repair lines) and the test shorting bars **220** in the array substrate **200** share a part to save the space for fabricating the wires **230** and the test shorting bars **220**. In other words, common trace **240** plays a role as transmitting test signals during array test, and plays another role as transmitting driving signals after an open-circuited defect occurs to data lines. Hence, the array substrate **200** has favorable utilization of the mother substrate. Moreover, the present invention reduces the layout space of the peripheral circuit region to increase the utilization of the mother substrate in the array process. Con-

sequently, the production costs are reduced, and the problems of abnormal alignment which occurs in the conventional technology and limited process margin are avoided. In addition, when the wires **230** and the test shorting bars **220** share a part, the wire width of the test shorting bars **220** is larger than that of the wires **230**, and thus the resistance in the original wires is usually decreased to improve the performance of the defective pixels or open-circuited signal wires which have been repaired.

Second Embodiment

FIG. **3** is a top view illustrating an array substrate in the second embodiment of the present invention. Referring to FIGS. **2A** and **3**, the array substrate **200** is similar to the array substrate **300**, and the descriptions for the similarities are not repeated here. The array substrate **300** in this embodiment comprises a contact window **280**. One of the first signal source connection wires **232a** of the wires **230** is connected with the corresponding test shorting bars **220a** through the contact window **280**. Each wire **230** and each test shorting bar **220** share a part which forms the common trace **240**, as shown in FIG. **3**. In other words, one of the first signal source connection wires **232a** of the wires **230** is electrically connected with the common trace **240** by the contact window **280**, and the common traces **240** are electrically connected with pixel array connection wires **234**. In this embodiment, each wire **230** and each test shorting bar **220** share a part for electrically connecting with each other.

In this embodiment, the data driving circuits **250** transmit driving signals to the first signal source connection wires **232**, wherein the first signal source connection wires **232** transmit the driving signals to the common traces **240** through the contact windows **280**. The driving signals are transmitted to the pixel array connection wires **234** through the common traces **240**.

A material of the first signal source connection wires **232** may be different from that of the common traces **240**. In this embodiment, the first signal source connection wires **232a** and the test shorting bars **220a** are, for example, respectively formed by using a first metal layer and a second metal layer, wherein the first metal layer and the second metal layer are two different layers. The first signal source connection wires **232a** made by the second metal layer is connected to the test shorting bars **220a** made by the first metal layer through wire jumping (i.e. the contact window **280**). On the other hand, in this embodiment, the first signal source connection wires **232b** and the test shorting bars **220b** are simultaneously formed by the same first metal layer, and the first signal source connection wires **232b** made by the first metal layer is directly connected to the test shorting bars **220b** made by the same layer. Hence, in this embodiment the above first signal source connection wires **232a** and **232b** are formed respectively by using the second metal layer and the first metal layer, but the present invention is not limited thereto.

In the array substrate **300**, the part shared by the wires **230** and the test shorting bars **220** is increased, and thus the space for fabricating the wires **230** and the test shorting bars **220** is further saved. Hence, the array substrate **300** has better utilization of the mother substrate when compared with the conventional technology. Further, as described in the above embodiment, when the wire **230** and the test shorting bar **220** share a part, the wire width of the test shorting bars **220** is larger than that of the wires **230**, the array substrate **300** is therefore advantageous for improving the performance of defective pixels which have been repaired.

Third Embodiment

FIG. **4** is a top view illustrating an array substrate in the third embodiment of the present invention. Referring to

FIGS. **2A** and **4**, an array substrate **400** is similar to the array substrate **200**, and the descriptions for the similarities are not repeated here. In this embodiment, the wires **230'** further comprise second signal source connection wires **236**, wherein the wires **230'** are also called gate signal wires. It is to say that the wires **230'** are also used for transmitting the driving signals generated by the gate driving circuits **274**. In this embodiment, the wires **230'** are, for example, formed by the first signal source connection wires **232'**, the common trace **240'**, the pixel array connection wires **234'**, and the second signal source connection wires **236**, as shown in FIG. **4**.

Specifically, one of the wires **230'** and the test shorting bar **220a** are connected by the common trace **240'**, as shown in FIG. **4**. The second signal source connection wires **236** are electrically connected with the gate driving circuits **274**, so that the driving signals provided by the gate driving circuits **274** may be transmitted by the wires **230'**, wherein the gate driving circuits **274** are adapted for transmitting driving signals. Thus, the common trace **240** serves as trace for both the gate driving signal and the short circuit test signal.

In this embodiment, the second signal source connection wires **236** are electrically connected with the gate driving circuits **274**. When the array substrate **400** is applied in a display panel (not shown), gate signals which are transmitted from top to bottom may be changed to transmit from bottom to top. Hence, the display modes, such as image direction, of the display panel may be changed according to the user's environment.

Therefore, when applied in a display panel, the array substrate **400** not only has the advantages of the array substrate **200** but also reduces the costs for producing the display panel and provides the users various display modes. Consequently, the competitiveness of the products is enhanced.

Fourth Embodiment

FIG. **5** is a top view illustrating an array substrate in the fourth embodiment of the present invention. Referring to FIGS. **3** and **5**, an array substrate **500** is similar to the array substrate **300**, and the descriptions for the similarities are not repeated here. In this embodiment, the wires **230'** further comprise second signal source connection wires **236**, wherein the wires **230'** are also called gate signal wires. It is to say that the wires **230'** are also used for transmitting the driving signals generated by the gate driving circuits **274**. In this embodiment, the wires **230'** are, for example, formed by the first signal source connection wires **232'**, the common traces **240'**, the pixel array connection wires **234'**, and the second signal source connection wires **236**, as shown in FIG. **5**.

Specifically, the wires **230'** and the test shorting bars **220** are respectively connected by the common traces **240'**, as shown in FIG. **5**. Similar to the foregoing embodiment, the second signal source connection wires **236** are electrically connected with the gate driving circuits **274**, so that the driving signals provided by the gate driving circuits **274** may be transmitted by the wires **230'**, wherein the gate driving circuits **274** are adapted for transmitting driving signals, and the common traces **240'** serve as traces for both the gate driving signals and short circuit test signals.

In this embodiment, the second signal source connection wire **236** are electrically connected with the gate driving circuits **274**. When the array substrate **500** is applied in a display panel, the display modes, such as image direction observable by users, of the display panel may be changed according to the user's environment.

Hence, the array substrate **500** has the advantages of both the array substrate **300** and the array substrate **400**. In other

words, as described in the foregoing embodiment, when applied in a display panel, the array substrate 500 not only reduces the costs for producing the display panel but also provides the users various display modes. Consequently, the competitiveness of the products is improved.

The Fifth Embodiment

FIG. 6 is a schematic view illustrating a display panel in the fifth embodiment of the present invention. Referring to FIG. 6, a display panel 600 comprises a first substrate 610, a second substrate 620, and a liquid crystal layer 630. The second substrate 620 is disposed opposite to the first substrate 610. The liquid crystal layer 630 is disposed between the first substrate 610 and the second substrate 620.

In this embodiment, the first substrate 610 is, for example, one of the aforesaid array substrates 200, 300, 400, and 500, and the second substrate 630 is, for example, a color filter substrate. The above is merely one of the examples, and the present invention is not limited thereto. In other words, the first substrate 610 may also be other array substrates formed based on the concept of the present invention. For instance, the first substrate 610 may be a color-filter-on-array (COA) array substrate, an array-on-color-filter (AOC) array substrate, or a substrate of other combinations. In addition to the aforesaid TFT-LCD, the display panel may also be an organic light-emitting diode (OLED) display panel, a low temperature poly-silicon (LTPS) display panel, or a plasma display panel (PDP) display panel.

In addition, according to different display modes and layer designs, the aforesaid display panel 600 may be applied in a transmissive display panel, a transfective display panel, a reflective display panel, a color-filter-on-array display panel, an array-on-color-filter display panel, a vertical alignment (VA) display panel, an in plane switching (IPS) display panel, an multi-domain vertical alignment (MVA) display panel, a twist nematic (TN) display panel, an super twisted nematic (STN) display panel, a patterned vertical alignment (PVA) display panel, an super-patterned vertical alignment (S-PVA) display panel, an advanced super-view (ASV) display panel, an fringe field switching (FFS) display panel, a continuous pinwheel alignment (CPA) display panel, an axially symmetric aligned microcell (ASM) display panel, an optically compensated bend (OCB) display panel, an super in plane switching (S-IPS) display panel, an advanced super in plane switching (AS-IPS) display panel, an ultra fringe field switching (UFFS) display panel, a polymer stabilized alignment (PSA) display panel, a dual-view display panel, a triple-view display panel, a three-dimensional display panel, a touch panel, other display panels, or a combination of the above.

In summary, the array substrate of the present invention at least has the following features. First, the wires and the test shorting bars share a part. Hence, the region of the array substrate becomes smaller and the resistance of the original wires is reduced. Furthermore, the second signal source connection wires of the wires are connected with the gate driving circuits in parts of embodiments of the present invention. When the array substrate is applied in a display panel, the display panel has various display modes. Therefore, the array substrate of the present invention not only has favorable substrate utilization but also allows the display panel disposed with the array substrate to have better display modes and lower productions costs. In addition, the gate driving circuits and data driving circuits in the present invention are simply one type of circuit which transmits driving signals. Hence, the present invention is not limited thereto.

Although the present invention has been disclosed by the above embodiments, they are not intended to limit the present

invention. Anybody with ordinary knowledge in the art may make some modifications and alterations without departing from the spirit and scope of the present invention. Therefore, the protection range of the present invention falls in the appended claims.

What is claimed is:

1. A display panel, comprising:

a first substrate having a display region and a peripheral circuit region adjacent to the display region, the first substrate comprising:

a pixel array disposed in the display region;

a common trace, disposed in the peripheral circuit and being a continuous conductor;

a first trace, disposed in the peripheral circuit and connected with a first end of the common trace to form a first type test shorting bar;

a plurality of first signal source connection wires, wherein one of the plurality of first signal source connection wires is connected with the first end of the common trace through a contact window, and a material of the one of the first signal source connection wires is different from that of the common trace; and

a plurality of pixel array connection wires, wherein one of the plurality of pixel array connection wires is connected with a second end of the common trace such that the one of the first signal connection wires, the one of the pixel array connection wires and the common trace together form one of a plurality of wires disposed in the peripheral region and the wires are respectively electrically connected with the pixel array;

a second substrate disposed opposite to the first substrate; and

a liquid crystal layer disposed between the first substrate and the second substrate.

2. The display panel as claimed in claim 1, further comprising a data driving circuit connected with the first signal source connection wires, and the data driving circuit being adapted for transmitting a driving signal.

3. The display panel as claimed in claim 1, wherein each wire comprises a second signal source connection wire, the second signal source connection wire is electrically connected with a gate driving circuit, and the gate driving circuit is adapted for transmitting a driving signal.

4. The display panel as claimed in claim 1, further comprising a dummy test pad connected with a dummy first trace, the first trace and the dummy first trace disposed in the peripheral circuit region respectively adjacent to two sides of the display region, and the first trace is insulated from the dummy first trace.

5. The display panel as claimed in claim 1, further comprising an electrostatic protection shorting bar disposed in the peripheral circuit region, and the electrostatic protection shorting bar is insulated from the first test shorting bars.

6. The display panel as claimed in claim 1, further comprising a second type test shorting bar not connected with any one of first signal source connection wires and any one of pixel array connection wires.

7. The display panel as claimed in claim 1, wherein the first trace of the first type test shorting bars is connected with the one of the first signal source connection wires and the one of the pixel array connection wires through the common trace such that the common trace is used for transmitting driving signals and test signals.

专利名称(译)	显示面板带有测试短路棒		
公开(公告)号	US8755000	公开(公告)日	2014-06-17
申请号	US13/471425	申请日	2012-05-14
[标]申请(专利权)人(译)	友达光电股份有限公司		
申请(专利权)人(译)	友达光电股份有限公司		
当前申请(专利权)人(译)	友达光电股份有限公司		
[标]发明人	LIN JIAN HONG		
发明人	LIN, JIAN-HONG		
IPC分类号	G02F1/1333 G02F1/13 G02F1/1343		
CPC分类号	G02F1/1345 G02F2001/136272 G02F1/136259		
优先权	097126985 2008-07-16 TW		
其他公开文献	US20120268434A1		
外部链接	Espacenet USPTO		

摘要(译)

一种显示面板，包括第一基板，第二基板和液晶层。第一基板包括显示区域和与显示区域相邻的外围电路区域，第一基板包括像素阵列，多个测试短路棒和多个导线。像素阵列设置在显示区域中。测试短路棒设置在外围电路区域中。导线设置在外围电路区域中并与像素阵列电连接。此外，至少一根导线和一根测试短路棒分别共用一部分，用于彼此连接并形成共同的迹线。另外，第二基板与第一基板相对设置。液晶层设置在第一基板和第二基板之间。

