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(54) **Organic light-emitting display apparatus and method of manufacturing the same**

Organische lichtemittierende Anzeigevorrichtung und Herstellungsverfahren dafür

Appareil à affichage luminescent organique et son procédé de fabrication

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Description

BACKGROUND

1. Field

[0001] One or more embodiments of the present invention relate to an organic light-emitting display apparatus and a method of manufacturing the same.

2. Description of the Related Art

[0002] In general, an organic light-emitting display apparatus is manufactured by forming organic light-emitting diodes (OLEDs) on a lower substrate, and bonding the lower substrate and an upper substrate such that the OLEDs are positioned between the lower and upper substrates. The organic light-emitting display apparatus may be used as a display unit in small devices such as cellular phones, and in large devices such as televisions.

[0003] In the organic light-emitting display apparatus, a sealant is used to bond the lower and upper substrates. A region in which the sealant is disposed is regarded as a dead space, which is a non-display region.

[0004] US 2005/0184927 discloses a display device with penetration holes located in the conductive layer.

[0005] US2007/0195252 discloses a display device comprising a first substrate, at least one metallic pattern layer having a plurality of holes, a sealant, a second substrate and plural pixel units.

[0006] EP2164105 discloses an organic light emitting diode (OLED) display having improved mechanical strength by suppressing stripping through the use of a plurality of joining enhancement holes.

[0007] US2012/0146041 discloses an organic light emitting display apparatus including a semiconductor layer formed in a bonding area of a lower substrate, and a method of manufacturing the organic light emitting display apparatus.

SUMMARY

[0008] One or more embodiments of the present invention include an organic light-emitting display apparatus in which shock damage may be reduced and a method of manufacturing the same.

[0009] Additional aspects will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the presented embodiments.

[0010] According to the present invention, an organic light emitting display apparatus is as recited in claims 1, 13, 14.

[0011] Further aspects of the invention are defined in dependent claims.

[0012] According to another embodiment of the present invention, a method of manufacturing an organic light-emitting display apparatus is defined in claim 18. Additional aspects of the method are described in dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Aspects of the present invention will become more apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a cross-sectional view illustrating a portion of an organic light-emitting display apparatus, according to an embodiment of the present invention;
FIG. 2 is a graph illustrating a peel-off strength of a sealant according to an area of a plurality of penetration holes in an insulating layer of the organic light-emitting display apparatus of FIG. 1;
FIG. 3 is a plan view illustrating the plurality of penetration holes in the insulating layer of an organic light-emitting display apparatus, according to another embodiment of the present invention;
FIG. 4 is a plan view illustrating a plurality of penetration openings in a metal layer of an organic light-emitting display apparatus, according to another embodiment of the present invention;
FIG. 5 is a graph illustrating electrostatic discharge (ESD) durability according to a distance between the plurality of penetration openings in the metal layer of the organic light-emitting display apparatus of FIG. 4;
FIG. 6 is a cross-sectional view illustrating a portion of the organic light-emitting display apparatus, according to another embodiment of the present invention;
FIG. 7 is a plan view illustrating a plurality of penetration openings in a metal layer of the organic light-emitting display apparatus, according to still another embodiment of the present invention;
FIG. 8 is a cross-sectional view illustrating a portion of the organic light-emitting display apparatus, according to still another embodiment of the present invention; and
FIG. 9 is a cross-sectional view illustrating a portion of the organic light-emitting display apparatus, according to still another embodiment of the present invention.

DETAILED DESCRIPTION

[0014] Reference will now be made in some detail to embodiments, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. In this regard, the present embodiments may have different forms and should not be construed as being limited to the descriptions set forth herein. Accordingly, the embodiments are merely described below, by referring to the figures, to explain aspects of the present invention. Also, the thickness or size of each layer illustrated in the drawings is exaggerated for convenience of explanation and clarity.

[0015] In the following description, an x-axis, a y-axis, and a z-axis are not limited to three axes on a rectangular coordinate system and may be interpreted in a broader sense. For example, the x-axis, y-axis, and z-axis may be perpendicular to one another or may indicate different directions that are not perpendicular to one another.

[0016] Also, in the following description, when a constituent element such as a layer, a film, a region, or a plate is described to exist on another constituent element, the constituent element may exist directly on the other constituent element or another constituent element may be disposed therebetween.

[0017] As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items. Expressions such as "at least one of," when preceding a list of elements, modify the entire list of elements and do not modify the individual elements of the list.

[0018] FIG. 1 is a cross-sectional view illustrating a portion of an organic light-emitting display apparatus, according to an embodiment of the present invention. Referring to FIG. 1, the organic light-emitting display apparatus according to an embodiment of the present invention includes a lower substrate 110, an upper substrate 300, an insulating layer IL, and a sealant 400.

[0019] The lower substrate 110 includes a display area DA and a peripheral area PA that surrounds the display area DA. The lower substrate 110 may be formed by using various materials such as glass, metal, or plastic. A plurality of thin film transistors TFT are positioned in the display area DA of the lower substrate 110. Also, a plurality of organic light-emitting diodes (OLEDs) 200 that are electrically coupled to the plurality of thin film transistors TFT may be positioned in the display area DA. When the OLEDs 200 are electrically coupled to the plurality of the thin film transistors TFT, such a connection may be regarded as a plurality of pixel electrodes 210 being electrically coupled to the plurality of thin film transistors TFT.

[0020] Each thin film transistor TFT includes a semiconductor layer 130 that includes amorphous silicon or poly silicon, or an organic semiconductor; a gate electrode 150; and source/drain electrodes 170. On the lower substrate 110, a buffer layer 120 formed of silicon oxide or silicon nitride is positioned, so as to planarize a surface of the lower substrate 110 or to prevent impurities from penetrating into the semiconductor layer 130. The semiconductor layer 130 may be positioned on the buffer layer 120.

[0021] The gate electrode 150 is positioned on the semiconductor layer 130. The source/drain electrodes 170 electrically communicate with each other according to a signal that is applied to the gate electrode 150. Depending on an adhesion strength between adjacent layers, a degree of surface planarization of stacked layers, and processability, the gate electrode 150 may be formed to have a single or multi-layer structure by using at least one of materials such as aluminum (Al), platinum (Pt), palladium (Pd), silver (Ag), magnesium (Mg), gold (Au), nickel (Ni), neodymium (Nd), iridium (Ir), chromium (Cr), lithium (Li), calcium (Ca), molybdenum (Mo), titanium (Ti), tungsten (W), and copper (Cu). A gate insulating film 140, which is formed by using a material such as silicon oxide and/or silicon nitride, may be formed between the semiconductor layer 130 and the gate electrode 150 to insulate the semiconductor layer 130 from the gate electrode 150.

[0022] An interlayer insulating film 160 may be positioned on the gate electrode 150, and may be formed to have a single or multi-layer structure by using materials such as silicon oxide or silicon nitride.

[0023] The source/drain electrodes 170 are positioned on the interlayer insulating film 160. The source/drain electrodes 170 are electrically coupled to the semiconductor layer 130 respectively through contact holes, which are formed in the interlayer insulating film 160 and the gate insulating film 140. In consideration of conductivity, the source/drain electrodes 170 may be formed to have a single or multi-layer structure by using at least one of materials such as Al, Pt, Pd, Ag, Mg, Au, Ni, Nd, Ir, Cr, Li, Ca, Mo, Ti, W, and Cu.

[0024] A first insulating film 181, which is a protective film covering the thin film transistor TFT to protect the thin film transistor TFT having a structure as described above, may be provided. The first insulating film 181 may be formed of inorganic materials such as silicon oxide, silicon nitride, or silicon oxynitride. Although the first insulating film 181 is illustrated as a single layer in FIG. 1, the first insulating film 181 may be modified to have a multi-layer structure or may be modified in other various ways.

[0025] A second insulating film 182 may be positioned on the first insulating film 181. For example, when the OLED 200 is positioned on the thin film transistor TFT as shown in FIG. 1, the second insulating film 182, which operates as a planarization film for planarizing an upper surface of the first insulating film 181 that covers the thin film transistor TFT, may be provided. The second insulating film 182 may be formed of materials such as an acryl-based organic material or benzocyclobutene (BCB). Although the second insulating film 182 is illustrated as a single layer in FIG. 1, the second insulating film 182 may be modified to have a multi-layer structure or may be modified in other various ways.

[0026] In the display area DA of the lower substrate 110, the OLED 200, which includes the pixel electrode 210, an opposite electrode 230, and an intermediate layer 220 positioned between the pixel electrode 210 and the opposite electrode 230, is positioned on the second insulating film 182.

[0027] An opening, which exposes at least one of the source/drain electrodes 170, is provided in the first and second insulating films 181 and 182. The pixel electrode 210, which contacts either one of the source/drain electrodes 170 through the opening and thus is electrically coupled to the thin film transistor TFT, is positioned on the second insulating film 182. The pixel electrode 210 may be a (semi) transparent electrode or a reflective electrode. When the pixel electrode 210 is a (semi) transparent electrode, the pixel electrode 210 may be formed of materials such as indium tin oxide (ITO), indium zinc oxide (IZO), zinc oxide (ZnO), indium oxide (In_2O_3), indium gallium oxide (IGO), or aluminum zinc oxide (AZO). When the pixel electrode 210 is a reflective electrode, the pixel electrode 210 may include a reflective film formed of Ag, Mg, Al, Pt, Pd, Au, Ni, Nd, Ir, Cr, or a compound thereof, and a layer formed of ITO, IZO, ZnO, In_2O_3, or AZO. A structure and a material of the pixel electrode 210 are not limited thereto, and may be modified in various ways. For example, the pixel electrode 210 may be formed to have a single or multi-layer structure.

[0028] A third insulating film 183 may be positioned on the second insulating film 182. The third insulating film 183 is a pixel defining film, which defines a pixel by having an opening corresponding to each sub-pixel, that is, an opening through which at least a central portion of the pixel electrode 210 is exposed. In addition, the third insulating film 183 may prevent an arc or the like from occurring at an end portion of the pixel electrode 210 by increasing a distance between the end portion of the pixel electrode 210 and the opposite electrode 230 that is positioned on the pixel electrode 210. The third insulating film 183 may be formed of an organic material such as polyimide.

[0029] The intermediate layer 220 may include a low molecular weight material or a high molecular weight material. When the intermediate layer 220 includes a low molecular weight material, a hole injection layer (HIL), a hole transport layer (HTL), an emission layer (EML), an electron transport layer (ETL), or an electron injection layer (EIL) may be stacked to form a single or multiple layer structure. Also, various organic materials such as copper phthalocyanine (CuPc), N,N'-Di(naphthalene-1-yl)-N,N'-diphenyl-benzidine (NPB), or tris-8-hydroxyquinoline aluminum (Alq3) may be used to form the intermediate layer 220. The intermediate layer 220 may be formed by any suitable method such as using a vacuum deposition method.

[0030] When the intermediate layer 220 includes a high molecular weight material, the intermediate layer 220 may include the HTL and EML. In this case, the HTL may be formed of poly(3,4-ethylenedioxythiophene) (PEDOT), and the EML may be formed of a high molecular weight material such as poly-phenylenevinylene (PPV) or polyfluorene. The intermediate layer 220 may be formed by using a method such as a screen printing method, an inkjet printing method, or a laser induced thermal imaging (LITI) method.

[0031] The intermediate layer 220 is not limited to the structure described above, and may be modified in various ways.

[0032] The opposite electrode 230 is positioned on the display area DA to cover the display area DA as shown in FIG. 1. That is, the opposite electrode 230 may be integrally formed with a plurality of OLEDs 200 and correspond to the plurality of pixel electrodes 210. The opposite electrode 230 may be a (semi) transparent electrode or a reflective electrode. When the opposite electrode 230 is a (semi) transparent electrode, the opposite electrode 230 may include a layer formed of a conductive material or metal having a low work function, that is, Li, Ca, LiF/Ca, LiF/Al, Al, Ag, Mg, or a compound thereof, and a (semi) transparent conductive layer formed of ITO, IZO, ZnO, or In_2O_3. A structure and a material of the opposite electrode 230 are not limited thereto, and may be modified in various ways.

[0033] The upper substrate 300 corresponds to the lower substrate 110, and may be formed of various materials such as glass, metal, or plastic. The lower and upper substrates 300 and 110 may be bonded to each other by using the sealant 400.

[0034] The buffer layer 120, the gate insulating film 140, and the interlayer insulating film 160 may be referred collectively as the insulating layer IL (a first insulating layer recited in the claims). The insulating layer IL may be formed over the display area DA and the peripheral area PA of the lower substrate 110 as shown in FIG. 1. The insulating layer IL includes a plurality of penetration holes ILH1 and ILH2 in the peripheral area PA. The sealant 400 fills the plurality of penetration holes ILH1 and ILH2 of the insulating layer IL, and bonds the lower substrate 110 and the upper substrate 300. The sealant 400 may include frit or epoxy, but is not limited thereto.

[0035] The insulating layer IL recited in the claims need not be construed as a stack structure including the buffer layer 120, the gate insulating film 140, and the interlayer insulating film 160. For example, the insulating layer IL recited in the claims may be construed as a stack structure including only the interlayer insulating film 160. In this case, the buffer layer 120 and gate insulating film 140 need not include the plurality of penetration holes ILH1 and ILH2.

[0036] For some cases, the insulating layer IL recited in the claims may include the gate insulating film 140 and the interlayer insulating film 160, thus the gate insulating film 140 and the interlayer insulating film 160 may include the plurality of penetration holes ILH1 and ILH2, and the buffer layer 120 need not be patterned. In these cases, the buffer layer 120 may be regarded as a second insulating layer recited in the claim that is interposed between the lower substrate 110 and the insulating layer IL.

[0037] To use the sealant 400 and relatively securely bond the lower and upper substrates 110 and 300 to each other, a sufficient contact area is to be provided. However, the greater an area of the sealant 400 (which may be regarded as a width 400A of the sealant 400 in FIG. 1), the greater the dead space, that is, an area of the peripheral area PA, outside of the display area DA. Therefore, the area of the sealant 400 is to be decreased so as to reduce the dead space. In the organic light-emitting display apparatus according to an embodiment of the present invention, the insulating layer IL includes the plurality of penetration holes ILH1 and ILH2. Accordingly, while an area of the sealant 400 on a surface parallel to the lower substrate 110 (an XY surface) is reduced, an area of the sealant 400 that contacts elements on the lower substrate 110, that is, the insulating layer IL, may be maintained or expanded. Thus, by reducing the area of the sealant 400, the dead space may be reduced while an adhesion strength of the sealant 400 that bonds the lower and upper substrates 110 and 300 to each other may be maintained or improved.

[0038] FIG. 2 is a graph illustrating a peel-off strength (e.g., an adhesion strength) of the sealant 400 based on an area of the plurality of penetration holes ILH1 and ILH2 in the insulating layer IL of the organic light-emitting display apparatus of FIG. 1. In the surface parallel to the lower substrate 110 (the XY surface), a ratio of the area of the sealant 400 to the total area of the plurality of penetration holes ILH1 and ILH2 in the insulating layer IL is shown on an x-axis; and the peel-off strength, which is a force that separates the lower substrate 110 from the sealant 400, is shown on a y-axis. A relationship between the ratio of the area of the sealant 400 to the total area of the plurality of penetration holes ILH1 and ILH2 and the peel-off strength may be represented as $y=0.0316x+5.8042$, which is determined by carrying out an experiment multiple times. A unit of the peel-off strength is a weight (kg) applied on 19 mm width X 19 mm height area; a unit of the ratio is a percentage (%).

[0039] In mobile devices that include an organic light-emitting display apparatus as a display unit, a maximum peel-off strength that the organic light-emitting display apparatus may be able to endure in a general usage environment may be, for example, 6.11kg. The maximum peel-off strength may be regarded as a maximum impact force that may be applied to the organic light-emitting display apparatus when the organic light-emitting display apparatus makes an impact with a surface (e.g., by falling or being dropped on a surface or the ground). In order to prevent the sealant 400 from being faulty under such conditions, the ratio of the area of the sealant 400 to the area of the plurality of penetration holes ILH1 and ILH2 in the insulating layer IL is to be about 9.8% or more, as shown using a dotted line in FIG. 2.

[0040] Referring back to FIG. 1, the organic light-emitting display apparatus may include a metal layer 150' (conductive layer) which is formed between the lower substrate 110 and the insulating layer IL in the peripheral area PA and includes a plurality of penetration openings 150A. The metal layer 150' may be extended into the display area DA. As described above, because the display area DA includes the thin film transistor TFT including the gate electrode 150, the metal layer 150' may include the same material as that of the gate electrode 150. Specifically, the metal layer 150' and the gate electrode 150 may be formed on the same layer. In FIG. 1, the metal layer 150' is illustrated as being formed on the gate insulating film 140, like the gate electrode 150. In some embodiments, the metal layer 150' may include the same material and be formed on the same layer as that of the source/drain electrode 170 of the thin film transistor TFT. For convenience of description, an embodiment in which the metal layer 150' includes the same material and is formed on the same layer as that of the gate electrode 150 will be described hereinafter.

[0041] When bonding the lower and upper substrates 110 and 300 by using the sealant 400, ultraviolet (UV) light or a laser beam may irradiate the sealant 400 to cure the sealant 400. Specifically, the UV light or laser beam may penetrate through the upper substrate 300 and irradiate the sealant 400. Then, the UV light or laser beam that has reached the sealant 400 may be reflected off the metal layer 150' under the sealant 400, and be redirected toward the sealant 400. Therefore, the UV light or laser beam may irradiate the sealant 400 more efficiently.

[0042] An area of the sealant 400 contacting the upper substrate 300 may be relatively easily observed through the upper substrate 300 formed of a transparent material. However, the area of the sealant 400 contacting the lower substrate 110 may not be observed through the opaque metal layer 150'. Therefore, by including the plurality of penetration openings 150A in the metal layer 150', depending on whether or not the sealant 400 may be observed through the plurality of penetration openings 150A in the metal layer 150', the area of the sealant 400 contacting the lower substrate 110 may be identified. Accordingly, a faulty sealing may be easily identified by identifying whether or not the area of the sealant 400 contacting the upper substrate 300 and/or lower substrate 110 are/is the same as or greater than a minimum value of an area (e.g., a predetermined area).

[0043] An inner surface 150a' of each of the plurality of penetration openings 150A in the metal layer 150' may be covered by using the insulating layer IL so as to not contact the sealant 400. In FIG. 1, the metal layer 150' is covered by using the interlayer insulating film 160, and accordingly, the inner surface 150a' of each of the plurality of penetration openings 150A in the metal layer 150' does not contact the sealant 400.

[0044] The plurality of penetration holes ILH1 and ILH2 in the insulating layer IL may be formed by concurrently (e.g., simultaneously) etching the buffer layer 120, gate insulating film 140, and interlayer insulating film 160. During this process, when the inner surface 150a' of each of the plurality of penetration openings 150A in the metal layer 150' is exposed through the plurality of penetration holes ILH1 and ILH2, the metal layer 150' in which the plurality of penetration openings 150A are already formed may be additionally etched. Thus, problems such as enlargement of an area of the plurality of penetration openings 150A in the metal layer 150' may occur. To prevent or reduce such a problem from occurring, the inner surface 150a' of each of the plurality of penetration openings 150A in the metal layer 150' may be covered by using the insulating layer IL so as to not contact the sealant 400. A problem that may occur when the area of the plurality of penetration openings 150A in the metal layer 150' is larger than a predetermined area will be described below.

[0045] FIG. 3 is a plan view illustrating the plurality of penetration holes in the insulating layer IL of an organic light-emitting display apparatus, according to one embodiment of the present invention. FIG. 1 may be interpreted as a cross-sectional view according to the line I-I of FIG. 3.

[0046] In FIG. 3, the sealant 400 is illustrated, and the plurality of penetration holes in the insulating layer IL that are formed under the sealant 400 are illustrated in solid lines for convenience.

[0047] As shown in FIG. 3, the insulating layer IL of the organic light-emitting display apparatus according to the present embodiment includes a plurality of penetration holes sets ILHS. Each of the plurality of penetration hole sets may include two or more penetration holes. An embodiment in which each of the plurality of penetration hole sets includes four penetration holes is illustrated in FIG. 3.

[0048] A distance ILHT between two or more penetration holes of each of the plurality of penetration hole sets ILHS in the insulating layer IL (hereinafter, referred to as "distance ILHT") may be 2.5 μm or more. When the distance ILHT is less than 2.5 μm, an area of the sealant 400 contacting the insulating layer IL may be reduced. Thus, the insulating layer IL between the adjacent penetration holes may collapse and form a single penetration hole. In this case, the distance ILHT is not a distance between the center of the plurality of penetration holes, but a distance between an inner surface of a penetration hole facing another penetration hole and an inner surface of another penetration hole facing a penetration hole, when a penetration hole and another penetration hole are adjacent to each other. That is, the distance ILHT may be regarded as a thickness of the insulating layer IL between the plurality of penetration holes.

[0049] FIG. 4 is a plan view illustrating a plurality of penetration openings 150A in the metal layer 150' of an organic light-emitting display apparatus, according to one embodiment of the present invention. FIG. 1 may be interpreted as a cross-sectional view according to the line I-I of FIG. 4. The metal layer 150' may include the plurality of penetration openings 150A that are arranged repeatedly as shown in FIG. 4. As described above, depending on whether or not the sealant 400 may be observed through the plurality of penetration openings 150A in the metal layer 150', the area of the sealant 400 contacting the lower substrate 110 may be identified.

[0050] The plurality of penetration hole sets ILHS in the insulating layer IL are formed to correspond to the plurality of penetration openings 150A in the metal layer 150'. The plurality of penetration holes included in the plurality of penetration hole sets ILHS may be extended to the buffer layer 120 through the plurality of penetration openings 150A in the metal layer 150', in which the buffer layer 120 is positioned directly above the lower substrate 110. Accordingly, because the sealant 400 may directly contact the lower substrate 110, an adhesion strength of the sealant 400 may be improved.

[0051] As described above, each inner surface 150a' of the plurality of penetration openings 150A in the metal layer 150' may be covered by using the insulating layer IL so as to not contact the sealant 400. To do so, an area of each of the plurality of penetration hole sets ILHS in the insulating layer IL may be narrower than an area of each of the plurality of penetration openings 150A, as shown in FIGS. 3 and 4.

[0052] FIG. 5 is a graph illustrating electrostatic discharge (ESD) durability according to a distance 150'W between the plurality of penetration openings 150A in the metal layer 150' (hereinafter, referred to as "distance 150'W") of the organic light-emitting display apparatus of FIG. 4. As described above, the metal layer 150' may be formed on the same layer as that of the gate electrode 150 of the thin film transistor TFT in the display area DA. Thus, in the surface parallel to the lower substrate 110 (the XY surface), the distance 150'W may be regarded as a width of a gate metal wiring.

[0053] The narrower the width of the gate metal wiring, the larger the resistance of the gate metal wiring. Therefore, even when static electricity of equal strength is applied to the metal layer 150', the narrower the width of the gate metal wiring, the greater the amount of heat that may be generated momentarily. As the amount of heat generated in the metal layer 150' increases, the adhesive properties of the sealant may decrease (e.g., the sealant 400 may peel off) or a degree of hardness of the sealant 400 may be reduced. Thus, the width of the gate metal wiring, that is, the distance 150'W, is to be appropriately adjusted.

[0054] In FIG. 5, the y-axis shows values of a strength of static electricity that may be applied to the metal layer 150', that is an ESD applied voltage; the x-axis shows a minimum width of the gate metal wiring that may cause the sealant 400 to peel off or a degree of hardness of the sealant 400 to be reduced, when the values of a strength of static electricity is applied to the metal layer 150'. A relationship between the minimum width of the gate metal wiring and the strength of the ESD applied voltage may be represented, for example, as $y=0.2959x+5.9694$, which is determined by carrying out an experiment multiple times. A unit of the width of the gate metal wiring is μm; a unit of the ESD applied voltage is kV.

[0055] As described above, static electricity may be generated during a process of manufacturing an organic light-emitting display apparatus or during a process of using the organic light-emitting display apparatus, and the static electricity may be transmitted to the metal layer 150'. In this case, when resistance of the metal layer 150' is large, heat may be generated in the metal layer 150' and thus weaken an adhesion strength of the (cured) sealant 400 or reduce hardness of the sealant 400.

[0056] In mobile devices that include an organic light-emitting display apparatus as a display unit, a maximum ESD applied voltage that the organic light-emitting display apparatus may be able to endure in a general usage environment is 12kV. The maximum ESD applied voltage may be regarded as a maximum strength of static electricity that may be applied to an organic light-emitting display apparatus when manufacturing or using the organic light-emitting display apparatus in a general usage environment. In order to prevent the sealant 400 from being faulty in such an environment, in a surface parallel to the lower substrate 110 (XY surface), the distance 150'W may be about 20.5 μm or more, as shown using a dotted line in FIG. 5.

[0057] Because the distance 150'W may be about 20.5 μm or more, in the surface parallel to the lower substrate 110 (the XY surface), the area of each of the plurality of penetration openings 150A in the metal layer 150' has an upper limit. Accordingly, the area of the plurality of penetration holes in the insulating layer IL, which are positioned in the plurality of penetration openings 150A in the metal layer 150', may also have an upper limit. When the distance 150'W is about 20.5 μm, in the surface parallel to the lower substrate 110 (the XY surface), the area of the plurality of penetration holes in the insulating layer IL may be about 16.5% of or less than the area of the sealant 400. Thus, in the surface parallel to the lower substrate 110 (the XY surface), a ratio of the area of the plurality of penetration holes ILH1 and ILH2 in the insulating layer IL to the area of the sealant 400 may be between about 9.8% and about 16.5%.

[0058] Although the insulating layer IL is illustrated as including the buffer layer 120, gate insulating film 140 and interlayer insulating film 160 in FIG. 1, the insulating layer IL is not limited thereto. For example, the first insulating film 181 may be extended to the peripheral area PA and thus be included in the insulating layer IL as an element thereof, and may include a plurality of penetration holes in the peripheral area PA.

[0059] FIG. 6 is a cross-sectional view illustrating a portion of the organic light-emitting display apparatus according to another embodiment of the present invention. Referring to FIG. 6, the insulating layer IL includes only the gate insulating film 140 and the interlayer insulating film 160, and the buffer layer 120 does not include a penetration hole. In this case, the buffer layer 120 may be regarded as a second insulating layer recited in the claim that is positioned between the lower substrate 110 and the insulating layer IL.

[0060] Accordingly, the insulating layer IL may be regarded as an extended portion of at least one of the buffer layer 120, the gate insulating film 140, the interlayer insulating film 160, and the first insulating film 181 that is a protective film.

[0061] FIG. 7 is a plan view illustrating a plurality of penetration openings 150A in a metal layer of the organic light-emitting display apparatus according to still another embodiment of the present invention. In this case, FIG. 1 may be interpreted as a cross-sectional view according to the line I-I of FIG. 7.

[0062] Referring to FIGS. 1 and 7, the organic light-emitting display apparatus may include the metal layer 150' which is formed between the lower substrate 110 and the insulating layer IL in the peripheral area PA or formed in the insulating layer IL in the peripheral area PA, includes a plurality of penetration openings 150A, and includes a width-change part. FIG 1 shows that the metal layer 150' is formed in the insulating layer IL, i.e., the metal layer 150' is interposed between the gate insulating film 120 and the interlayer insulating film 160. FIG 7 shows that the metal layer 150' includes the width-change part, the width of which decreases from W1 to W2 and then increases from W2 to W1 in +y-axis direction. The metal layer 150' may be extended into the display area DA.

[0063] Because the metal layer 150' includes a metal, the metal layer 150' may shield an electromagnetic wave due to the characteristics of the metal. However, if the organic light-emitting display apparatus is used in a mobile apparatus such as a mobile phone, the metal layer 150' in the organic light-emitting display apparatus may shield the electromagnetic wave so that receiving sensibility of an antenna may decrease.

[0064] However, according to the organic light-emitting display apparatus of the present embodiment, the metal layer 150' includes the width-change part. Thus, it is possible to prevent the receiving sensibility of an antenna from decreasing by the width-change part which is formed to correspond to the position of the antenna. For example, a portion A shown in FIG. 7 may corresponds to the position of the antenna.

[0065] The width-change part of the metal layer 150' may be formed in other positions which does not correspond to the position of the antenna. For example, if a certain part of the edge portion of the organic light-emitting display apparatus is vulnerable to static electricity, the width-change part of the metal layer 150' may correspond to the certain part. Because the static electricity may be induced by the metal layer 150', it is possible to decrease the possibility of the static electricity inducement by the width-change part wherein the width of the metal layer 150' decreases.

[0066] Because the metal layer 150' has the width-change part, the insulating layer IL may include a first portion and a second portion. The first portion of the insulating layer IL contacts a layer beneath the metal layer 150' through the plurality of penetration openings 150A of the metal layer 150', and the second portion of the insulating layer IL contacts the layer beneath the metal layer 150' outside the metal layer 150' in a portion of the width-change part in which the width of the metal layer 150' decreases. In case of FIGS. 1 and 7, the first portion of the insulating layer IL contacts the lower substrate 110 through the plurality of penetration openings 150A of the metal layer 150', and the second portion of the insulating layer IL contacts the lower substrate 110 directly outside of the metal layer 150' in the portion A.

[0067] FIG. 8 is a cross-sectional view illustrating a portion of the organic light-emitting display apparatus, according to still another embodiment of the present invention. According to the present embodiment of the invention, the metal layer 150' may be formed between the lower substrate 110 and the insulating layer IL in the peripheral area PA or formed in the insulating layer IL in the peripheral area PA, includes a plurality of penetration openings 150A. The metal layer 150' is formed in the peripheral area PA, however, the metal layer 150' is formed to be located biasedly to the display area DA in relation with the center of the peripheral area PA. For example, the metal layer 150' is located biasedly to the display area DA in relation with the central axis 400CA of the sealant 400.

[0068] It is possible to maintain or improve the adhesion strength between the sealant 400 and the lower substrate 110 because the contact area between the sealant 400 and the insulating layer IL increases due to the plurality of penetration holes ILH1 and ILH2. In order to increase the adhesion strength between the sealant 400 and the lower substrate 110, it is preferable to increase the number of the plurality of penetration holes ILH1 and ILH2. However, the position of the plurality of penetration holes ILH2 and ILH2 is limited due to the penetration openings 150A of the metal layer 150'. Thus, there is a limitation in increasing the number of the plurality of penetration holes ILH1 and ILH2 in a portion of the insulating layer IL corresponding to the metal layer 150'.

[0069] According to the present embodiment of the invention, the metal layer 150' is located biasedly to the display area DA in relation with the center of the peripheral area PA. Thus, the metal layer 150' does not exist in the most part of a outer region of the organic light-emitting display apparatus in relation with the central axis 400CA of the sealant 400. Therefore, the plurality of penetration holes ILH3 of the insulating layer IL may be formed regardless of the penetration openings 150A of the metal layer 150' in that region. As a result, by increasing the number of the penetration holes ILH3 per unit area in the most part of the outer region of the organic light-emitting display apparatus, it is possible to increase the contact area between the sealant 400 and the insulating layer IL. In this case, the number of the penetration holes ILH3 of the insulating layer IL per unit area in a region where the insulating layer IL does not correspond to the metal layer 150' may be higher than the number of the penetration holes ILH1 and ILH2 of the insulating layer per unit area in a region where the insulating layer IL corresponds to the metal layer 150'.

[0070] The metal layer 150' still exists in a region of the peripheral area PA in a direction to the display area DA. This is in order to protect the intermediate layer 220 of the plurality of OLEDs 200. The intermediate layer 220 is vulnerable to the impurities such as oxide or moisture. Thus, it is necessary to increase hardness of a portion of the sealant 400, the portion being close to the display area DA.

[0071] In order to increase hardness of the portion of the sealant 400, it is necessary to irradiate the portion of the sealant 400 with the UV light or the laser beam sufficiently. Because the metal layer 150' still exists in the region of the peripheral area PA in a direction to the display area DA, the UV light or the laser beam irradiated onto the sealant 400 and penetrating the sealant 400 is reflected by the metal layer 150' and reaches the sealant 400 again, thus the portion of the sealant 400 is sufficiently irradiated by the UV light or the laser beam.

[0072] FIG. 9 is a cross-sectional view illustrating a portion of the organic light-emitting display apparatus, according to still another embodiment of the present invention. According to the present embodiment of the invention, the organic light-emitting display apparatus comprises a dummy semiconductor layer 130'. The dummy semiconductor layer 130' may be formed on or under the insulating layer IL in the peripheral area PA, or formed in the insulating layer IL in the peripheral area PA. The dummy semiconductor layer 130' has a plurality of penetration apertures corresponding to the plurality of penetration holes ILH1 and ILH2. FIG. 9 shows that the dummy semiconductor layer 130' locates in the insulating layer IL, i.e., locates between the buffer layer 120 and the gate insulating layer 140. The sealant 400 fills the plurality of penetration holes ILH1 and ILH2 and the plurality of penetration apertures.

[0073] As described above, to use the sealant 400 and relatively securely bond the lower and upper substrates 110 and 300 to each other, a sufficient contact area is to be provided. According to the organic light-emitting display apparatus shown in FIG. 9, the depth of the plurality of penetration holes ILH1 and ILH2 becomes deeper due to the presence of the dummy semiconductor layer 130'. This increase in depth means the increase of contact area between the sealant 400 and the insulating layer IL (including the dummy semiconductor layer 130'), thus the adhesion strength between the sealant 400 and the lower substrate 110 becomes strong.

[0074] As described above, because the display area DA includes the thin film transistor TFT including the semiconductor layer 130, the dummy semiconductor layer 130' may include the same material as that of the semiconductor layer 130. Specifically, the dummy semiconductor layer 130' and the semiconductor layer 130 may be formed on the same layer. In FIG. 9, the dummy semiconductor layer 130' is illustrated as being formed on the buffer layer 120, like the semiconductor layer 130.

[0075] Although an organic light-emitting display apparatus is described above, the present invention is not limited thereto. For example, a method of manufacturing an organic light-emitting display apparatus may also be included in the scope of the present invention.

[0076] A method of manufacturing the organic light-emitting display apparatus according to an embodiment of the present invention will now be described. The method includes preparing the lower substrate 110 which includes the display area DA and the peripheral area PA that surrounds the display area DA; and forming the insulating layer IL over the display area DA and the peripheral area DA of the lower substrate 110, and includes forming the plurality of penetration holes ILH1 and ILH2 in the peripheral area PA.

[0077] The buffer layer 120, gate insulating film 140 and interlayer insulating film 160 may be formed over the display area DA and the peripheral area PA of the lower substrate 110. Then, a penetration hole that exposes a portion of the source/drain electrodes 170 of the thin film transistor TFT in the display area DA may be formed to couple the pixel electrode 210 to the source/drain electrodes 170. At the same time, the plurality of penetration holes ILH1 and ILH2 penetrating through the buffer layer 120, gate insulating film 140 and interlayer insulating film 160 in the peripheral area PA may be formed. In this case, the insulating layer IL may be regarded as including the buffer layer 120, gate insulating film 140 and interlayer insulating film 160. The insulating film IL may include at least one of the buffer layer 120, gate insulating film 140, and interlayer insulating layer 160 (in FIG. 6, the insulating layer IL may be regarded as not including the gate insulating film 140 and interlayer insulating film 160), and/or further include at least one of the first protective film 181 and second protective film 182.

[0078] Next, the OLED 200 and other elements are formed. Then, the upper substrate 300 which corresponds to the lower substrate 100 is prepared. The upper substrate 300 may be prepared before processing the lower substrate 110, or the upper substrate 300 may be prepared while processing the lower substrate 110. Here, processing the lower substrate 110 may mean forming the insulating layer IL on the lower substrate 110, etc.. Then, the plurality of penetration holes in the insulating layer IL are filled (or substantially filled) with the sealant 400, and the lower and upper substrates 110 and 300 are bonded to each other by using the sealant 400.

[0079] When forming the thin film transistor TFT while forming the gate electrode 150, the metal layer 150', which is located in the peripheral area PA of the lower substrate 110 and includes the plurality of penetration openings 150A may be formed. In the forming of the insulating layer IL, the metal layer 150' may be formed to be positioned between the lower substrate 110 and the insulating layer IL. Furthermore, in the forming of the insulating layer IL, the insulating layer IL is formed to include the plurality of penetration hole sets ILHS that correspond to the plurality of penetration openings 150A in the metal layer 150', in which each of the plurality of penetration hole sets ILHS includes two or more penetration holes.

[0080] In the forming of the insulating layer IL, the insulating layer IL may be formed so that a minimum distance between two or more penetration holes in each of the plurality of penetration hole sets ILHS in the insulating layer 150 is about 2.5 μm or more. The minimum distance may provide the same characteristics as described earlier above.

[0081] The metal layer 150' may be formed so that a minimum distance between the plurality of penetration openings 150A is about 20.5 μm or more. The minimum distance may provide the same characteristics as described earlier above with respect to static electricity.

[0082] The insulating layer IL may be formed so that in the surface parallel to the lower substrate 110 (the XY surface), a total area of the plurality of penetration holes ILH1 and ILH2 in the insulating layer IL may be between about 9.8% and about 16.5% of the area of the sealant 400. The lower limit and upper limit may provide the same characteristics as described earlier above.

[0083] In the forming of the insulating layer IL, the buffer layer 120, gate insulating film 140, and interlayer insulating film 160 may be formed over the display area DA and the peripheral area PA of the lower substrate 110; and the plurality of penetration holes penetrating through the buffer layer 120, gate insulating film 140, and interlayer insulating film 160 may be formed.

[0084] The metal layer 150' may be formed to have a width-change part in which the width of the metal layer 150' changes, as shown in FIG. 7.

[0085] The metal layer 150' may be formed biasedly to the display area DA, as shown in FIG. 8.

[0086] A dummy semiconductor layer 130' may be formed on or under the insulating layer IL in the peripheral area PA, or formed in the insulating layer IL in the peripheral area PA, as shown in FIG. 9. The dummy semiconductor layer 130' may have a plurality of penetration apertures corresponding to the plurality of penetration holes ILH1 and ILH2. The dummy semiconductor layer 130' may be formed to include the same material as that of the semiconductor layer 130. Specifically, the dummy semiconductor layer 130' and the semiconductor layer 130 may be formed on the same layer.

[0087] As described above, according to the one or more of the above embodiments of the present invention, an organic light-emitting display apparatus in which shock damage may be reduced and a method of manufacturing the same are provided.

[0088] It should be understood that the example embodiments described therein should be considered in a descriptive sense only and not for purposes of limitation. Descriptions of features or aspects within each embodiment should typically be considered as available for other similar features or aspects in other embodiments.

[0089] While one or more embodiments of the present invention have been described with reference to the figures, it will be understood by those of ordinary skill in the art that various changes in form and details may be made therein without departing from the scope of the present invention as defined by the following claims.

Claims

1. An organic light-emitting display apparatus compris-

ing: a lower substrate (110) comprising a display area (DA) and a peripheral area (PA) situated outside the display area (DA);
a first insulating layer (IL) on the display area (DA) and the peripheral area (PA) of the lower substrate (110), wherein a plurality of penetration holes (ILHS) are formed in the first insulating layer (IL) in the peripheral area (PA);
a conductive layer (150') located in the peripheral region, between the lower substrate (110) and the first insulating layer (IL) or located in the first insulating layer (IL), wherein a plurality of penetration openings (150A) are formed in the conductive layer (150');an upper substrate (300) on the lower substrate (110); and
a sealant (400) in the plurality of penetration holes (ILHS) and in the plurality of penetration openings (150A) bonding the lower substrate (110) to the upper substrate (300), **characterized in that** the first insulating layer (IL) comprises a plurality of penetration hole sets (ILHS), each of the plurality of penetration hole sets (ILHS) comprises two or more of the penetration holes (ILH1,ILH2,ILH3), and each of the plurality of penetration hole sets (ILHS) corresponds to one of the plurality of penetration openings (150A) in the conductive layer (150').

2. An organic light-emitting display apparatus according to claim 1, further comprising a second insulating layer (120) between the lower substrate (300) and the first insulating layer (IL).

3. An organic light-emitting display apparatus according to claims 1 or 2, wherein an area of each of the plurality of penetration hole sets (ILHS) in the first insulating layer (IL) is narrower than an area of each of the plurality of penetration openings (150A) in the conductive layer (150').

4. An organic light-emitting display apparatus of claims 1 or 3, wherein a distance between the two or more of the penetration holes (ILH1,ILH2,ILH3) in each of the plurality of penetration hole sets (ILHS) in the first insulating layer (IL) is 2.5 μm or more.

5. An organic light-emitting display apparatus according to one of claims 1 to 4, wherein an inner surface of each of the plurality of penetration openings (150A) in the conductive layer (150') is covered by the first insulating layer (IL), and does not contact the sealant (400).

6. An organic light-emitting display apparatus according to one of claims 1 to 5, wherein a distance between the plurality of penetration openings (150A) in the conductive layer (150') is 20.5 μm or more.

7. An organic light-emitting display apparatus according to one of claims 1 to 6, wherein the display area (DA) comprises a thin film transistor (TFT) comprising a gate electrode (150), and wherein the conductive layer (150') comprises a same material as that of the gate electrode (150) in the thin film transistor (TFT).

8. An organic light-emitting display apparatus of claim 7, wherein the conductive layer (150') and the gate electrode (150) are disposed on a same layer.

9. An organic light-emitting display apparatus according to any preceding claim, wherein in a surface parallel to the lower substrate (110), a total area of the plurality of penetration holes (ILHS) in the first insulating layer (IL) is in a range of 9.8% and 16.5% of an area of the sealant (400).

10. The organic light-emitting display apparatus according to any preceding claim, wherein the display area (DA) comprises a buffer layer (120), a gate insulating film (140), an interlayer insulating film (160), and a protective film (181,182), and wherein the first insulating layer (IL) is an extended portion of at least one of the buffer layer (120), the gate insulating film (140), the interlayer insulating film (160), and the protective film (181,182).

11. An organic light-emitting display apparatus according to claim 1 or any claim dependent upon claim 1, wherein the conductive layer (150') has a width-change part in which a width of the conductive layer (150') changes.

12. An organic light-emitting display apparatus of claim 11, wherein the first insulating layer (IL) has a first portion and a second portion, the first portion contacting a layer beneath the conductive layer (150') through the plurality of penetration openings (150A) of the conductive layer (150'), the second portion contacting the layer beneath the conductive layer (150') outside the conductive layer (150') in a region of the width-change part of the conductive layer (150').

13. An organic light-emitting display apparatus comprising:

a lower substrate (110) comprising a display area (DA) and a peripheral area (PA) situated outside the display area (DA);
a first insulating layer (IL) on the display area (DA) and the peripheral area (PA) of the lower substrate (110), wherein a plurality of penetration holes (ILHS) are formed in the first insulating layer (IL) in the peripheral area (PA);
a conductive layer (150') located in the peripheral region, between the lower substrate (110)

and the first insulating layer (IL) or located in the first insulating layer (IL), wherein a plurality of penetration openings (150A) are formed in the conductive layer (150');
an upper substrate (300) on the lower substrate (110); and a sealant (400) in the plurality of penetration holes (ILHS) and in the plurality of penetration openings (150A) bonding the lower substrate (110) to the upper substrate (300),
characterized in that the conductive layer is located biasedly to the display area in relation with the central axis of the sealant such that the conductive layer does not exist in the most part of an outer region of the organic light emitting diode apparatus in relation with the central axis of the sealant, the outer region being covered by the sealant.

14. An organic light-emitting display apparatus comprising:

a lower substrate (110) comprising a display area (DA) and a peripheral area (PA) situated outside the display area (DA);
a first insulating layer (IL) on the display area (DA) and the peripheral area (PA) of the lower substrate (110), wherein a plurality of penetration holes (ILHS) are formed
in the first insulating layer (IL) in the peripheral area (PA);
a conductive layer (150') located in the peripheral region, between the lower substrate (110) and the first insulating layer (IL) or located in the first insulating layer (IL), wherein a plurality of penetration openings (150A) are formed in the conductive layer (150');
an upper substrate (300) on the lower substrate (110); and
a sealant (400) in the plurality of penetration holes (ILHS) and in the plurality of penetration openings (150A) bonding the lower substrate (110) to the upper substrate (300),
characterized in that the number of the plurality of penetration holes (ILHS) of the first insulating layer (IL) per unit area in a region where the first insulating layer (IL) does not overlap with the conductive layer (150') and outside the conductive layer (150') is higher than the number of the plurality of penetration holes (ILHS) of the first insulating layer (IL) per unit area in a region where the insulating layer (IL) overlaps with the conductive layer (150') or with the plurality of penetration holes (150A) of the conductive layer (150').

15. An organic light-emitting display apparatus according to any preceding claim, further comprising a dummy semiconductor layer (130') on or under the insulating layer (IL) or in the insulating layer (IL), wherein the dummy semiconductor layer (130') is located in the peripheral area (PA), and has a plurality of penetration apertures corresponding to the plurality of penetration holes (ILHS) of the insulating layer (IL), and wherein the sealant (400) fills the plurality of penetration apertures and the plurality of penetration holes (ILHS).

16. An organic light-emitting display apparatus according to claim 15, wherein the display area (DA) comprises a thin film transistor (TFT) comprising a semiconductor layer (130), and wherein the dummy semiconductor layer (130') comprises a same material as that of the semiconductor layer (130) in the thin film transistor (TFT).

17. An organic light-emitting display apparatus according to claim 16, wherein the dummy semiconductor layer (130') and the semiconductor layer (130) are disposed on a same layer.

18. A method of manufacturing an organic light-emitting display apparatus, the method comprising:

preparing a lower substrate (110) comprising a display area (DA) and a peripheral area (PA) outside the display area (DA);
forming a conductive layer (150') in the peripheral area (PA) of the lower substrate (110), the conductive layer (150') comprising a plurality of penetration openings (150A);
forming an insulating layer (IL) over the display area (DA) and the peripheral area (PA) of the lower substrate (110) so that the conductive layer (150') is between the lower substrate (110) and the insulating layer or within the insulating layer; forming a plurality of penetration hole sets (ILHS) in the insulating layer in the peripheral area (PA), each of the plurality of penetration hole sets (ILHS) comprising two or more penetration holes (ILH1,ILH2,ILH3), each of the plurality of penetration hole sets (ILHS) corresponding to one of the plurality of penetration openings (150A) in the conductive layer (150'); arranging an upper substrate (300) to corresponds to the lower substrate (110); and bonding the lower substrate (110) and the upper substrate (300) by using a sealant (400), the sealant filling the plurality of penetration holes (ILHS) in the insulating layer and the plurality of penetration openings (150A) in the conductive layer.

19. A method according to claim 18, wherein a distance between the two or more of the penetration holes (ILHT) in each of the plurality of penetration hole sets (ILHS) in the insulating layer is 2.5 μm or more.

20. A method according to one of claims 18 to 19, wherein a distance between the plurality of penetration openings (150'W) is 20.5 μm or more.

21. A method according to one of claims 18 to 20, wherein a total area of the plurality of penetration holes (ILHS) in the insulating layer (IL) is in a range of 9.8% and 16.5% of an area of the sealant (400).

22. A method according to one of claims 18 to 21, wherein forming the insulating layer (IL) comprises forming a buffer layer (120), a gate insulating film (140), an interlayer insulating film (160), and a protective film (181,182) over the display area (DA) and the peripheral area (PA) of the lower substrate (110), and forming the plurality of penetration holes (ILHS) through the buffer layer (120), the gate insulating film (140), the interlayer insulating film (160), and the protective film (181,182).

Patentansprüche

1. Organische Licht emittierende Anzeigevorrichtung, die Folgendes umfasst:

ein unteres Substrat (110), das eine Anzeigefläche (DA) und eine Randfläche (PA), die außerhalb der Anzeigefläche (DA) angeordnet ist, umfasst,
eine erste isolierende Schicht (IL) auf der Anzeigefläche (DA) und der Randfläche (PA) des unteren Substrats (110), wobei mehrere Durchdringungslöcher (ILHS) in der ersten isolierenden Schicht (IL) in der Randfläche (PA) geformt sind,
eine leitfähige Schicht (150'), die in dem Randbereich, zwischen dem unteren Substrat (110) und der ersten isolierenden Schicht (IL), angeordnet ist oder in der ersten isolierenden Schicht (IL) angeordnet ist, wobei mehrere Durchdringungsöffnungen (150A) in der leitfähigen Schicht (150') geformt sind,
ein oberes Substrat (300) auf dem unteren Substrat (110), und
eine Dichtungsmasse (400) in den mehreren Durchdringungslöchern (ILHS) und in den mehreren Durchdringungsöffnungen (150A), die das untere Substrat (110) mit dem oberen Substrat (300) verbindet, **dadurch gekennzeichnet, dass**
die erste isolierende Schicht (IL) mehrere Durchdringungslochsätze (ILHS) umfasst, jeder der mehreren Durchdringungslochsätze (ILHS) zwei oder mehr der Durchdringungslöcher (ILH1, ILH2, ILH3) umfasst und jeder der mehreren Durchdringungslochsätze (ILHS) einer der mehreren Durchdringungsöffnungen (150A) in der leitfähigen Schicht (150') entspricht.

2. Organische Licht emittierende Anzeigevorrichtung nach Anspruch 1, die ferner eine zweite isolierende Schicht (120) zwischen dem oberen Substrat (300) und der ersten isolierenden Schicht (IL) umfasst.

3. Organische Licht emittierende Anzeigevorrichtung nach Anspruch 1 oder 2, wobei eine Fläche jedes der mehreren Durchdringungslochsätze (ILHS) in der ersten isolierenden Schicht (IL) schmaler ist als eine Fläche jeder der mehreren Durchdringungsöffnungen (150A) in der leitfähigen Schicht (150').

4. Organische Licht emittierende Anzeigevorrichtung nach Anspruch 1 oder 3, wobei ein Abstand zwischen den zwei oder mehr der Durchdringungslöcher (ILH1, ILH2, ILH3) in jedem der mehreren Durchdringungslochsätze (ILHS) in der ersten isolierenden Schicht (IL) 2,5 μm oder mehr beträgt.

5. Organische Licht emittierende Anzeigevorrichtung nach einem der Ansprüche 1 bis 4, wobei eine Innenfläche jeder der mehreren Durchdringungsöffnungen (150A) in der leitfähigen Schicht (150') durch die erste isolierende Schicht (IL) bedeckt ist und die Dichtungsmasse (400) nicht berührt.

6. Organische Licht emittierende Anzeigevorrichtung nach einem der Ansprüche 1 bis 5, wobei ein Abstand zwischen den mehreren Durchdringungsöffnungen (150A) in der leitfähigen Schicht (150') 20,5 μm oder mehr beträgt.

7. Organische Licht emittierende Anzeigevorrichtung nach einem der Ansprüche 1 bis 6, wobei die Anzeigefläche (DA) einen Dünnschichttransistor (TFT) umfasst, der eine Gate-Elektrode (150) umfasst, und wobei die leitfähige Schicht (150') ein gleiches Material wie dasjenige der Gate-Elektrode (150) in dem Dünnschichttransistor (TFT) umfasst.

8. Organische Licht emittierende Anzeigevorrichtung nach Anspruch 7, wobei die leitfähige Schicht (150') und die Gate-Elektrode (150) auf einer gleichen Schicht angeordnet sind.

9. Organische Licht emittierende Anzeigevorrichtung nach einem der vorhergehenden Ansprüche, wobei in einer Oberfläche, parallel zu dem unteren Substrat (110), eine Gesamtfläche der mehreren Durchdringungslöcher (ILHS) in der ersten isolierenden Schicht (IL) in einem Bereich von 9,8 % und 16,5 % einer Fläche der Dichtungsmasse (400) liegt.

10. Organische Licht emittierende Anzeigevorrichtung nach einem der vorhergehenden Ansprüche, wobei die Anzeigefläche (DA) eine Pufferschicht (120), eine Gate-Isolationsfolie (140), eine Zwischenschicht-Isolationsfolie (160) und eine Schutzfolie (181, 182) umfasst und wobei die erste isolierende Schicht (IL) ein erweiterter Abschnitt wenigstens einer von der Pufferschicht (120), der Gate-Isolationsfolie (140), der Zwischenschicht-Isolationsfolie (160) und der Schutzfolie (181, 182) ist.

11. Organische Licht emittierende Anzeigevorrichtung nach Anspruch 1 oder einem von Anspruch 1 abhängigen Anspruch, wobei die leitfähige Schicht (150') einen Breitenänderungsteil aufweist, in dem sich eine Breite der leitfähigen Schicht (150') ändert.

12. Organische Licht emittierende Anzeigevorrichtung nach Anspruch 11, wobei die erste isolierende Schicht (IL) einen ersten Abschnitt und einen zweiten Abschnitt aufweist, wobei der erste Abschnitt eine Schicht unterhalb der leitfähigen Schicht (150') durch die mehreren Durchdringungsöffnungen (150A) der leitfähigen Schicht (150') berührt, wobei der zweite Abschnitt die Schicht unterhalb der leitfähigen Schicht (150') außerhalb der leitfähigen Schicht (150') in einem Bereich der Breitenänderung der leitfähigen Schicht (150') berührt.

13. Organische Licht emittierende Anzeigevorrichtung, die Folgendes umfasst:

ein unteres Substrat (110), das eine Anzeigefläche (DA) und eine Randfläche (PA), die außerhalb der Anzeigefläche (DA) angeordnet ist, umfasst,
eine erste isolierende Schicht (IL) auf der Anzeigefläche (DA) und der Randfläche (PA) des unteren Substrats (110), wobei mehrere Durchdringungslöcher (ILHS) in der ersten isolierenden Schicht (IL) in der Randfläche (PA) geformt sind,
eine leitfähige Schicht (150'), die in dem Randbereich, zwischen dem unteren Substrat (110) und der ersten isolierenden Schicht (IL), angeordnet ist oder in der ersten isolierenden Schicht (IL) angeordnet ist, wobei mehrere Durchdringungsöffnungen (150A) in der leitfähigen Schicht (150') geformt sind,
ein oberes Substrat (300) auf dem unteren Substrat (110), und
eine Dichtungsmasse (400) in den mehreren Durchdringungslöchern (ILHS) und in den mehreren Durchdringungsöffnungen (150A), die das untere Substrat (110) mit dem oberen Substrat (300) verbindet,
dadurch gekennzeichnet, dass
die leitfähige Schicht derart vorgespannt zu der Anzeigefläche in Beziehung zu der Mittelachse der Dichtungsmasse angeordnet ist, dass die leitfähige Schicht in dem größten Teil eines äußeren Bereichs der organischen Licht emittierenden Vorrichtung in Beziehung zu der Mittelachse der Dichtungsmasse nicht vorhanden ist, wobei der äußere Bereich durch die Dichtungsmasse bedeckt ist.

14. Organische Licht emittierende Anzeigevorrichtung, die Folgendes umfasst:

ein unteres Substrat (110), das eine Anzeigefläche (DA) und eine Randfläche (PA), die außerhalb der Anzeigefläche (DA) angeordnet ist, umfasst,
eine erste isolierende Schicht (IL) auf der Anzeigefläche (DA) und der Randfläche (PA) des unteren Substrats (110), wobei mehrere Durchdringungslöcher (ILHS) in der ersten isolierenden Schicht (IL) in der Randfläche (PA) geformt sind,
eine leitfähige Schicht (150'), die in der Randfläche, zwischen dem unteren Substrat (110) und der ersten isolierenden Schicht (IL), angeordnet ist oder in der ersten isolierenden Schicht (IL) angeordnet ist, wobei mehrere Durchdringungsöffnungen (150A) in der leitfähigen Schicht (150') geformt sind,
ein oberes Substrat (300) auf dem unteren Substrat (110), und
eine Dichtungsmasse (400) in den mehreren Durchdringungslöchern (ILHS) und in den mehreren Durchdringungsöffnungen (150A), die das untere Substrat (110) mit dem oberen Substrat (300) verbindet,
dadurch gekennzeichnet, dass
die Anzahl der mehreren Durchdringungslöcher (ILHS) in der ersten isolierenden Schicht (IL) je Flächeneinheit in einem Bereich, wo die erste isolierende Schicht (IL) nicht mit der leitfähigen Schicht (150') überlappt, und außerhalb der leitfähigen Schicht (150') höher ist als die Anzahl der mehreren Durchdringungslöcher (ILHS) in der ersten isolierenden Schicht (IL) je Flächeneinheit in einem Bereich, wo die isolierende Schicht (IL) mit der leitfähigen Schicht (150') oder mit den mehreren Durchdringungsöffnungen (150A) der leitfähigen Schicht (150') überlappt.

15. Organische Licht emittierende Anzeigevorrichtung nach einem der vorhergehenden Ansprüche, die ferner eine Blindhalbleiterschicht (130') auf oder unter der isolierenden Schicht (IL) oder in der isolierenden Schicht (IL) umfasst, wobei die Blindhalbleiterschicht (130') in der Randfläche (PA) angeordnet ist und mehrere Durchdringungsöffnungen aufweist, die den mehreren Durchdringungslöchern (ILHS) der isolierenden Schicht (IL) entsprechen, und wobei die Dichtungsmasse (400) die mehreren Durchdringungsöffnungen und die mehreren Durchdringungslöcher (ILHS) füllt.

16. Organische Licht emittierende Anzeigevorrichtung nach Anspruch 15, wobei die Anzeigefläche (DA) einen Dünnschichttransistor (TFT) umfasst, der eine Halbleiterschicht (130) umfasst, und wobei die Blindhalbleiterschicht (130') ein gleiches Material wie dasjenige der Halbleiterschicht (130) in dem Dünnschichttransistor (TFT) umfasst.

17. Organische Licht emittierende Anzeigevorrichtung nach Anspruch 16, wobei die Blindhalbleiterschicht (130') und die Halbleiterschicht (130) auf einer gleichen Schicht bereitgestellt werden.

18. Verfahren zum Herstellen einer organischen Licht emittierenden Anzeigevorrichtung, wobei das Verfahren Folgendes umfasst:

Vorbereiten eines unteren Substrats (110), das eine Anzeigefläche (DA) und eine Randfläche (PA) außerhalb der Anzeigefläche (DA) umfasst,
Formen einer leitfähigen Schicht (150') in der Randfläche (PA) des unteren Substrats (110), wobei die leitfähige Schicht (150') mehrere Durchdringungsöffnungen (150A) umfasst,
Formen einer isolierenden Schicht (IL) über der Anzeigefläche (DA) und der Randfläche (PA) des unteren Substrats (110), so dass sich die leitfähige Schicht (150') zwischen dem unteren Substrat (110) und der isolierenden Schicht oder innerhalb der isolierenden Schicht befindet,
Formen mehrerer Durchdringungslochsätze (ILHS) in der isolierenden Schicht (IL) in der Randfläche (PA), wobei jeder der mehreren Durchdringungslochsätze (ILHS) zwei oder mehr Durchdringungslöcher (ILH1, ILH2, ILH3) umfasst, wobei jeder der mehreren Durchdringungslochsätze (ILHS) einer der mehreren Durchdringungsöffnungen (150A) in der leitfähigen Schicht (150') entspricht,
Anordnen eines oberen Substrats (300), so dass es dem unteren Substrat (110) entspricht, und
Verbinden des unteren Substrats (110) und des oberen Substrats (300) durch die Verwendung einer Dichtungsmasse (400), wobei die Dichtungsmasse die mehreren Durchdringungslöcher (ILHS) in der isolierenden Schicht und die mehreren Durchdringungsöffnungen (150A) in der leitfähigen Schicht füllt.

19. Verfahren nach Anspruch 18, wobei ein Abstand zwischen den zwei oder mehr der Durchdringungslöcher (ILHT) in jedem der mehreren Durchdringungslochsätze (ILHS) in der isolierenden Schicht 2,5 μm oder mehr beträgt.

20. Verfahren nach einem der Ansprüche 18 oder 19, wobei ein Abstand zwischen den mehreren Durchdringungsöffnungen (150'W) 20,5 μm oder mehr beträgt.

21. Verfahren nach einem der Ansprüche 18 bis 20, wobei eine Gesamtfläche der mehreren Durchdringungslöcher (ILHS) in der isolierenden Schicht (IL) in einem Bereich von 9,8 % und 16,5 % einer Fläche der Dichtungsmasse (400) liegt.

22. Verfahren nach einem der Ansprüche 18 bis 21, wobei das Formen der isolierenden Schicht (IL) das Formen einer Pufferschicht (120), einer Gate-Isolationsfolie (140), einer Zwischenschicht-Isolationsfolie (160) und einer Schutzfolie (181, 182) über der Anzeigefläche (DA) und der Randfläche (PA) des unteren Substrats (110) und das Formen der mehreren Durchdringungslöcher (ILHS) durch die Pufferschicht (120), die Gate-Isolationsfolie (140), die Zwischenschicht-Isolationsfolie (160) und die Schutzfolie (181, 182) umfasst.

Revendications

1. Appareil à affichage luminescent organique comprenant :

un substrat inférieur (110) comprenant une zone d'affichage (DA) et une zone périphérique (PA) située hors de la zone d'affichage (DA) ;
une première couche d'isolation (IL) sur la zone d'affichage (DA) et la zone périphérique (PA) du substrat inférieur (110), dans lequel une pluralité d'orifices de pénétration (ILHS) sont formés dans la première couche d'isolation (IL) dans la zone périphérique (PA) ;
une couche conductrice (150') située dans la région périphérique, entre le substrat inférieur (110) et la première couche d'isolation (IL) ou située dans la première couche d'isolation (IL), dans lequel une pluralité d'ouvertures de pénétration (150A) sont formées dans la couche conductrice (150') ;
un substrat supérieur (300) sur le substrat supérieur (110) ; et
un produit d'étanchéité (400) dans la pluralité d'orifices de pénétration (ILHS) et dans la pluralité d'ouvertures de pénétration (150A) reliant le substrat inférieur (110) au substrat supérieur (300),
caractérisé en ce que
la première couche d'isolation (IL) comprend une pluralité d'ensembles d'orifices de pénétra-

tion (ILHS), chacun de la pluralité d'ensembles d'orifices de pénétration (ILHS) comprend deux orifices de pénétration ou plus (ILH1, ILH2, ILH3) et chacun de la pluralité d'ensembles d'orifices de pénétration (ILHS) correspond à une de la pluralité d'ouvertures de pénétration (150A) dans la couche conductrice (150').

2. Appareil à affichage luminescent organique selon la revendication 1, comprenant en outre une seconde couche d'isolation (120) entre le substrat inférieur (300) et la première couche d'isolation (IL).

3. Appareil à affichage luminescent organique selon les revendications 1 ou 2, dans lequel une zone de chacun de la pluralité des ensembles d'orifices de pénétration (ILHS) dans la première couche d'isolation (IL) est plus étroite qu'une zone de chacune de la pluralité des ouvertures de pénétration (150A) dans la couche conductrice (150').

4. Appareil à affichage luminescent organique selon les revendications 1 ou 3, dans lequel une distance entre les deux orifices de pénétration ou plus (ILH1, ILH2, ILH3) dans chacun de la pluralité d'ensembles d'orifices de pénétration (ILHS) dans la première couche d'isolation (IL) est de 2,5 μm ou plus.

5. Appareil à affichage luminescent organique selon l'une des revendications 1 à 4, dans lequel une surface intérieure de chacune de la pluralité d'ouvertures de pénétration (150A) dans la couche conductrice (150') est couverte par la première couche d'isolation (IL), et n'entre pas en contact avec le produit d'étanchéité (400).

6. Appareil à affichage luminescent organique selon l'une des revendications 1 à 5, dans lequel une distance entre la pluralité d'ouvertures de pénétration (150A) dans la couche conductrice (150') est de 20,5 μm ou plus.

7. Appareil à affichage luminescent organique selon l'une des revendications 1 à 6, dans lequel la zone d'affichage (DA) comprend un transistor à couche mince (TFT) comprenant une électrode de grille (150) et dans lequel la couche conductrice (150') comprend un même matériau que celui de l'électrode de grille (150) dans le transistor à couche mince (TFT).

8. Appareil à affichage luminescent organique selon la revendication 7, dans lequel la couche conductrice (150') et l'électrode de grille (150) sont disposées sur une même couche.

9. Appareil à affichage luminescent organique selon l'une quelconque des revendications précédentes, dans lequel, dans une surface parallèle au substrat inférieur (110), une zone totale de la pluralité d'orifices de pénétration (ILHS) dans la première couche d'isolation (IL) est dans une plage comprise entre 9,8 % et 16,5 % d'une zone du produit d'étanchéité (400).

10. Appareil à affichage luminescent organique selon l'une quelconque des revendications précédentes, dans lequel la zone d'affichage (DA) comprend une couche tampon (120), un film d'isolation de grille (140), un film d'isolation inter-couches (160), et un film de protection (181, 182) et dans lequel la première couche d'isolation (IL) est une partie étendue d'au moins une de la couche tampon (120), du film d'isolation de de grille (140), du film d'isolation inter-couches (160) et du film de protection (181, 182).

11. Appareil à affichage luminescent organique selon la revendication 1, ou toute revendication dépendante de la revendication 1, dans lequel la couche conductrice (150') présente une partie à changement de largeur dans laquelle une largeur de la couche conductrice (150') change.

12. Appareil à affichage luminescent organique selon la revendication 11, dans lequel la première couche d'isolation (IL) présente une première partie et une seconde partie, la première partie entrant en contact avec une couche sous la couche conductrice (150') à travers la pluralité d'ouvertures de pénétration (150A) de la couche conductrice (150'), la seconde partie entrant en contact avec la couche sous la couche conductrice (150') hors de la couche conductrice (150') dans une région de la partie de changement de largeur de la couche conductrice (150').

13. Appareil à affichage luminescent organique comprenant :

un substrat inférieur (110) comprenant une zone d'affichage (DA) et une zone périphérique (PA) située hors de la zone d'affichage (DA) ;
une première couche d'isolation (IL) sur la zone d'affichage (DA) et la zone périphérique (PA) du substrat inférieur (110), dans lequel une pluralité d'orifices de pénétration (ILHS) sont formés dans la première couche d'isolation (IL) dans la zone périphérique (PA) ;
une couche conductrice (150') située dans la région périphérique, entre le substrat inférieur (110) et la première couche d'isolation (IL) ou située dans la première couche d'isolation (IL), dans lequel une pluralité d'ouvertures de pénétration (150A) sont formées dans la couche conductrice (150') ;
un substrat supérieur (300) sur le substrat inférieur (110) ; et

un produit d'étanchéité (400) dans la pluralité d'orifices de pénétration (ILHS) et dans la pluralité d'ouvertures de pénétration (150A) liant le substrat inférieur (110) au substrat supérieur (300),

caractérisé en ce que

la couche conductrice est située de manière décentrée par rapport à la zone d'affichage relativement à l'axe central du produit d'étanchéité, de sorte que la couche conductrice n'existe pas dans la plupart d'une région extérieure de l'appareil à diode luminescente organique relativement à l'axe central du produit d'étanchéité, la région extérieure étant recouverte du produit d'étanchéité.

14. Appareil d'affichage luminescent organique comprenant :

un substrat inférieur (110) comprenant une zone d'affichage (DA) et une zone périphérique (PA) située hors de la zone d'affichage (DA) ;
une première couche d'isolation (IL) sur la zone d'affichage (DA) et la zone périphérique (PA) du substrat inférieur (110), dans lequel une pluralité d'orifices de pénétration (ILHS) sont formés dans la première couche d'isolation (IL) dans la zone périphérique (PA) ;
une couche conductrice (150') située dans la région périphérique, entre le substrat inférieur (110) et la première couche d'isolation (IL) ou située dans la première couche d'isolation (IL), dans lequel une pluralité d'ouvertures de pénétration (150A) sont formées dans la couche conductrice (150') ;
un substrat supérieur (300) sur le substrat inférieur (110) ; et
un produit d'étanchéité (400) dans la pluralité d'orifices de pénétration (ILHS) et dans la pluralité d'ouvertures de pénétration (150A) liant le substrat inférieur (110) au substrat supérieur (300),

caractérisé en ce que

le nombre de la pluralité d'orifices de pénétration (ILHS) de la première couche d'isolation (IL) par zone unitaire dans une région où la première couche d'isolation (IL) ne recouvre pas la couche conductrice (150') et hors de la couche conductrice (150') est supérieur au nombre de la pluralité d'orifices de pénétration (ILHS) de la première couche d'isolation (IL) par zone unitaire dans une région où la couche d'isolation (IL) recouvre la couche conductrice (150') ou avec la pluralité d'orifices de pénétration (150A) de la couche conductrice (150').

15. Appareil d'affichage luminescent organique selon l'une quelconque des revendications précédentes, comprenant en outre une couche semi-conductrice fictive (130') sur ou sous la couche d'isolation (IL) ou dans la couche d'isolation (IL), dans lequel la couche semi-conductrice fictive (130') est située dans la zone périphérique (PA), et présente une pluralité d'ouvertures de pénétration correspondant à la pluralité d'orifices de pénétration (ILHS) de la couche d'isolation (IL), et dans lequel le produit d'étanchéité (400) remplit la pluralité d'ouvertures de pénétration et la pluralité d'orifices de pénétration (ILHS).

16. Appareil d'affichage luminescent organique selon la revendication 15, dans lequel la zone d'affichage (DA) comprend un transistor à couche mince (TFT) comprenant une couche semi-conductrice (130), et dans lequel la couche semi-conductrice fictive (130') comprend un même matériau que celui de la couche semi-conductrice (130) dans le transistor à couche mince (TFT).

17. Appareil d'affichage luminescent organique selon la revendication 16, dans lequel la couche semi-conductrice fictive (130') et la couche semi-conductrice (130) sont disposées sur une même couche.

18. Procédé de préparation d'un appareil d'affichage luminescent organique, le procédé comprenant :

la préparation d'un substrat inférieur (110) comprenant une zone d'affichage (DA) et une zone périphérique (PA) située hors de la zone d'affichage (DA) ;
la formation d'une couche conductrice (150') dans la zone périphérique (PA) du substrat inférieur (110), la couche conductrice (150') comprenant une pluralité d'ouvertures de pénétration (150A) ;
la formation d'une couche d'isolation (IL) sur la zone d'affichage (DA) et la zone périphérique (PA) du substrat inférieur (110), de sorte que la couche conductrice (150') soit comprise entre le substrat inférieur (110) et la couche d'isolation ou dans la couche d'isolation ;
la formation d'une pluralité d'ensembles d'orifices de pénétration (ILHS) dans la couche d'isolation dans la zone périphérique (PA), chacune de la pluralité d'ensembles d'orifices de pénétration (ILHS) comprenant deux orifices de pénétration ou plus (ILH1, ILH2, ILH3), chacun de la pluralité d'ensembles d'orifices de pénétration (ILHS) correspondant à une de la pluralité des ouvertures de pénétration (150A) dans la couche conductrice (150') ;
l'agencement d'un substrat supérieur (300) afin qu'il corresponde au substrat inférieur (110) ;
et la liaison du substrat inférieur (110) et du substrat supérieur (300) en utilisant un produit d'étanchéité (400), le produit d'étanchéité rem-

plissant la pluralité d'orifices de pénétration (ILHS) dans la couche d'isolation et la pluralité d'ouvertures de pénétration (150A) dans la couche conductrice.

19. Procédé selon la revendication 18, dans lequel une distance entre les deux orifices de pénétration ou plus (ILHT) dans chacun de la pluralité des ensembles d'orifices de pénétration (ILHS) dans la couche d'isolation est de 2,5 μm ou plus.

20. Procédé selon l'une des revendications 18 à 19, dans lequel une distance entre la pluralité d'ouvertures de pénétration (150'W) est de 20,5 μm ou plus.

21. Procédé selon l'une des revendications 18 à 20, dans lequel une zone totale de la pluralité d'orifices de pénétration (ILHS) dans la couche d'isolation (IL) est dans la plage comprise entre 9,8 % et 16,5 % d'une zone du produit d'étanchéité (400).

22. Procédé selon l'une des revendications 18 à 21, dans lequel la formation de la couche d'isolation (IL) comprend la formation d'une couche tampon (120), d'un film d'isolation de grille (140), d'un film d'isolation inter-couches (160), et d'un film de protection (181, 82) sur la zone d'affichage (DA) et la zone périphérique (PA) du substrat inférieur (110), et la formation de la pluralité d'orifices de pénétration (ILHS) à travers la couche tampon (120), le film d'isolation de grille (140), le film d'isolation inter-couches (160) et le film de protection (181, 182).

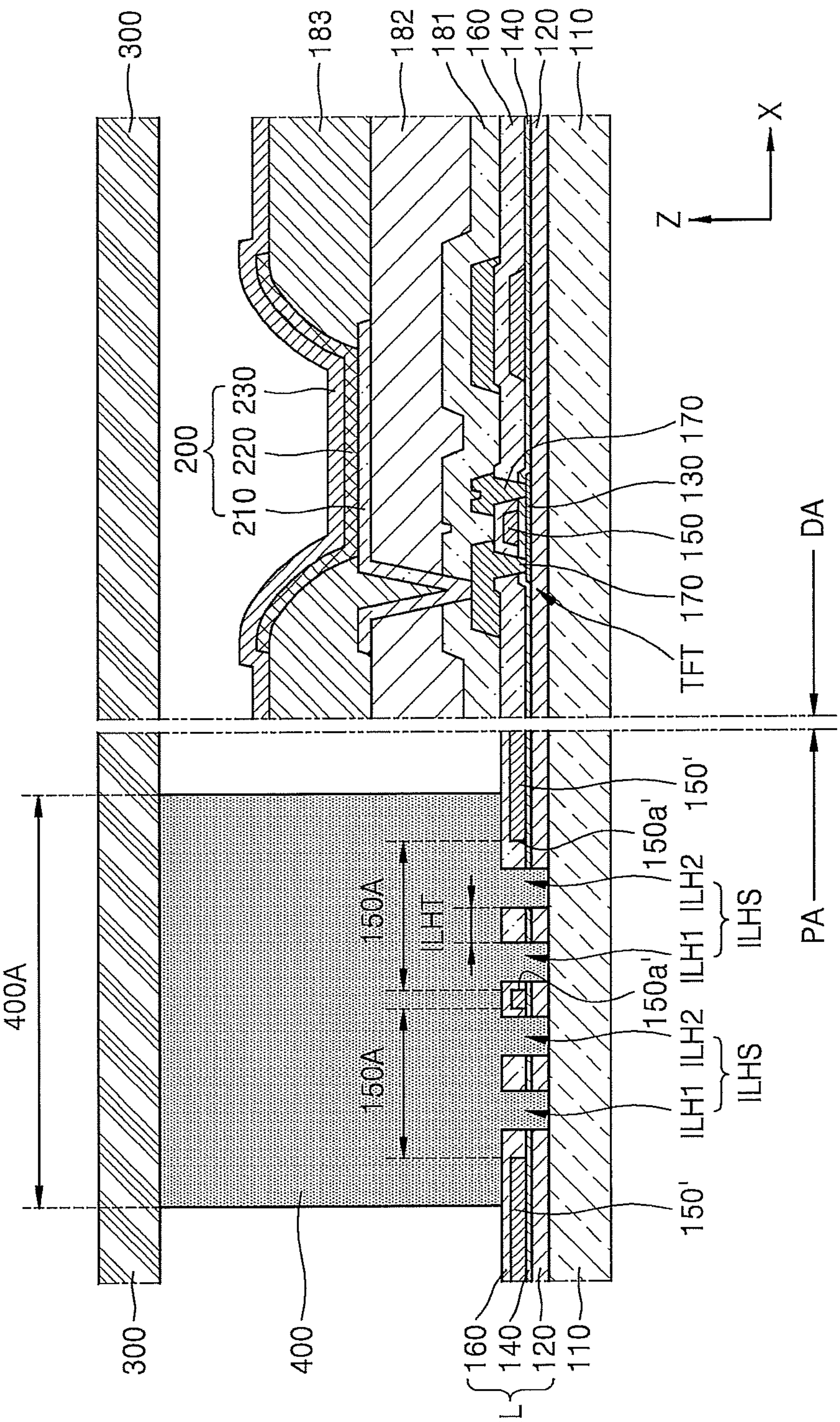

300
183
182
181
160
140
120
110
X
Z
200
210 220 230
170
130
150
TFT
DA
PA
400A
150A
ILHT
150a'
150'
ILH1 ILH2
ILHS
400
IL
160
140
120
110
300

FIG. 1

FIG. 2

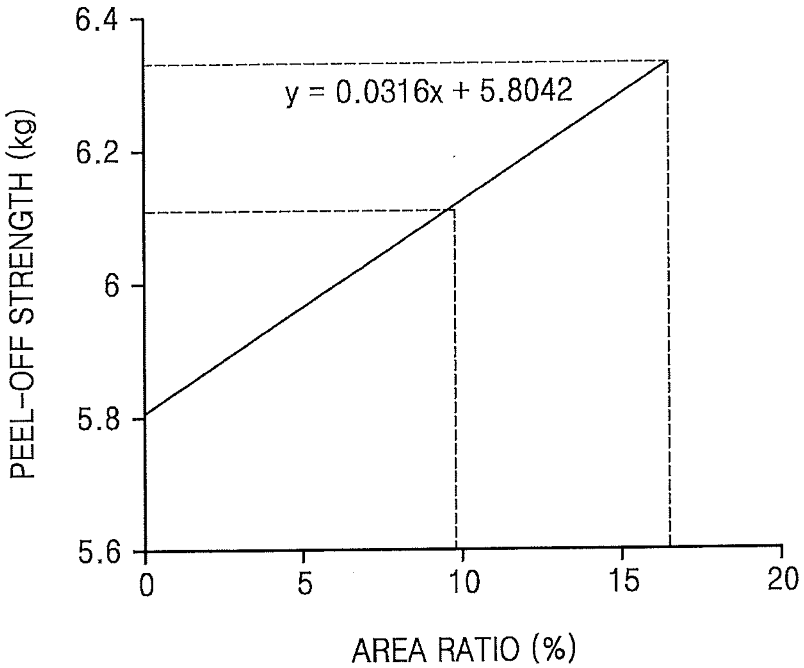

PEEL-OFF STRENGTH (kg)
6.4
6.2
6
5.8
5.6
y = 0.0316x + 5.8042
0
5
10
15
20
AREA RATIO (%)

FIG. 3

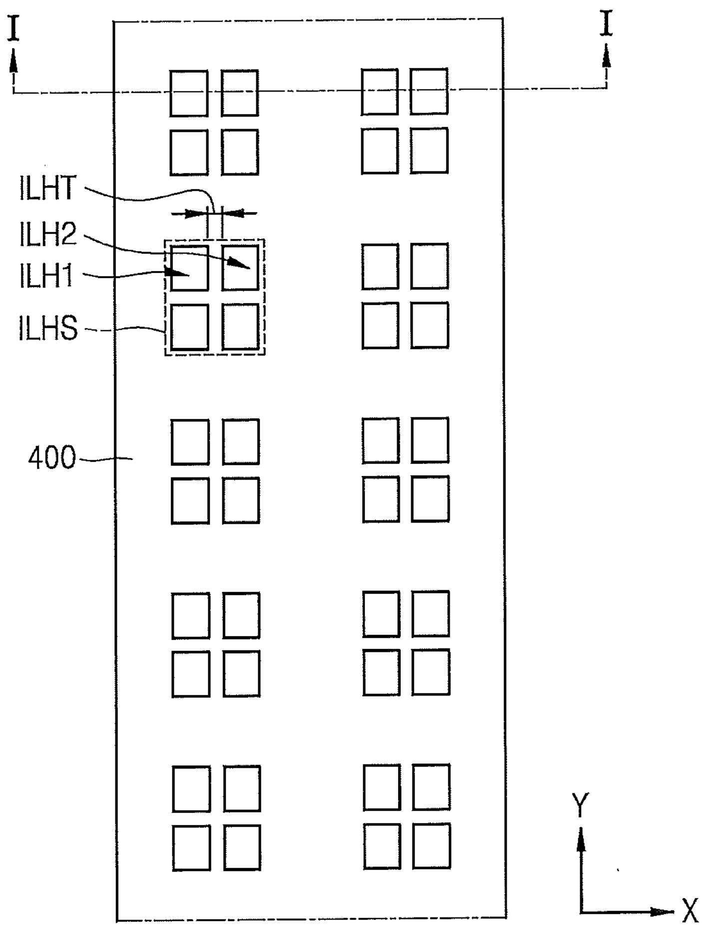


FIG. 4

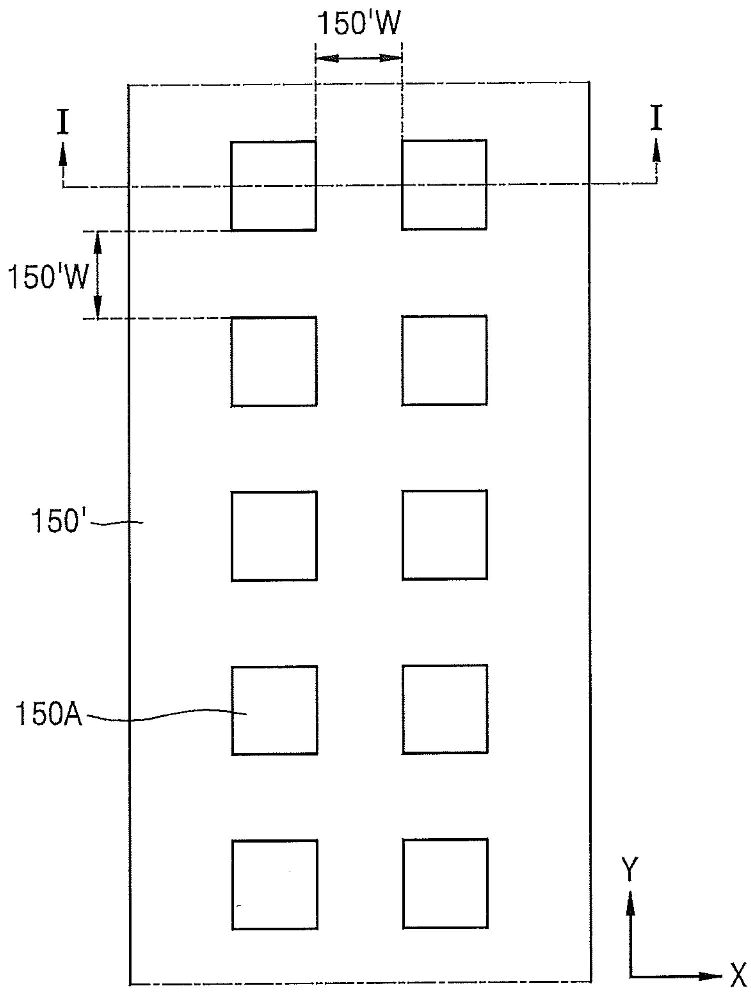


FIG. 5

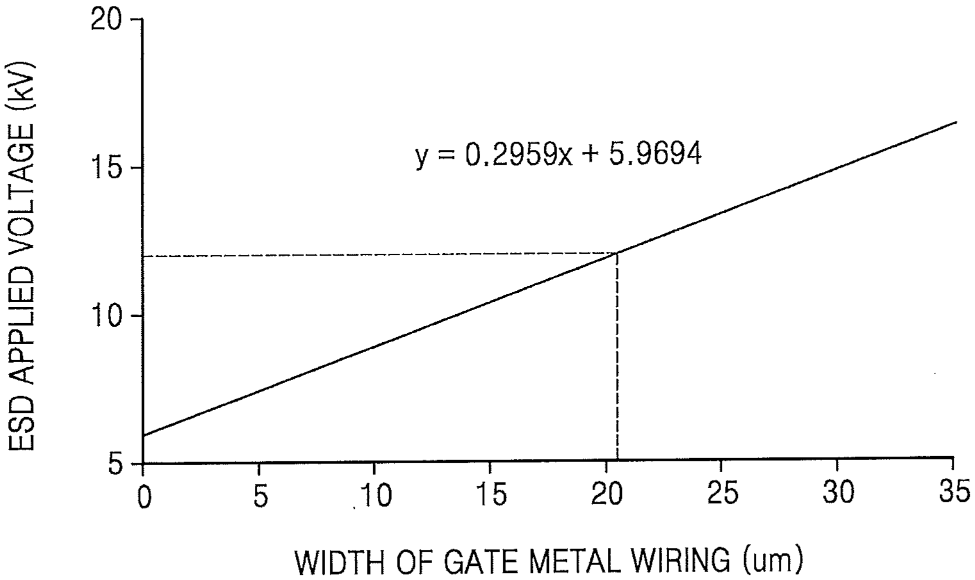

ESD APPLIED VOLTAGE (kV)
y = 0.2959x + 5.9694
20
15
10
5
0
5
10
15
20
25
30
35
WIDTH OF GATE METAL WIRING (um)

FIG. 6

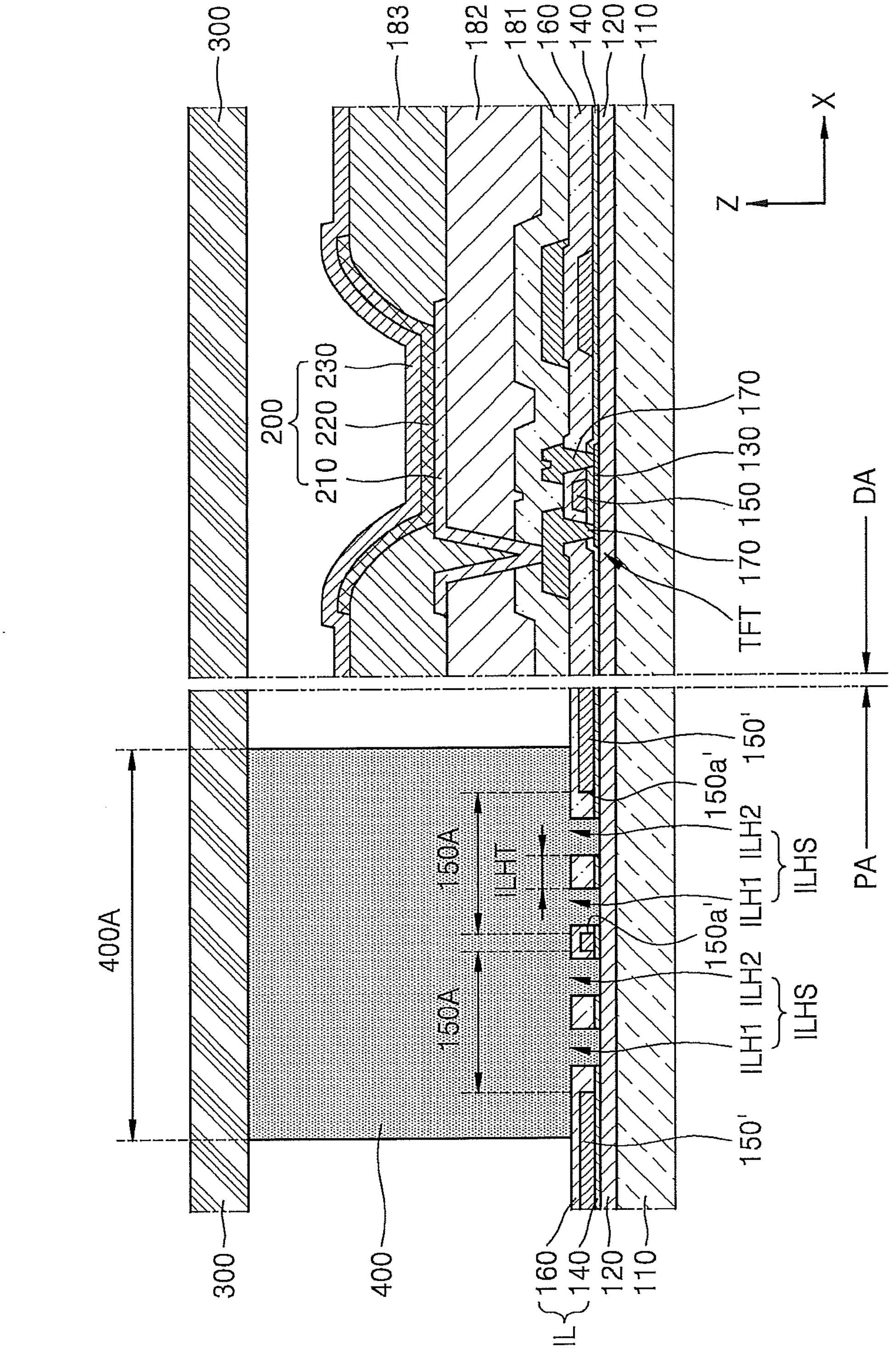
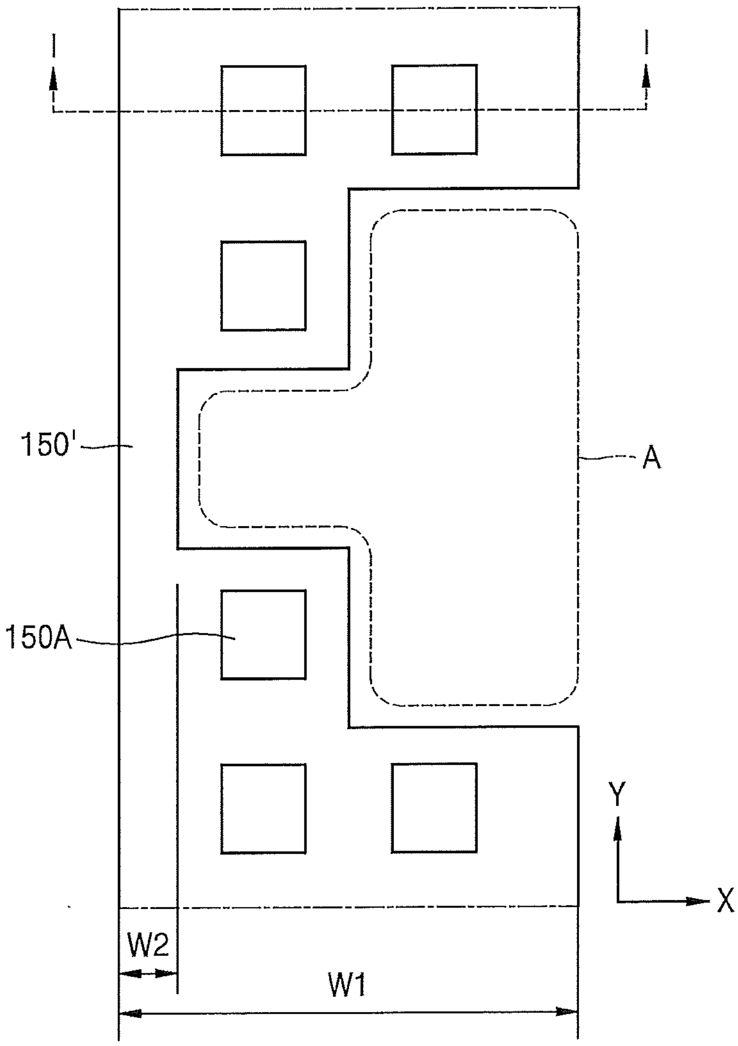

300
183
182
181
160
140
120
110
X
Z
200
210 220 230
170
130
150
TFT
DA
PA
400A
400
150A
ILHT
150a'
150'
ILH1 ILH2
ILHS
IL
160
140
120
110

FIG. 7



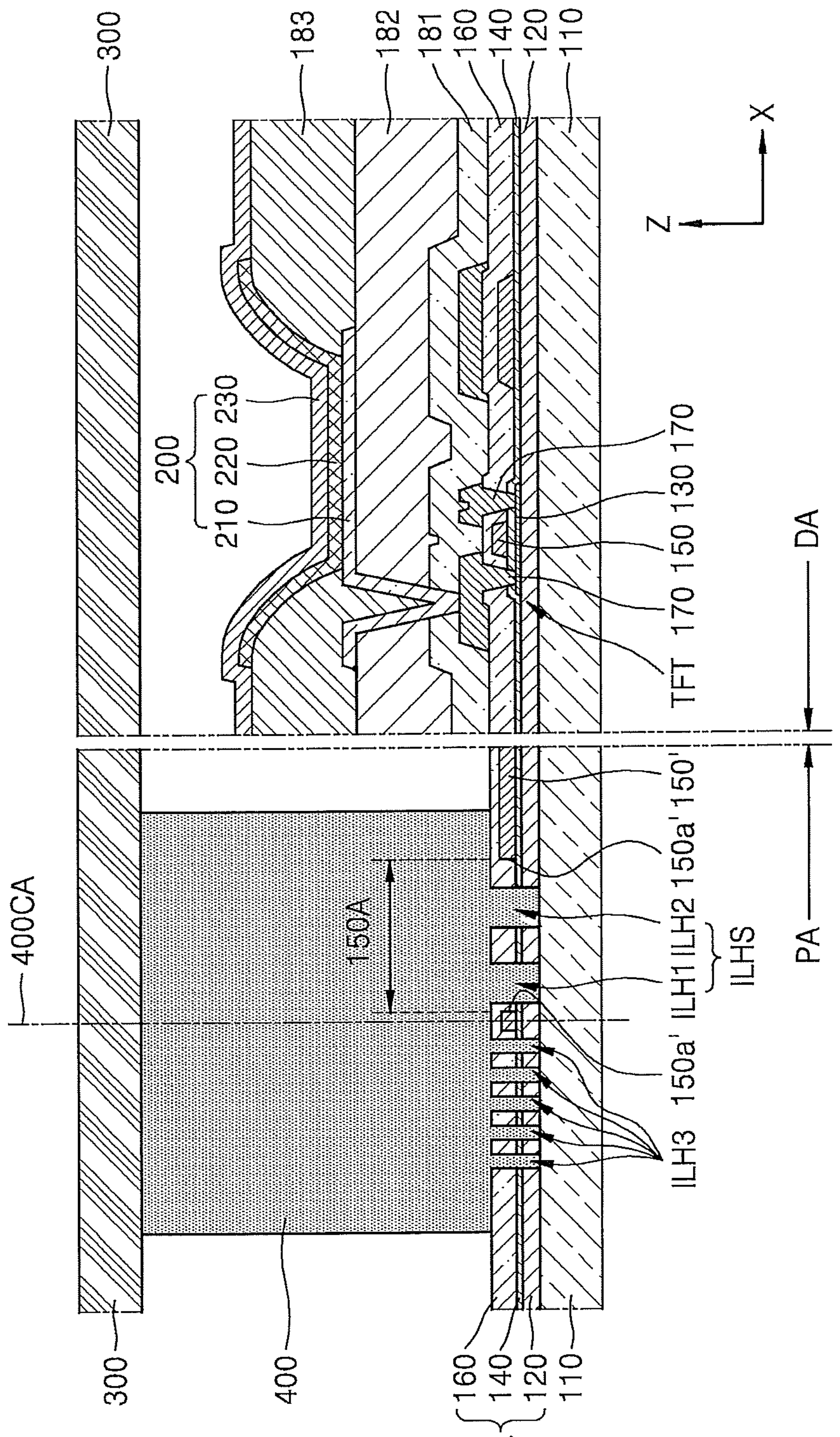
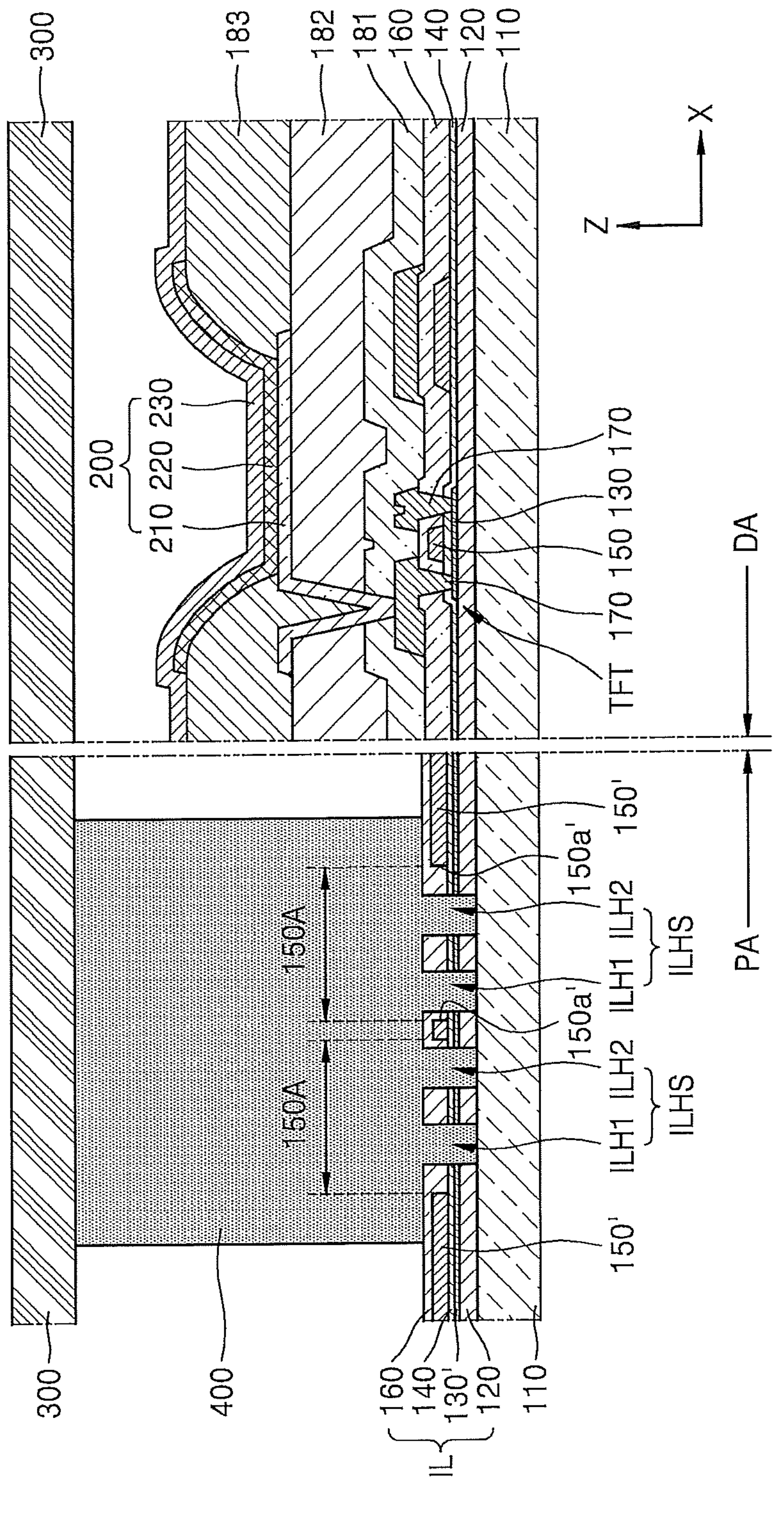

300
183
182
181
160
140
120
110
X
Z
200
210 220 230
TFT 170 150 130 170
DA
PA
400CA
150A
150a' 150'
ILH2
ILH1
ILHS
150a'
ILH3
400
IL

FIG. 8

FIG. 9


300
183
182
181
160
140
120
110
X
Z
200
210 220 230
170 130 170
150
TFT 170
DA
PA
150'
150a'
150A
150A
ILH1 ILH2
ILHS
ILH1 ILH2
ILHS
150a'
150'
400
160
140
130'
120
110
IL

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20050184927 A **[0004]**
- US 20070195252 A **[0005]**
- EP 2164105 A **[0006]**
- US 20120146041 A **[0007]**

专利名称(译)	有机发光显示装置及其制造方法		
公开(公告)号	EP2819203B1	公开(公告)日	2019-11-06
申请号	EP2014174847	申请日	2014-06-27
[标]申请(专利权)人(译)	三星显示有限公司		
申请(专利权)人(译)	三星DISPLAY CO.，LTD.		
当前申请(专利权)人(译)	三星DISPLAY CO.，LTD.		
[标]发明人	CHO SUNG HO KIM HYUN YOUNG CHO IL RYONG		
发明人	CHO, SUNG-HO KIM, HYUN-YOUNG CHO, IL-RYONG		
IPC分类号	H01L51/52 H01L27/32		
CPC分类号	H01L27/3244 H01L27/3276 H01L51/5246		
优先权	1020130075937 2013-06-28 KR 1020140072691 2014-06-16 KR		
其他公开文献	EP2819203A3 EP2819203A2		
外部链接	Espacenet		

摘要(译)

一种有机发光装置，包括下基板（110），该下基板包括显示区域（DA）和围绕该显示区域的外围区域（PA）；在下基板的显示区域和外围区域上的第一绝缘层（120，140，160，IL），其中在外围区域的第一绝缘层中形成多个通孔（ILH1，ILH2）；下基板上的上基板（300）；密封剂（多个贯通孔中的400将下部基板和上部基板接合。

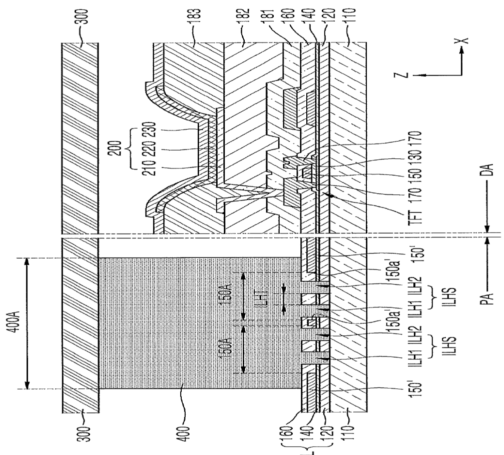

FIG. 1