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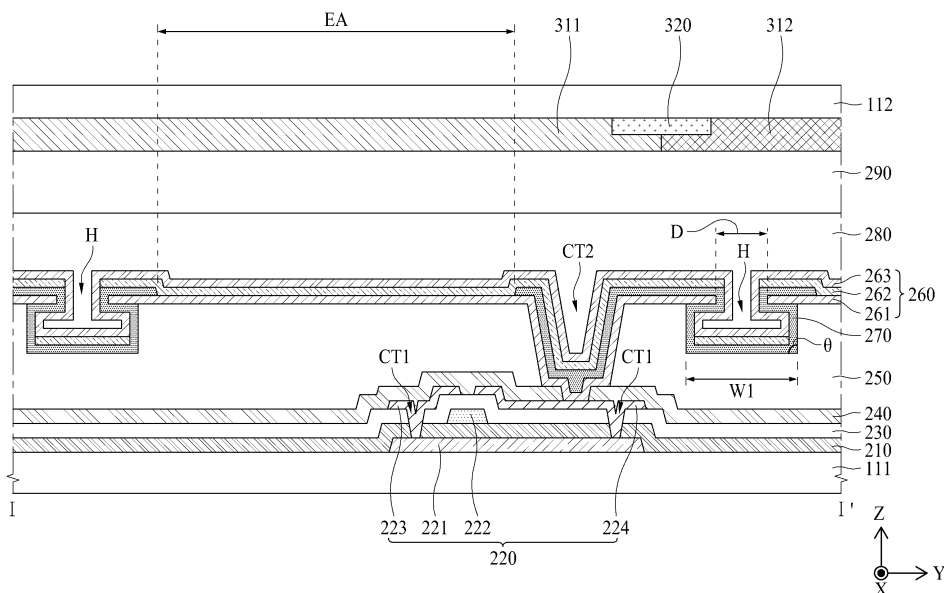
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(54) **ORGANIC LIGHT EMITTING DISPLAY DEVICE AND METHOD OF MANUFACTURING THE SAME**

(57) Disclosed is an organic light emitting display device including a thin film transistor on a substrate, a planarization layer on the thin film transistor, a contact hole passing through the planarization layer to expose a source or drain electrode of the thin film transistor, a first electrode on the planarization layer, the first electrode being connected to the source or drain electrode of the thin film transistor through the contact hole, a hole be-

between the first electrode and another first electrode adjacent thereto, the hole being a recessed portion of the planarization layer, a pixel defining layer covering the first electrode passing through the contact hole and the planarization layer disposed in the hole, a light emitting layer on the first electrode and the pixel defining layer, and a second electrode on the light emitting layer.

FIG. 5



Description

BACKGROUND

Field

[0001] The present disclosure relates to an organic light emitting display device and a method of manufacturing the same.

Discussion of Related Art

[0002] With the advancement of information-oriented society, various requirements for display devices for displaying an image are increasing. Therefore, various display devices such as liquid crystal display (LCD) devices, plasma display panel (PDP) devices, organic light emitting display devices, etc. are being used recently.

[0003] As a type of display device, organic light emitting display devices are self-emitting display devices and are better in viewing angle and contrast ratio than LCD devices. Also, since the organic light emitting display devices do not need a separate backlight, it is possible to lighten and make thin the organic light emitting display devices, and the organic light emitting display devices are excellent in power consumption. Furthermore, the organic light emitting display devices are driven with a low direct current (DC) voltage, have a fast response time, and are low in manufacturing cost.

[0004] The organic light emitting display devices each include a plurality of pixels each including an organic light emitting device and a bank which divides the pixels for defining the pixels. The bank may act as a pixel defining layer. The organic light emitting device includes an anode electrode, a hole transporting layer, an organic light emitting layer, and an electron transporting layer, and a cathode electrode. In this instance, when a high-level voltage is applied to the anode electrode and a low-level voltage is applied to the cathode electrode, a hole and an electron respectively move to the organic light emitting layer through the hole transporting layer and the electron transporting layer and are combined with each other in the organic light emitting layer to emit light.

[0005] The organic light emitting device includes a red organic light emitting device emitting red light, a green organic light emitting device emitting green light, and a blue organic light emitting device emitting blue light, or include only a white organic light emitting device emitting white light. If the organic light emitting device includes the white organic light emitting device, the organic light emitting layer and the cathode electrode may be provided in the pixels in common. That is, the organic light emitting layer and the cathode electrode may be connected to each other between adjacent pixels.

[0006] In order to enhance a color reproduction rate and emission efficiency, the white organic light emitting device may be provided in a tandem structure of two or more stacks where two or more organic light emitting

layers are stacked. The tandem structure of two or more stacks needs a charge generating layer disposed between adjacent organic light emitting layers. However, in a structure where the organic light emitting layer and the cathode electrode are connected to each other between adjacent pixels, a current can be leaked from one pixel to an adjacent pixel due to the charge generating layer. That is, the adjacent pixel is affected by the leaked current. In this instance, the adjacent pixel cannot emit desired light due to the leaked current, causing a reduction in a color reproduction rate. Particularly, in high-resolution small display devices applied to virtual reality (VR) devices, smartphones, etc., an interval between pixels is narrow, and for this reason, the adjacent pixel is more affected by the leaked current.

SUMMARY

[0007] Accordingly, the present disclosure is directed to provide an organic light emitting display device and a method of manufacturing the same that substantially address one or more problems due to limitations and disadvantages of the related art.

[0008] The present disclosure concerns an organic light emitting display device and a method of manufacturing the same, in which in a white organic light emitting device, an adjacent pixel is prevented from being affected by a leakage current.

[0009] Aspects of the present disclosure are defined in the appended claims.

[0010] Additional advantages and features of the disclosure will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the disclosure. The objectives and other advantages of the disclosure may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0011] In accordance with an embodiment, an organic light emitting display device includes a thin film transistor on a substrate, a planarization layer on the thin film transistor, a contact hole passing through the planarization layer to expose a source or drain electrode of the thin film transistor, a first electrode on the planarization layer, the first electrode being connected to the source or drain electrode of the thin film transistor through the contact hole, a hole between the first electrode and another first electrode adjacent thereto, the hole being a recessed portion of the planarization layer, a pixel defining layer covering the first electrode passing through the contact hole and the planarization layer disposed in the hole, an organic light emitting layer on the first electrode and the pixel defining layer, and a second electrode on the organic light emitting layer.

[0012] In accordance with another embodiment a method of manufacturing an organic light emitting display device includes forming a thin film transistor on a sub-

strate, forming a planarization layer on the thin film transistor, forming a contact hole exposing a source or drain electrode of the thin film transistor through the planarization layer, forming a first electrode connected to the source or drain electrode of the thin film transistor through the contact hole, forming a hole, which is a recessed portion of the planarization layer, between the first electrode and another first electrode adjacent thereto, forming a pixel defining layer which covers the first electrode passing through the contact hole and the planarization layer disposed in the hole, and sequentially forming an organic light emitting layer, a second electrode, and an encapsulation layer on the first electrode and the pixel defining layer.

[0013] It is to be understood that both the foregoing general description and the following detailed description are by way of example, and intended to provide further explanation of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying drawings, which are included to provide a further understanding of the disclosure and are incorporated in and constitute a part of this application, illustrate embodiments and, together with the description, merely serve to explain the principles of the disclosure. In the drawings:

FIG. 1 is a perspective view illustrating an organic light emitting display device according to an embodiment;

FIG. 2 is a plan view illustrating a first substrate, a gate driver, a source drive integrated circuit (IC), a flexible film, a circuit board, and a timing controller of FIG. 1;

FIG. 3 is a plan view illustrating an example where a hole and emissive areas of pixels are arranged in a display area according to an embodiment;

FIG. 4 is a plan view illustrating another example where a hole and emissive areas of pixels are arranged in a display area according to an;

FIG. 5 is a cross-sectional view illustrating an example taken along line I-I' of FIGS. 3 and 4;

FIG. 6 is a cross-sectional view illustrating another example taken along line I-I' of FIGS. 3 and 4;

FIG. 7 is a cross-sectional view illustrating another example taken along line I-I' of FIGS. 3 and 4;

FIG. 8 is a flowchart illustrating a method of manufacturing an organic light emitting display device according to an embodiment; and

FIGS. 9A to 9H are cross-sectional views taken along line I-I' of FIGS. 3 and 4 for describing a method of manufacturing an organic light emitting display device according to an embodiment.

DETAILED DESCRIPTION OF EMBODIMENTS

[0015] Reference will now be made in detail to the ex-

ample, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0016] Advantages and features of the present disclosure, and implementation methods thereof, will be clarified through the following embodiments described with reference to the accompanying drawings. The present disclosure may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the present disclosure to those skilled in the art.

[0017] A shape, a size, a ratio, an angle, and a number disclosed in the drawings for describing the embodiments are merely an example, and thus, the present disclosure is not limited to the illustrated details. In the following description, when the detailed description of the relevant known function or configuration is determined to unnecessarily obscure the important point of the present disclosure, the detailed description will be omitted.

[0018] In instances where 'comprise', 'have', and 'include' are used in the present specification, another part may be added unless 'only' is used. The terms of a singular form may include plural forms unless referred to the contrary.

[0019] In construing an element, the element is construed as including an error range although there is no explicit description.

[0020] In describing a position relationship, for example, when a position relation between two parts is described as 'on~', 'over~', 'under~', and 'next~', one or more other parts may be disposed between the two parts unless 'just' or 'direct' is used.

[0021] In describing a time relationship, for example, when the temporal order is described as 'after~', 'subsequent~', 'next~', and 'before~', an instance which is not continuous may be included unless 'just' or 'direct' is used.

[0022] It will be understood that, although the terms "first", "second", etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are only used to distinguish one element from another. For example, a first element could be termed a second element, and, similarly, a second element could be termed a first element, without departing from the scope of the present disclosure.

[0023] An X axis direction, a Y axis direction, and a Z axis direction should not be construed as only a geometric relationship where a relationship therebetween is vertical, and may denote having a broader directionality within a scope where elements of the present disclosure operate functionally.

[0024] The term "at least one" should be understood as including any and all combinations of one or more of the associated listed items. For example, the meaning of "at least one of a first item, a second item, and a third

item" denotes the combination of all items proposed from two or more of the first item, the second item, and the third item as well as the first item, the second item, or the third item.

[0025] Features of various embodiments may be partially or overall coupled to or combined with each other, and may be variously inter-operated with each other and driven technically as those skilled in the art can sufficiently understand. The embodiments may be carried out independently from each other, or may be carried out together in a co-dependent relationship.

[0026] Hereinafter, example embodiments will be described in detail with reference to the accompanying drawings.

[0027] FIG. 1 is a perspective view illustrating an organic light emitting display device 100 according to an embodiment. FIG. 2 is a plan view illustrating a first substrate, a gate driver, a source drive integrated circuit (IC), a flexible film, a circuit board, and a timing controller of FIG. 1.

[0028] Referring to FIGS. 1 and 2, the organic light emitting display device 100 according to an embodiment may include a display panel 110, a gate driver 120, a source drive IC 130, a flexible film 140, a circuit board 150, and a timing controller 160.

[0029] The display panel 110 may include a first substrate 111 and a second substrate 112. The second substrate 112 may be an encapsulation substrate. The first substrate 111 and the second substrate 112 may each be plastic, glass, or the like.

[0030] A plurality of gate lines, a plurality of data lines, and a plurality of pixels may be provided on one surface of the first substrate 111 facing the second substrate 112. The pixels may be respectively provided in a plurality of areas defined by an intersection structure of the gate lines and the data lines.

[0031] Each of the pixels may include a thin film transistor (TFT) and an organic light emitting device which includes a first electrode, an organic light emitting layer, and a second electrode. When a gate signal is input through a gate line, each of the pixels may supply a certain current to the organic light emitting device by using the TFT according to a data voltage supplied through a data line. Therefore, the organic light emitting device of each of the pixels may emit light having certain brightness according to the certain current. A structure of each of the pixels will be described in detail with reference to FIGS. 3 to 6.

[0032] The display panel 110, as illustrated in FIG. 2, may be divided into a display area DA, where the pixels are provided to display an image, and a non-display area NDA which does not display an image. The gate lines, the data lines, and the pixels may be provided in the display area DA. The gate driver 120 and a plurality of pads may be provided in the non-display area NDA.

[0033] The gate driver 120 may sequentially supply gate signals to the gate lines according to a gate control signal input from the timing controller 160. The gate driver

120 may be provided in the non-display area NDA outside one side or both sides of the display area DA of the display panel 110 in a gate driver-in panel (GIP) type. Alternatively, the gate driver 120 may be manufactured as a driving chip and may be mounted on a flexible film, and moreover, may be attached on the non-display area NDA outside the one side or the both sides of the display area DA of the display panel 110 in a tape automated bonding (TAB) type.

[0034] The source drive IC 130 may receive digital video data and a source control signal from the timing controller 160. The source driver IC 130 may convert the digital video data into analog data voltages according to the source control signal and may respectively supply the analog data voltages to the data lines. If the source drive IC 130 is manufactured as a driving chip, the source drive IC 130 may be mounted on the flexible film 140 in a chip-on film (COF) type or a chip-on plastic (COP) type.

[0035] A plurality of pads such as data pads may be provided in the non-display area NDA of the display panel 110. Lines connecting the pads to the source drive IC 130 and lines connecting the pads to lines of the circuit board 150 may be provided on the flexible film 140. The flexible film 140 may be attached to the pads by using an anisotropic conductive film, and thus, the pads may be connected to the lines of the flexible film 140.

[0036] The circuit board 150 may be attached to the flexible film 140 which is provided in plurality. A plurality of circuits implemented as driving chips may be mounted on the circuit board 150. For example, the timing controller 160 may be mounted on the circuit board 150. The circuit board 150 may be a printed circuit board (PCB) or a flexible printed circuit board (FPCB).

[0037] The timing controller 160 may receive the digital video data and a timing signal from an external system board through a cable of the circuit board 150. The timing controller 160 may generate a gate control signal for controlling an operation timing of the gate driver 120 and a source control signal for controlling the source drive IC 130 which is provided in plurality, based on the timing signal. The timing controller 160 may supply the gate control signal to the gate driver 120 and may supply the source control signal to the plurality of source drive ICs 130.

[0038] FIG. 3 is a plan view illustrating an example where a hole and emissive areas of pixels are arranged in a display area. In FIG. 3, for convenience of description, only a hole H and emissive areas RE, GE, BE, and WE of pixels are illustrated.

[0039] Each of the pixels may include one emissive area. The emissive area may denote an area where a first electrode corresponding to an anode electrode, an organic light emitting layer, and a second electrode corresponding to a cathode electrode are sequentially stacked, and a hole from the first electrode and an electron from the second electrode are combined with each other in the organic light emitting layer to emit light. The first electrode is connected to a thin film transistor through

a contact hole CT2. The contact hole CT2 is between each emissive area and the hole H.

[0040] The emissive area may be divided into a red emissive area RE which emits red light by using a red color filter, a green emissive area GE which emits green light by using a green color filter, a blue emissive area BE which emits blue light by using a blue color filter, and a white emissive area WE which emits white light without a color filter. A pixel including the red emissive area RE, a pixel including the green emissive area GE, a pixel including the blue emissive area BE, and a pixel including the white emissive area WE may be defined as one unit pixel.

[0041] The hole H may be disposed to surround each of the emissive areas RE, GE, BE, and WE as in FIG. 3. Alternatively, as in FIG. 4, the hole H may be disposed between two adjacent emissive areas of the emissive areas RE, GE, BE, and WE. For this reason, an organic light emitting layer of one pixel may not be connected to an organic light emitting layer of another pixel adjacent to the one pixel. Accordingly, according to an embodiment, a current is prevented from being leaked from one pixel to another pixel adjacent thereto due to a hole transporting layer and/or a charge generating layer of an organic light emitting layer. That is, according to an embodiment, the other pixel adjacent to the one pixel is prevented from being affected by the current leaked from the one pixel.

[0042] FIG. 5 is a cross-sectional view illustrating an example taken along line I-I' of FIGS. 3 and 4.

[0043] Referring to FIG. 5, a buffer layer may be formed on one surface of the first substrate 111 facing the second substrate 112. The buffer layer may be formed on the one surface of the first substrate 111, for protecting a plurality of TFTs 220 and a plurality of organic light emitting devices 260 from water which penetrates through the first substrate 111 vulnerable to penetration of water. The buffer layer may include a plurality of inorganic layers which are alternately stacked. For example, the buffer layer may be formed of a multilayer where one or more inorganic layers of silicon oxide (SiOx), silicon nitride (SiNx), and SiON are alternately stacked. The buffer layer may be omitted.

[0044] The TFTs 220 may be formed on the buffer layer. Each of the TFTs 220 may include an active layer 221, a gate electrode 222, a source electrode 223, and a drain electrode 224. In FIG. 5, the TFTs 220 are by example illustrated as being formed in a top gate type where the gate electrode 222 is disposed on the active layer 221, but is not limited thereto. In other embodiments, the TFTs 220 may be formed in a bottom gate type where the gate electrode 222 is disposed under the active layer 221 or a double gate type where the gate electrode 222 is disposed both on and under the active layer 221.

[0045] The active layer 221 may be formed on the buffer layer. The active layer 221 may be formed of a silicon-based semiconductor material or an oxide-based semi-

conductor material. A light blocking layer for blocking external light incident on the active layer 221 may be formed between the buffer layer and the active layer 221.

[0046] A gate insulation layer 210 may be formed on the active layer 221. The gate insulation layer 210 may be formed of an inorganic layer, for example, silicon oxide (SiOx), silicon nitride (SiNx), or a multilayer thereof.

[0047] The gate electrode 222 and a gate line may be formed on the gate insulation layer 210. The gate electrode 222 and the gate line may each be formed of a single layer or a multilayer which includes one of molybdenum (Mo), chromium (Cr), titanium (Ti), nickel (Ni), neodymium (Nd), and copper (Cu), or an alloy thereof.

[0048] An interlayer dielectric 230 may be formed on the gate electrode 222 and the gate line. The interlayer dielectric 230 may be formed of an inorganic layer, for example, SiOx, SiNx, or a multilayer thereof.

[0049] The source electrode 223, the drain electrode 224, and a data line may be formed on the interlayer dielectric 230. Each of the source electrode 223 and the drain electrode 224 may contact the active layer 221 through a corresponding contact hole CT1 which passes through the gate insulation layer 210 and the interlayer dielectric 230. The source electrode 223, the drain electrode 224, and the data line may each be formed of a single layer or a multilayer which includes one of Mo, Cr, Ti, Ni, Nd, and Cu, or an alloy thereof.

[0050] A passivation layer 240 for insulating the TFTs 220 may be formed on the source electrode 223, the drain electrode 224, and the data line. The passivation layer 240 may be formed of an inorganic layer, for example, SiOx, SiNx, or a multilayer thereof.

[0051] A planarization layer 250 for planarizing a step height caused by the TFTs 220 may be formed on the passivation layer 240. The planarization layer 250 may be formed of an organic layer such as acryl resin, epoxy resin, phenolic resin, polyamide resin, polyimide resin, and/or the like.

[0052] An organic light emitting device 260 and a pixel defining layer 270 may be formed on the planarization layer 250. The organic light emitting device 260 may include a first electrode 261, an organic light emitting layer 262, and a second electrode 263. The first electrode 261 may be an anode electrode, and the second electrode 263 may be a cathode electrode.

[0053] The first electrode 261 may be formed on the planarization layer 250. The first electrode 261 may be connected to the source electrode 223 or the drain electrode 224 of the TFT 220 through a contact hole CT2 which passes through the passivation layer 240 and the planarization layer 250. The first electrode 261 may be formed of a metal material, having a high reflectivity, such as a stacked structure (Ti/Al/Ti) of aluminum (Al) and titanium (Ti), a stacked structure (ITO/Al/ITO) of Al and ITO, an APC alloy, a stacked structure (ITO/APC/ITO) of an APC alloy and ITO, and/or the like. The APC alloy may be an alloy of Ag, palladium (Pd), and Cu.

[0054] The hole H is provided in the planarization layer.

That is, the hole H may be a recessed portion of the planarization layer 250. The hole H may be formed between adjacent first electrodes 261. As in FIG. 5, a width W1 of the hole H may be set wider than a distance D between the adjacent first electrodes 261. That is, the hole H may be formed in a pot shape where a width of a floor is wider than that of an entrance. Alternatively, as in FIG. 6, a width W2 of the hole H may be set equal to or narrower than the distance D between the adjacent first electrodes 261. The hole H may be formed in a form of a trench. The hole H may be generally defined as an interruption, a disconnection, or a cut.

[0055] A pixel defining layer 270 may be formed on a portion of the first electrode 261 and in the hole H. For example, the pixel defining layer 270 may be formed on the first electrode 261 in the contact hole CT2, and on the first electrode 261 between the contact hole CT2 and the hole H. An emissive area EA may be defined as an area where the first electrode 261, the organic light emitting layer 262, and the second electrode 263 are sequentially stacked to emit light. The first electrode 261, the organic light emitting layer 262, and the second electrode 263 may be sequentially stacked in an area where the pixel defining layer 270 is not provided. Accordingly, the pixel defining layer 270 may divide the emissive area EA to define the emissive area EA for each pixel.

[0056] The pixel defining layer 270 may be formed in an atomic layer deposition (ALD) process or an initiated chemical vapor deposition (iCVD) process. If the pixel defining layer 270 is formed in the ALD process, the pixel defining layer 270 may be formed to have a thickness of about 0.01 μm to 0.1 μm , and if the pixel defining layer 270 is formed in the iCVD process, the pixel defining layer 270 may be formed to have a thickness of about 0.1 μm to 1 μm . That is, the pixel defining layer 270 may be formed to fill a portion, instead of a whole portion, of the hole H and may be formed to divide the emissive area EA.

[0057] Moreover, a layer formed by the ALD process or the iCVD process is good in step coverage characteristic, and thus, even when the width W1 of the hole H is set wider than the distance D between the adjacent first electrodes 261 as in FIG. 5, the pixel defining layer 270 may be formed on both a sidewall and a floor of the hole H. Particularly, the pixel defining layer 270 may also be formed under the first electrode 261. The step coverage denotes that a layer deposited by a deposition process is continuously connected without being disconnected even in a portion where a step height is formed.

[0058] The organic light emitting layer 262 may be formed on the first electrode 261 and the pixel defining layer 270. The organic light emitting layer 262 may be a white light emitting layer emitting white light. In this instance, the organic light emitting layer 262 may be formed in a tandem structure of two or more stacks. The two or more stacks may each include a hole transporting layer, at least one light emitting layer, and an electron transporting layer. That is, the organic light emitting layer 282

may include the hole transporting layer, the at least one light emitting layer, and the electron transporting layer.

[0059] Moreover, a charge generating layer may be formed between adjacent stacks. The charge generating layer may include an n-type charge generating layer, disposed adjacent to a lower stack, and a p-type charge generating layer which is formed on the n-type charge generating layer and is disposed adjacent to an upper stack. The n-type charge generating layer may inject an electron into the lower stack, and the p-type charge generating layer may inject a hole into the upper stack. The n-type charge generating layer may be formed of an organic layer which is doped with alkali metal, such as lithium (Li), sodium (Na), potassium (K), or cesium (Cs), or alkali earth metal such as magnesium (Mg), strontium (Sr), barium (Ba), or radium (Ra). The p-type charge generating layer may be an organic layer which is formed by doping a dopant on an organic host material having an ability to transport holes.

[0060] The organic light emitting layer 262 may be formed in a deposition process or a solution process, and if the organic light emitting layer 262 is formed in the deposition process, the organic light emitting layer 262 may be formed in an evaporation process. A layer formed in the evaporation process is not good in step coverage characteristic.

[0061] Therefore, if the width W1 of the hole H is set wider than the distance D between the adjacent first electrodes 261 as in FIG. 5, the organic light emitting layer 262 may be disconnectedly formed in the hole H. That is, since the organic light emitting layer 262 is formed in the deposition process which is not good in step coverage characteristic, the organic light emitting layer 262 may be formed on only the floor of the hole H without being formed on the sidewall of the hole H.

[0062] Alternatively, if the width W2 of the hole H is set equal to or narrower than the distance D between the adjacent first electrodes 261 as in FIG. 6, a thickness of the organic light emitting layer 262 on the sidewall of the hole H may be set thinner than that of the organic light emitting layer 262 on the floor of the hole H. That is, since an angle " θ " of the sidewall of the hole H is large and the organic light emitting layer 262 is formed in the deposition process which is not good in step coverage characteristic, the organic light emitting layer 262 may be formed thinner on the sidewall of the hole H than the floor of the hole H.

[0063] As a result, since the organic light emitting layer 262 is disconnectedly formed in the hole H due to a step height caused by the hole H, an organic light emitting layer of one pixel may not be connected to an organic light emitting layer of another pixel adjacent to the one pixel. Alternatively, since a thickness of the organic light emitting layer 262 on the sidewall of the hole H is set thinner than that of the organic light emitting layer 262 on the floor of the hole H, a resistance of the organic light emitting layer 262 increases between adjacent pixels. Therefore, according to an embodiment, the amount of

current leaked from one pixel to another pixel adjacent thereto due to the hole transporting layer and/or the charge generating layer of the organic light emitting layer 262 is minimized. Accordingly, according to an embodiment, the other pixel adjacent to the one pixel is prevented from being affected by the current leaked from the one pixel.

[0064] The angle " θ " of the sidewall of the hole H may be set to 90 degrees or more, but an embodiment is not limited thereto. That is, the angle " θ " of the sidewall of the hole H may be set to a degree to which since the organic light emitting layer 262 is formed thinner on the sidewall than the floor of the hole H, the resistance of the organic light emitting layer 262 increases, and thus, another pixel adjacent to one pixel is prevented from being affected by a leakage current leaked from the one pixel. For example, the angle " θ " of the sidewall of the hole H may be set to 70 degrees in an instance where even when the angle " θ " of the sidewall of the hole H is 70 degrees, the resistance of the organic light emitting layer 262 increases, and thus, another pixel adjacent to one pixel is prevented from being affected by a leakage current leaked from the one pixel.

[0065] The second electrode 263 may be formed on the organic light emitting layer 262. The second electrode 263 may be formed of a transparent conductive material (or TCO), such as indium tin oxide (ITO) or indium zinc oxide (IZO) capable of transmitting light, or a semi-transparent conductive material such as Mg, Ag, or an alloy of Mg and Ag. A capping layer may be formed on the second electrode 263.

[0066] The second electrode 263 may be formed in a physical vapor deposition (PVD) process such as a sputtering process. A layer formed in the PVD process such as the sputtering process is good in step coverage characteristic. Accordingly, the second electrode 263 may be continuously connected without being disconnected despite a step height caused by the hole H.

[0067] An encapsulation layer 280 may be formed on the second electrode 263. The encapsulation layer 280 may be formed to fill the contact hole CT2 and the hole H. That is, in order for the organic light emitting layer 262 to be disconnected in the hole H due to the step height caused by the hole H, the pixel defining layer 270 may be thinly formed by the ALD process or the iCVD process. Therefore, the hole H may be filled not by the pixel defining layer 270 but by the encapsulation layer 280.

[0068] The encapsulation layer 280 prevents oxygen or water from penetrating into the organic light emitting layer 262 and the second electrode 263. To this end, the encapsulation layer 280 may include at least one inorganic layer and at least one organic layer.

[0069] For example, the encapsulation layer 280 may include a first inorganic layer, an organic layer, and a second inorganic layer. In this instance, the first inorganic layer may be formed on the second electrode 263 to cover the second electrode 263. The organic layer may be formed on the first inorganic layer to cover the first inor-

ganic layer. The organic layer may be formed to have a sufficient thickness for preventing particles from penetrating into the organic light emitting layer 262 and the second electrode 263 via the first inorganic layer. The second inorganic layer may be formed on the organic layer to cover the organic layer.

[0070] The first and second inorganic layers may each be formed of silicon nitride, aluminum nitride, zirconium nitride, titanium nitride, hafnium nitride, tantalum nitride, silicon oxide, aluminum oxide, titanium oxide, and/or the like. The organic layer may be formed of acryl resin, epoxy resin, phenolic resin, polyamide resin, polyimide resin, and/or the like.

[0071] A plurality of color filters 311 and 312 and a black matrix 320 may be formed on one surface of the second substrate 112 facing the first substrate 111. A red color filter 311 may be formed in a red emissive area RE, a green color filter 312 may be formed in a green emissive area GE, and a blue color filter may be formed in a blue emissive area. The emissive area EA illustrated in FIGS. 5 and 6 may be the red emissive area RE.

[0072] The black matrix 320 may be disposed between the color filters 311 and 312. The black matrix 320 may be provided in a non-emissive area instead of the emissive area EA, and thus, may be disposed to overlap the pixel defining layer 270.

[0073] The encapsulation layer 280 of the first substrate 111 may be adhered to the color filters 311 and 312 of the second substrate 112 by using an adhesive layer 290, and thus, the first substrate 111 may be bonded to the second substrate 112. The adhesive layer 290 may be a transparent adhesive resin.

[0074] As described above, in an embodiment, the hole H corresponding to the recessed portion of the planarization layer 250 may be formed between adjacent first electrodes 261, and the pixel defining layer 270 may be thinly formed by the ALD process or the iCVD process. As a result, according to an embodiment, since the hole H is not filled with the pixel defining layer 270, the organic light emitting layer 262 may be formed with an interruption between light emitting layers 262 of first and second emissive areas that are separated by the hole H. The interruption may comprise an electrical disconnection or an increased resistance. In particular, the organic light emitting layer 262 may be disconnected in the hole H due to a step height caused by the hole H, or may be thinly formed on the sidewall of the hole H. Therefore, according to an embodiment, the amount of current leaked from one pixel to another pixel adjacent thereto due to the hole transporting layer and/or the charge generating layer of the organic light emitting layer is minimized. Accordingly, according to an embodiment, the other pixel adjacent to the one pixel is prevented from being affected by the current leaked from the one pixel.

[0075] FIG. 7 is a cross-sectional view illustrating another example taken along line I-I' of FIGS. 3 and 4.

[0076] Except for pixel defining layer 270, the organic light emitting display device illustrated in FIG. 7 is sub-

stantially as described above with reference to FIGS. 5 and 6. In FIG. 7, therefore, detailed descriptions of elements other than the pixel defining layer 270 are omitted.

[0077] Referring to FIG. 7, the pixel defining layer 270 may be only formed on the first electrode 261 in the contact hole CT2 and in the hole H. Therefore, an emissive area EA where a first electrode 261, an organic light emitting layer 262, and a second electrode 263 are sequentially stacked may be provided outside both sides of the contact hole CT2, and thus, an area of the emissive area EA may increase. Accordingly, the area of the emissive area EA is enlarged in the organic light emitting display device of FIG. 7 than the organic light emitting display device illustrated in FIGS. 5 and 6, and thus, an emission efficiency of an organic light emitting device is enhanced.

[0078] FIG. 8 is a flowchart illustrating a method of manufacturing an organic light emitting display device according to an embodiment. FIGS. 9A to 9H are cross-sectional views taken along line I-I' of FIGS. 3 and 4 for describing a method of manufacturing an organic light emitting display device according to an embodiment. The cross-sectional views illustrated in FIGS. 9A to 9H relate to the method of manufacturing the organic light emitting display device illustrated in FIG. 5, and thus, like reference numerals refer to like elements. Hereinafter, a method of manufacturing an organic light emitting display device according to an embodiment will be described in detail with reference to FIGS. 8 and 9A to 9H.

[0079] First, as in FIG. 9A, a TFT 220 and a planarization layer 250 may be formed, and a first electrode 261 may be formed on the planarization layer 250.

[0080] Before the TFT 220 is formed, a buffer layer may be formed on a first substrate 111, for protecting the TFT 220 from water penetrating through a substrate 100. The buffer layer may include a plurality of inorganic layers which are alternately stacked, for protecting the TFT 220 and an organic light emitting device 260 from water which penetrates through the first substrate 111 vulnerable to penetration of water. For example, the buffer layer may be formed of a multilayer where one or more inorganic layers of silicon oxide (SiOx), silicon nitride (SiNx), and SiON are alternately stacked. The buffer layer may be formed by using a chemical vapor deposition (CVD) process.

[0081] Subsequently, an active layer 221 of the TFT 220 may be formed on the buffer layer. In detail, an active metal layer may be formed all over the buffer layer by using a sputtering process, a metal organic chemical vapor (MOCVD) process, and/or the like. Subsequently, the active layer 221 may be formed by patterning the active metal layer through a mask process using a photoresist pattern. The active layer 211 may be formed of a silicon-based semiconductor material, an oxide-based semiconductor material, and/or the like.

[0082] Subsequently, a gate insulation layer 210 may be formed on the active layer 221. The gate insulation layer 210 may be formed of an inorganic layer, for example, silicon oxide (SiOx), silicon nitride (SiNx), or a mul-

tilayer thereof.

[0083] Subsequently, a gate electrode 222 of the TFT 220 may be formed on the gate insulation layer 210. In detail, a first metal layer may be formed all over the gate insulation layer 210 by using a sputtering process, an MOCVD process, and/or the like. Subsequently, the gate electrode 222 may be formed by patterning the first metal layer through a mask process using a photoresist pattern. The gate electrode 222 may be formed of a single layer or a multilayer which includes one of molybdenum (Mo), chromium (Cr), titanium (Ti), nickel (Ni), neodymium (Nd), and copper (Cu), or an alloy thereof.

[0084] Subsequently, an interlayer dielectric 230 may be formed on the gate electrode 222. The interlayer dielectric 230 may be formed of an inorganic layer, for example, SiOx, SiNx, or a multilayer thereof.

[0085] Subsequently, a plurality of contact holes CT1 which pass through the gate insulation layer 210 and the interlayer dielectric 230 to expose the active layer 211 may be formed.

[0086] Subsequently, a source electrode 223 and a drain electrode 224 of the TFT 220 may be formed on the interlayer dielectric 230. In detail, a second metal layer may be formed all over the interlayer dielectric 230 by using a sputtering process, an MOCVD process, and/or the like. Subsequently, the source electrode 223 and the drain electrode 224 may be formed by patterning the second metal layer through a mask process using a photoresist pattern. Each of the source electrode 223 and the drain electrode 224 may contact the active layer 221 through a corresponding contact hole CT1 which passes through the gate insulation layer 210 and the interlayer dielectric 230. The source electrode 223 and the drain electrode 224 may each be formed of a single layer or a multilayer which includes one of Mo, Cr, Ti, Ni, Nd, and Cu, or an alloy thereof.

[0087] Subsequently, a passivation layer 240 may be formed on the source electrode 223 and the drain electrode 224 of the TFT 220. The passivation layer 240 may be formed of an inorganic layer, for example, SiOx, SiNx, or a multilayer thereof. The passivation layer 240 may be formed by using a CVD process.

[0088] Subsequently, a planarization layer 250 for planarizing a step height caused by the TFT 220 may be formed on the passivation layer 240. The passivation layer 250 may be formed of an organic layer such as acryl resin, epoxy resin, phenolic resin, polyamide resin, polyimide resin, and/or the like.

[0089] Subsequently, a first electrode 261 of the organic light emitting device 260 may be formed on the planarization layer 250. In detail, a third metal layer may be formed all over the planarization layer 250 by using a sputtering process, an MOCVD process, and/or the like. Subsequently, the first electrode 261 may be formed by patterning the third metal layer through a mask process using a photoresist pattern. The first electrode 261 may be connected to the source electrode 223 of the TFT 220 through a contact hole CT2 which passes through the

passivation layer 240 and the planarization layer 250. The first electrode 261 may be formed of a metal material, having a high reflectivity, such as a stacked structure (Ti/Al/Ti) of aluminum (Al) and titanium (Ti), a stacked structure (ITO/Al/ITO) of Al and ITO, an APC alloy, a stacked structure (ITO/APC/ITO) of an APC alloy and ITO, and/or the like (S101 of FIG. 8).

[0090] Second, as in FIG. 9B, a hole H corresponding to a recessed portion of the planarization layer 250 may be formed between adjacent first electrodes 261. In detail, by dry-etching the planarization layer 250 with the first electrodes 261 as a mask, the hole H corresponding to the recessed portion of the planarization layer 250 may be formed between the adjacent first electrodes 261. A material applied to the dry-etching may be O₂ or a mixed gas of O₂ and CF₄.

[0091] As in FIG. 5, a width W1 of the hole H may be set wider than a distance D between the adjacent first electrodes 261. Alternatively, as in FIG. 6, a width W2 of the hole H may be set equal to or narrower than the distance D between the adjacent first electrodes 261 (S102 of FIG. 8).

[0092] Third, as in FIG. 9C, a pixel defining layer 270 may be formed on the planarization layer 250 disposed in the hole H and the first electrode 261. That is, the pixel defining layer 270 may be formed all over the first substrate 111. The pixel defining layer 270 may be an insulation layer.

[0093] The pixel defining layer 270 may be formed in an atomic layer deposition (ALD) process or an initiated chemical vapor deposition (iCVD) process. If the pixel defining layer 270 is formed in the ALD process, the pixel defining layer 270 may be formed to have a thickness of about 0.01 μm to 0.1 μm , and if the pixel defining layer 270 is formed in the iCVD process, the pixel defining layer 270 may be formed to have a thickness of about 0.1 μm to 1 μm .

[0094] A layer formed in the ALD process or the iCVD process is good in step coverage characteristic. Therefore, a layer formed by the ALD process or the iCVD process is good in step coverage characteristic, and thus, even when the width W1 of the hole H is set wider than the distance D between the adjacent first electrodes 261 as in FIG. 5, the pixel defining layer 270 may be formed on both a sidewall and a floor of the hole H. Particularly, the pixel defining layer 270 may also be formed under the first electrode 261. That is, the pixel defining layer 270 may be continuously connected without being disconnected despite a step height caused by the hole H (S103 of FIG. 8).

[0095] Fourth, as in FIG. 9D, a photoresist pattern PR may be formed on the pixel defining layer 270. The photoresist pattern PR may be formed in an area other than an emissive area EA (S104 of FIG. 8).

[0096] Fifth, as in FIG. 9E, the pixel defining layer 270 uncovered by the photoresist pattern PR may be dry-etched. Therefore, a portion of the first electrode 261 corresponding to the emissive area EA may be exposed

(S105 of FIG. 8).

[0097] Sixth, as in FIG. 9F, the photoresist pattern PR may be removed (S106 of FIG. 8).

[0098] Seventh, as in FIG. 9G, an organic light emitting layer 262, a second electrode 263, and an encapsulation layer 280 may be sequentially formed on the first electrode 261 and the pixel defining layer 270.

[0099] In detail, the organic light emitting layer 262 may be formed on the first electrode 261 and the pixel defining layer 270 in a deposition process or a solution process. If the organic light emitting layer 262 is formed in the deposition process, the organic light emitting layer 262 may be formed in an evaporation process. A layer formed in the evaporation process is not good in step coverage characteristic.

[0100] Therefore, if the width W1 of the hole H is set wider than the distance D between the adjacent first electrodes 261 as in FIG. 5, the organic light emitting layer 262 may be disconnectedly formed in the hole H. That is, since the organic light emitting layer 262 is formed in the deposition process which is not good in step coverage characteristic, the organic light emitting layer 262 may be formed on only the floor of the hole H without being formed on the sidewall of the hole H.

[0101] Alternatively, if the width W2 of the hole H is set equal to or narrower than the distance D between the adjacent first electrodes 261 as in FIG. 6, a thickness of the organic light emitting layer 262 on the sidewall of the hole H may be set thinner than that of the organic light emitting layer 262 on the floor of the hole H. That is, since an angle " θ " of the sidewall of the hole H is large and the organic light emitting layer 262 is formed in the deposition process which is not good in step coverage characteristic, the organic light emitting layer 262 may be formed thinner on the sidewall of the hole H than the floor of the hole H.

[0102] As a result, since the organic light emitting layer 262 is disconnectedly formed in the hole H due to a step height caused by the hole H, an organic light emitting layer of one pixel may not be connected to an organic light emitting layer of another pixel adjacent to the one pixel. Alternatively, since a thickness of the organic light emitting layer 262 on the sidewall of the hole H is set thinner than that of the organic light emitting layer 262 on the floor of the hole H, a resistance of the organic light emitting layer 262 increases between adjacent pixels. Therefore, according to an embodiment, the amount of current leaked from one pixel to another pixel adjacent thereto due to the hole transporting layer and/or the charge generating layer of the organic light emitting layer 262 is minimized. Accordingly, according to an embodiment, the other pixel adjacent to the one pixel is prevented from being affected by the current leaked from the one pixel.

[0103] Subsequently, the second electrode 263 may be formed on the organic light emitting layer 262. The second electrode 263 may be formed of a transparent conductive material (or TCO), such as indium tin oxide

(ITO) or indium zinc oxide (IZO) capable of transmitting light, or a semi-transmissive conductive material such as Mg, Ag, or an alloy of Mg and Ag. The second electrode 263 may be formed in a physical vapor deposition (PVD) process such as a sputtering process. A layer formed in the PVD process such as the sputtering process is good in step coverage characteristic. Accordingly, the second electrode 263 may be continuously connected without being disconnected despite a step height caused by the hole H.

[0104] Subsequently, a capping layer may be formed on the second electrode 263.

[0105] Subsequently, an encapsulation layer 280 may be formed on the second electrode 263. The encapsulation layer 280 may be formed to fill the contact hole CT2 and the hole H.

[0106] The encapsulation layer 280 prevents oxygen or water from penetrating into the organic light emitting layer 262 and the second electrode 263. To this end, the encapsulation layer 280 may include at least one inorganic layer and at least one organic layer.

[0107] For example, the encapsulation layer 280 may include a first inorganic layer, an organic layer, and a second inorganic layer. In this instance, the first inorganic layer may be formed on the second electrode 263 to cover the second electrode 263. The organic layer may be formed on the first inorganic layer to cover the first inorganic layer. The organic layer may be formed to have a sufficient thickness for preventing particles from penetrating into the organic light emitting layer 262 and the second electrode 263 via the first inorganic layer. The second inorganic layer may be formed on the organic layer to cover the organic layer.

[0108] The first and second inorganic layers may each be formed of silicon nitride, aluminum nitride, zirconium nitride, titanium nitride, hafnium nitride, tantalum nitride, silicon oxide, aluminum oxide, titanium oxide, and/or the like. The organic layer may be formed of acryl resin, epoxy resin, phenolic resin, polyamide resin, polyimide resin, and/or the like (S107 of FIG. 8).

[0109] Eighth, as in FIG. 9H, the encapsulation layer 280 of the first substrate 111 may be adhered to the color filters 311 and 312 of the second substrate 112 by using an adhesive layer 290. Therefore, the first substrate 111 may be bonded to the second substrate 112. The adhesive layer 290 may be a transparent adhesive resin (S108 of FIG. 8).

[0110] As described above, in an embodiment, the hole H corresponding to the recessed portion of the planarization layer 250 may be formed between adjacent first electrodes 261, and the pixel defining layer 270 may be thinly formed by the ALD process or the iCVD process. As a result, according to an embodiment, since the hole H is not filled with the pixel defining layer 270, the organic light emitting layer 262 may be disconnected in the hole H due to a step height caused by the hole H, or may be thinly formed on the sidewall of the hole H. Therefore, according to an embodiment, the amount of current

leaked from one pixel to another pixel adjacent thereto due to the hole transporting layer and/or the charge generating layer of the organic light emitting layer is minimized. Accordingly, according to an embodiment, the other pixel adjacent to the one pixel is prevented from being affected by the current leaked from the one pixel.

[0111] Moreover, according to the embodiments, the hole may be formed in order for the planarization layer to be recessed between the first electrodes, and the pixel defining layer may be thinly formed by the ALD process or the iCVD process. As a result, according to the embodiments, since the hole is not filled with the pixel defining layer, the organic light emitting layer may be disconnected in the hole due to a step height caused by the hole, or may be thinly formed on a sidewall of the hole. Therefore, according to the embodiments, the amount of current leaked from one pixel to another pixel adjacent thereto due to the hole transporting layer and/or the charge generating layer of the organic light emitting layer is minimized. Accordingly, according to the embodiments, the other pixel adjacent to the one pixel is prevented from being affected by the current leaked from the one pixel.

[0112] It will be apparent to those skilled in the art that various modifications and variations can be made in the present disclosure without departing from the scope of the disclosure. Thus, it is intended that the present disclosure covers the modifications and variations of this disclosure provided they come within the scope of the appended claims.

[0113] Aspects of the present disclosure are defined in the following numbered clauses:

1. An organic light emitting display device comprising: a plurality of emissive areas each having a first electrode, a light emitting layer on the first electrode, and a second electrode on the light emitting layer; and a hole between a first emissive area and a second emissive area of the plurality of emissive areas to disconnect the light emitting layer of the first emissive area from the light emitting layer of the second emissive area.

2. The organic light emitting display device of clause 1, further comprising: a substrate; a thin film transistor on the substrate; a planarization layer on the thin film transistor; and a contact hole passing through the planarization layer to expose a source or drain electrode of the thin film transistor.

3. The organic light emitting display device of clause 2, wherein one first electrode is on the planarization layer, and is connected to the source or drain electrode of the thin film transistor through the contact hole, and wherein the hole is provided in the planarization layer.

4. The organic light emitting display device of clause

3, further comprising a pixel defining layer both on a portion of the one first electrode and in the hole.

5. The organic light emitting display device of clause 4, wherein the pixel defining layer is provided on both a side wall and a floor of the hole. 5

6. The organic light emitting display device of any preceding clause, wherein a portion of the light emitting layer is provided on the floor of the hole. 10

7. The organic light emitting display device of any preceding clause, wherein the hole is between one first electrode of the first emissive area and one second electrode of the second emissive area. 15

8. The organic light emitting display device of any preceding clause, wherein a width of the hole is wider than a distance between one first electrode of the first emissive area and one first electrode of the second emissive area. 20

9. The organic light emitting display device of clause 4, or any one of clauses 5 to 8 when dependent on clause 4, wherein one second electrode is provided on the pixel defining layer in the hole. 25

10. The organic light emitting display device of any preceding clause, wherein a width of the hole is equal to or narrower than a distance between one first electrode of the first emissive area and one first electrode of the second emissive area. 30

11. The organic light emitting display device of clause 6, or any one of clauses 7 to 10 when dependent on clause 6, wherein a thickness of the portion of the light emitting layer on a sidewall of the hole is thinner than a thickness of the portion of the light emitting layer on the floor of the hole. 35

12. The organic light emitting display device of clause 4, or any one of clauses 5 to 11 when dependent on clause 4, wherein the pixel defining layer fills a portion of the hole. 40

13. The organic light emitting display device of clause 4, or any one of clauses 5 to 8 when dependent on clause 4, further comprising an encapsulation layer on one second electrode, the encapsulation layer filling the contact hole and the hole. 45

14. The organic light emitting display device of clause 13, further comprising: a plurality of color filters on the encapsulation layer; and a black matrix between adjacent color filters, the black matrix overlapping the pixel defining layer. 50

15. The organic light emitting display device of

clause 14, wherein the hole is aligned with the black matrix.

16. The organic light emitting display device of clause 4, or any one of clauses 5 to 15 when dependent on clause 4, wherein the plurality of emissive areas are divided by the pixel defining layer.

17. The organic light emitting display device of any preceding clause, wherein the hole is disposed to surround an emissive area of the plurality of emissive areas.

18. The organic light emitting display device of clause 2, or any one of clauses 3 to 17 when dependent on clause 2, wherein the contact hole is between an emissive area of the plurality of emissive areas and the hole.

19. A method of manufacturing an organic light emitting display device, the method comprising: forming a thin film transistor on a substrate, the substrate having a plurality of emissive areas; forming a planarization layer on the thin film transistor; forming a contact hole exposing a source or drain electrode of the thin film transistor through the planarization layer; forming a first electrode connected to the source or drain electrode of the thin film transistor through the contact hole; forming a hole between adjacent emissive areas, the hole being provided in the planarization layer; forming a pixel defining layer on a portion of the first electrode and in the hole; and sequentially forming a light emitting layer, a second electrode, and an encapsulation layer on the first electrode and the pixel defining layer.

20. The method of clause 19, wherein the forming of the pixel defining layer comprises: forming the pixel defining layer on the portion of the first electrode and in the hole by using an atomic layer deposition (ALD) process or an initiated chemical vapor deposition (iCVD) process; forming a photoresist pattern on the pixel defining layer; etching the pixel defining layer uncovered by the photoresist pattern to expose the portion of the first electrode; and removing the photoresist pattern.

Claims

1. An organic light emitting display device comprising:
 - a plurality of emissive areas each having a first electrode (261), a light emitting layer (262) on the first electrode (261), and a second electrode (263) on the light emitting layer (262); and
 - a hole (H) between a first emissive area (EA) and a second emissive area (EA) of the plurality

- of emissive areas to provide an interruption between the light emitting layer (262) of the first emissive area and the light emitting layer (262) of the second emissive area.
2. The organic light emitting display device of claim 1, wherein the interruption between the light emitting layer (262) of the first emissive area and the light emitting layer (262) of the second emissive area, comprises:
 - a disconnection of the light emitting layer (262) of the first emissive area from the light emitting layer (262) of the second emissive area, or
 - a resistance between the light emitting layer (262) of the first emissive area and the light emitting layer (262) of the second emissive area, preferably comprising a light emitting layer (262) on a sidewall of the hole (H) that is thinner than the light emitting layer (262) on the floor of the hole (H).
 3. The organic light emitting display device of claim 1 or claim 2, wherein:
 - the hole (H) is disposed to surround an emissive area (EA) of the plurality of emissive areas, and/or
 - the hole (H) is between one first electrode (161) of the first emissive area and one first electrode (161) of the second emissive area.
 4. The organic light emitting display device of claim 1, 2 or 3, further comprising:
 - a substrate (111);
 - a thin film transistor (220) on the substrate (111);
 - a planarization layer (250) on the thin film transistor (220); and
 - a contact hole (CT2) passing through the planarization layer (250) to expose a source or drain electrode (223, 224) of the thin film transistor (220).
 5. The organic light emitting display device of claim 4, wherein the contact hole (CT2) is between an emissive area (EA) of the plurality of emissive areas and the hole (H).
 6. The organic light emitting display device of claim 4 or claim 5, wherein one first electrode (262) is on the planarization layer (250), and is connected to the source or drain electrode (223, 224) of the thin film transistor (220) through the contact hole (CT2), and wherein the hole (H) is provided in the planarization layer (250).
 7. The organic light emitting display device of claim 4,
- 5 or 6, further comprising a pixel defining layer (270) both on a portion of one first electrode (261) and in the hole (H), wherein, preferably, the plurality of emissive areas are divided by the pixel defining layer (270).
 8. The organic light emitting display device of claim 7, wherein the pixel defining layer (270) is provided on both a side wall and a floor of the hole (H), and preferably a portion of the light emitting layer is (262) provided on the floor of the hole (H).
 9. The organic light emitting display device of claim 7 or claim 8, wherein:
 - one second electrode (263) is provided on the pixel defining layer (270) in the hole (H), and/or
 - the pixel defining layer (270) fills a portion of the hole (H).
 10. The organic light emitting display device of claims 7, 8 or 9, further comprising an encapsulation layer (280) on one second electrode (263), the encapsulation layer (280) filling the contact hole (CT) and the hole (H).
 11. The organic light emitting display device of claim 10, further comprising:
 - a plurality of color filters (311) on the encapsulation layer (280); and
 - a black matrix (320) between adjacent color filters (320), the black matrix (320) overlapping the pixel defining layer (270), wherein, preferably, the hole (H) is aligned with the black matrix (320).
 12. The organic light emitting display device of any preceding claim, wherein a width (W2) of the hole (H) is wider than a distance (D) between one first electrode (161) of the first emissive area and one first electrode (161) of the second emissive area.
 13. The organic light emitting display device of any preceding claim, wherein a width (W2) of the hole (H) is equal to or narrower than a distance between one first electrode (161) of the first emissive area and one first electrode (161) of the second emissive area, wherein, preferably, a thickness of the portion of the light emitting layer (162) on a sidewall of the hole (H) is thinner than a thickness of the portion of the light emitting layer (162) on the floor of the hole (H).
 14. A method of manufacturing an organic light emitting display device, the method comprising:
 - forming (S101) a thin film transistor on a substrate, the substrate having a plurality of emis-

sive areas;
forming (S101) a planarization layer on the thin
film transistor;
forming (S101) a contact hole exposing a source
or drain electrode of the thin film transistor 5
through the planarization layer;
forming (S101) a first electrode connected to the
source or drain electrode of the thin film transistor through the contact hole;
forming (S102) a hole between adjacent emissive areas, the hole being provided in the
planarization layer; 10
forming (S103, S104, S105, S106) a pixel defining layer on a portion of the first electrode and
in the hole; and 15
sequentially forming (S107) a light emitting layer, a second electrode, and an encapsulation
layer on the first electrode and the pixel defining layer.

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15. The method of claim 14, wherein the forming (S103)
of the pixel defining layer comprises:

forming (S103) the pixel defining layer on the
portion of the first electrode and in the hole by 25
using an atomic layer deposition (ALD) process
or an initiated chemical vapor deposition (iCVD)
process;
forming (S104) a photoresist pattern on the pixel
defining layer; 30
etching (S105) the pixel defining layer uncovered
by the photoresist pattern to expose the
portion of the first electrode; and
removing (S106) the photoresist pattern.

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FIG. 1

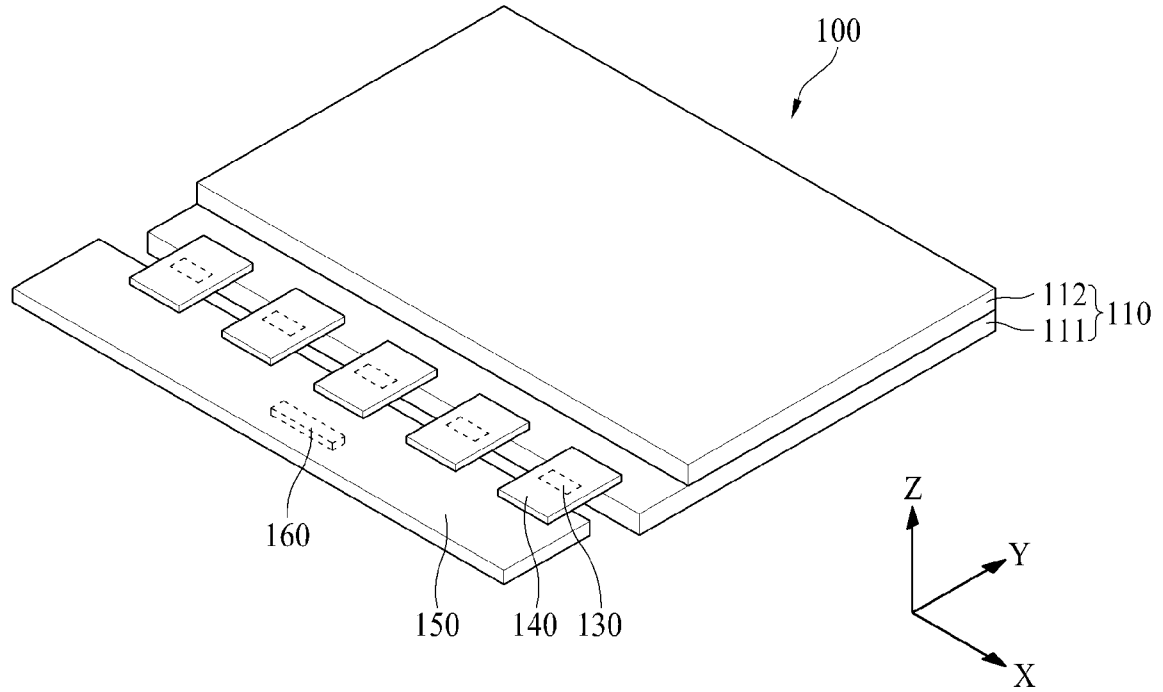


FIG. 2

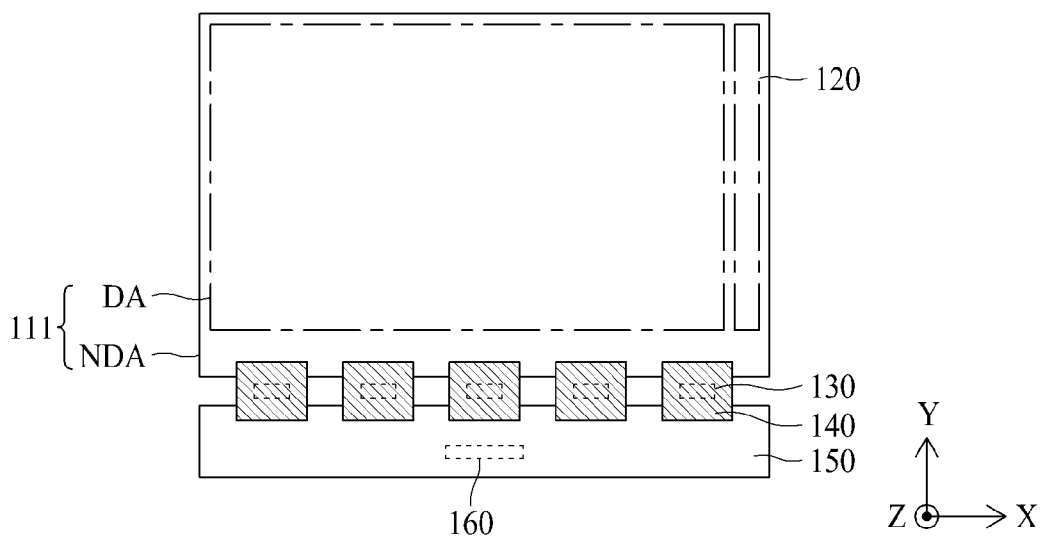


FIG. 3

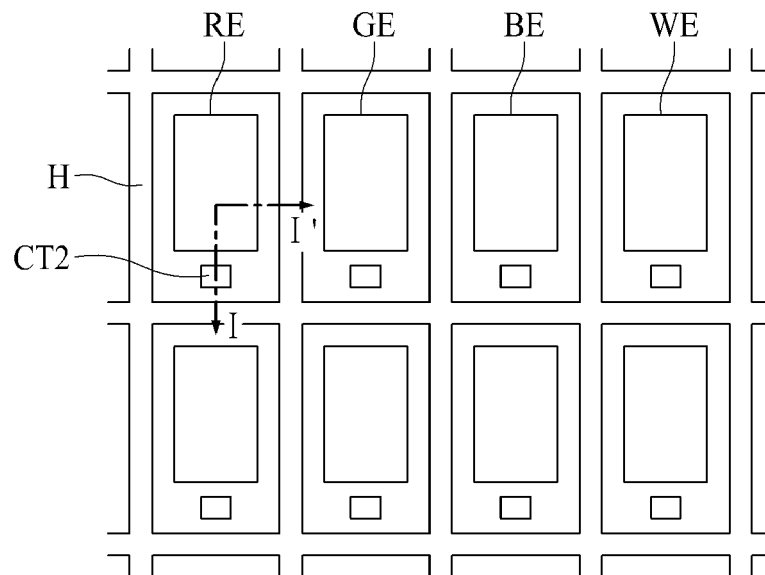


FIG. 4

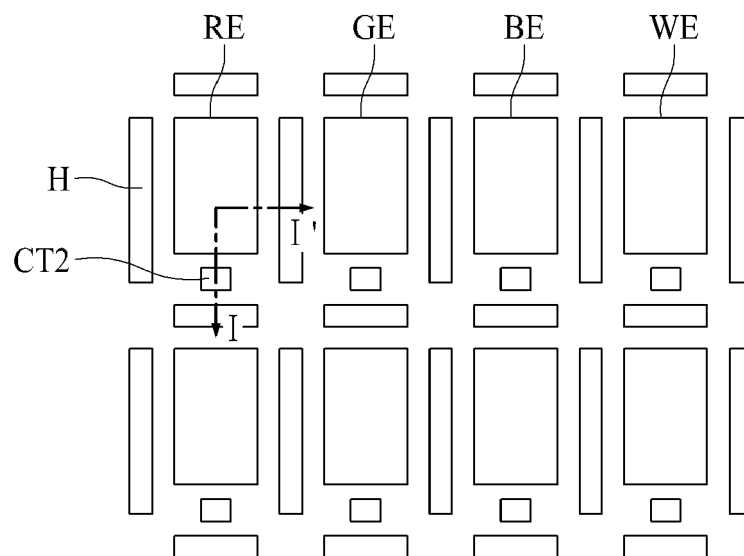


FIG. 5

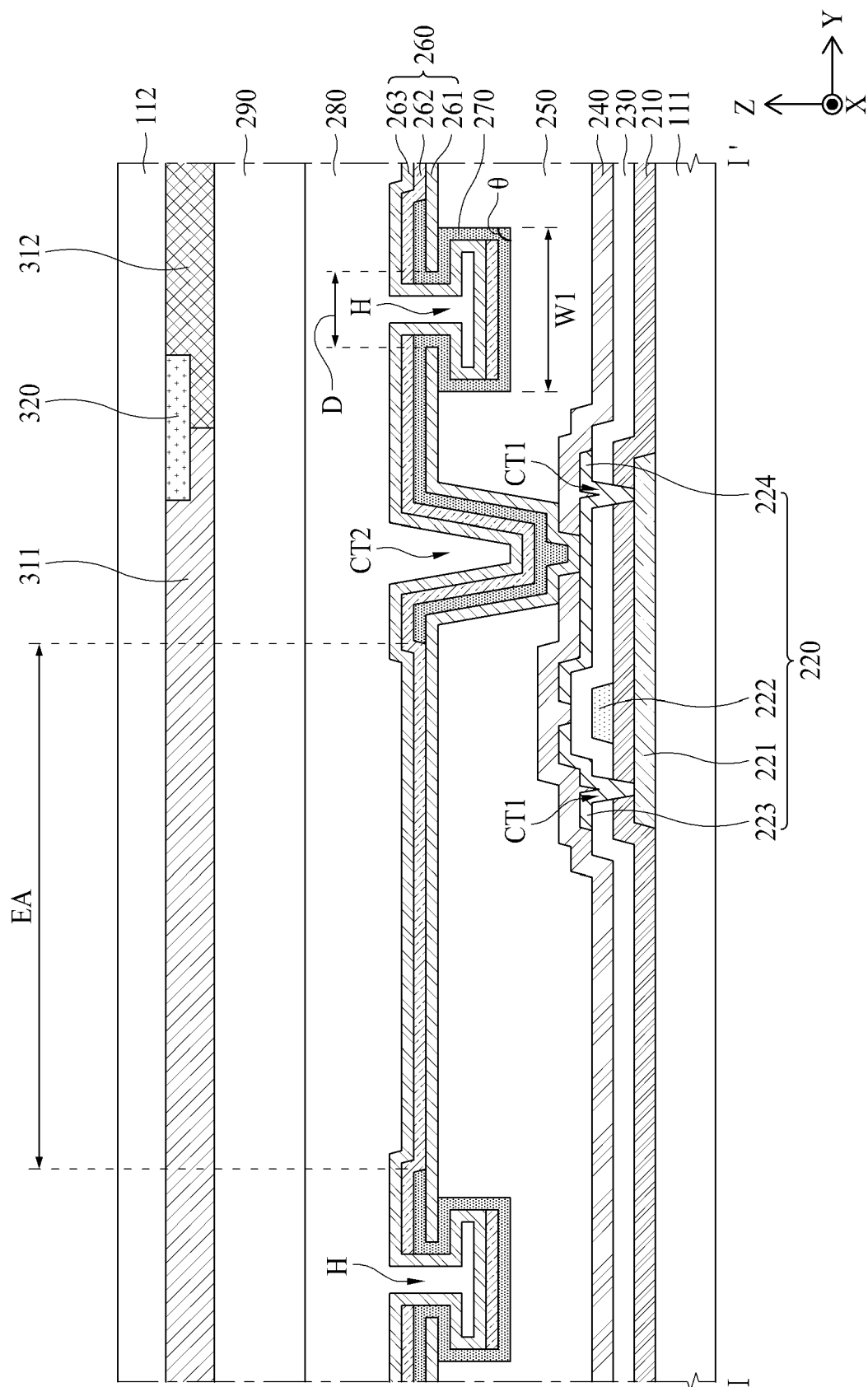


FIG. 6

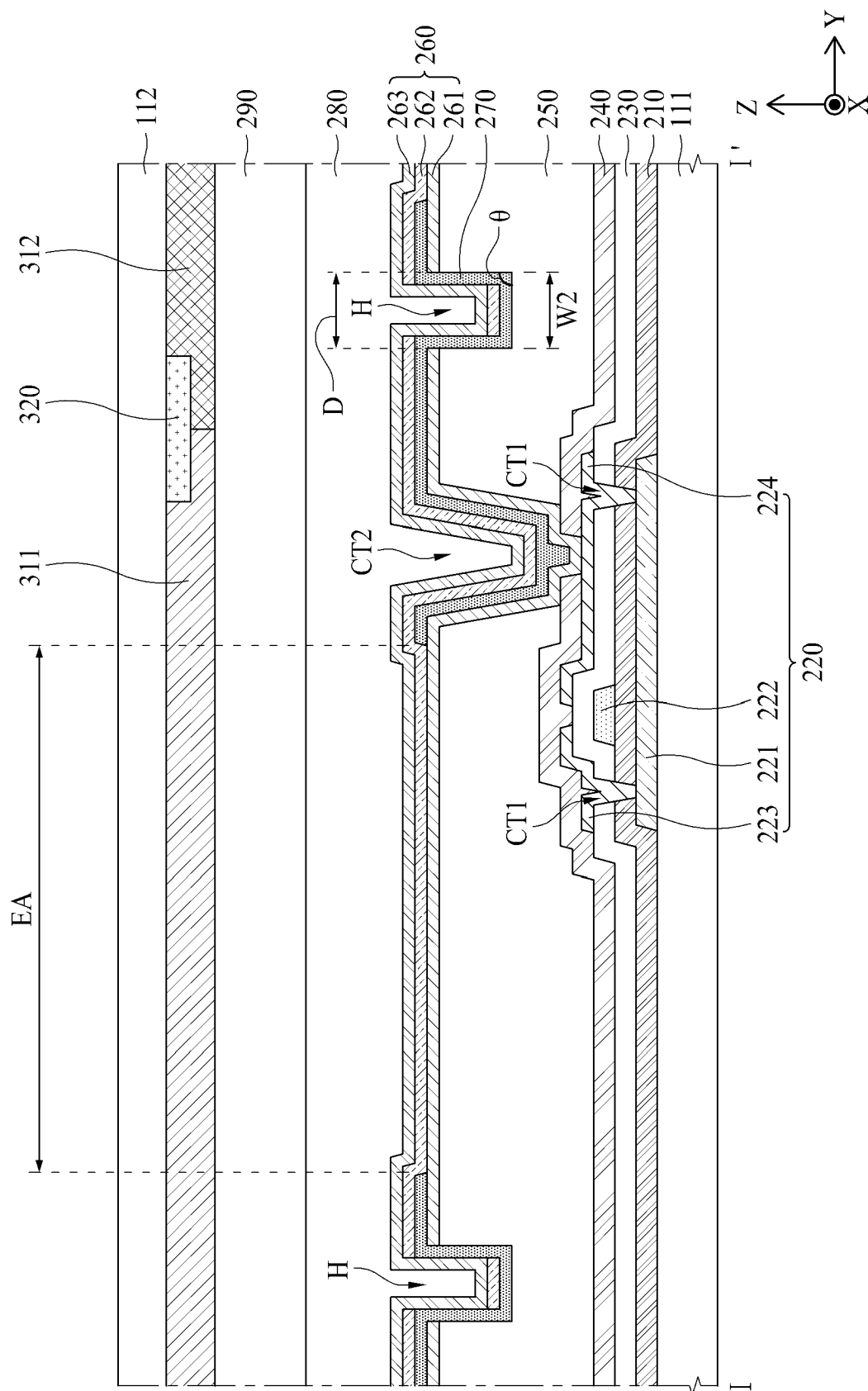


FIG. 7

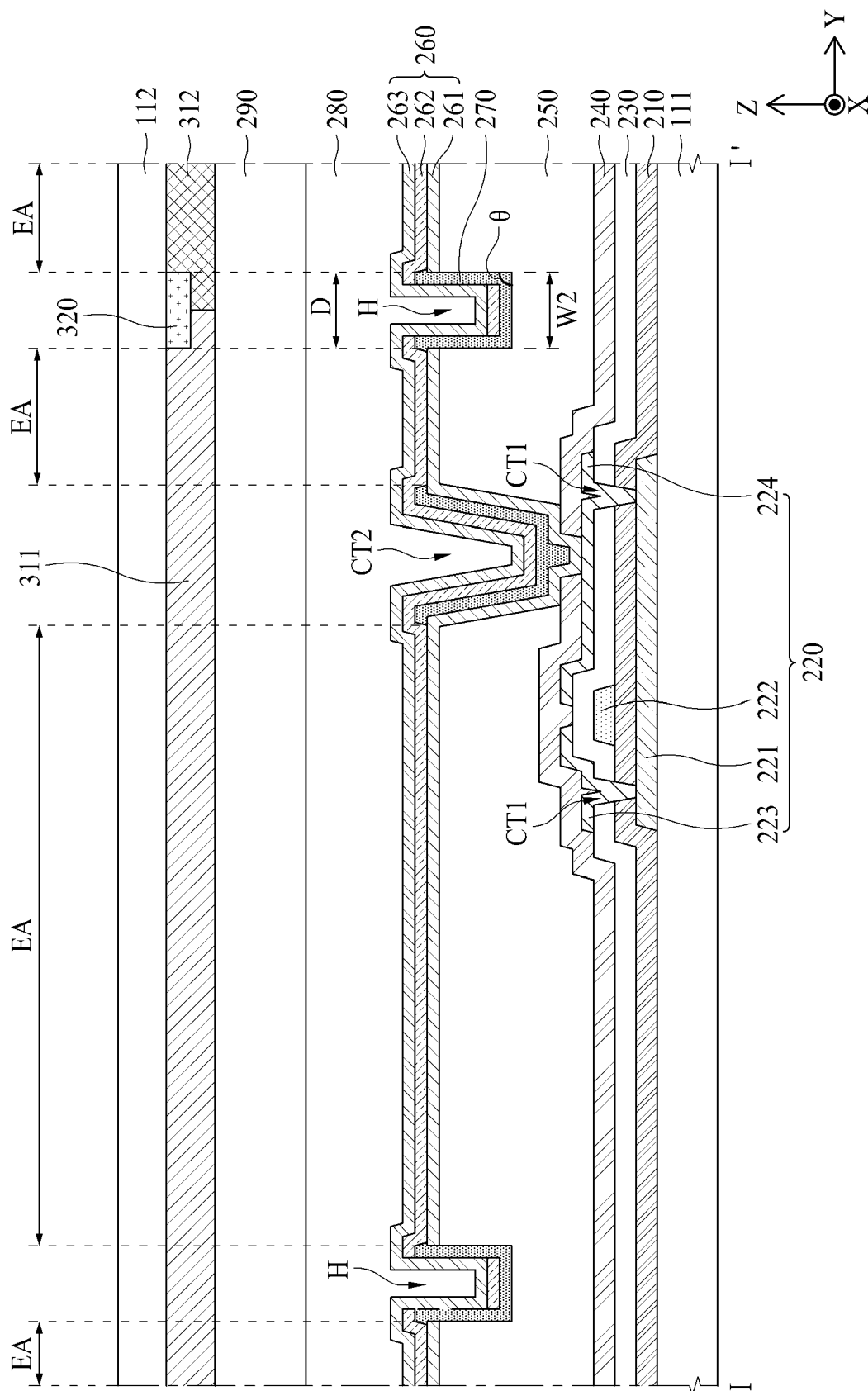


FIG. 8

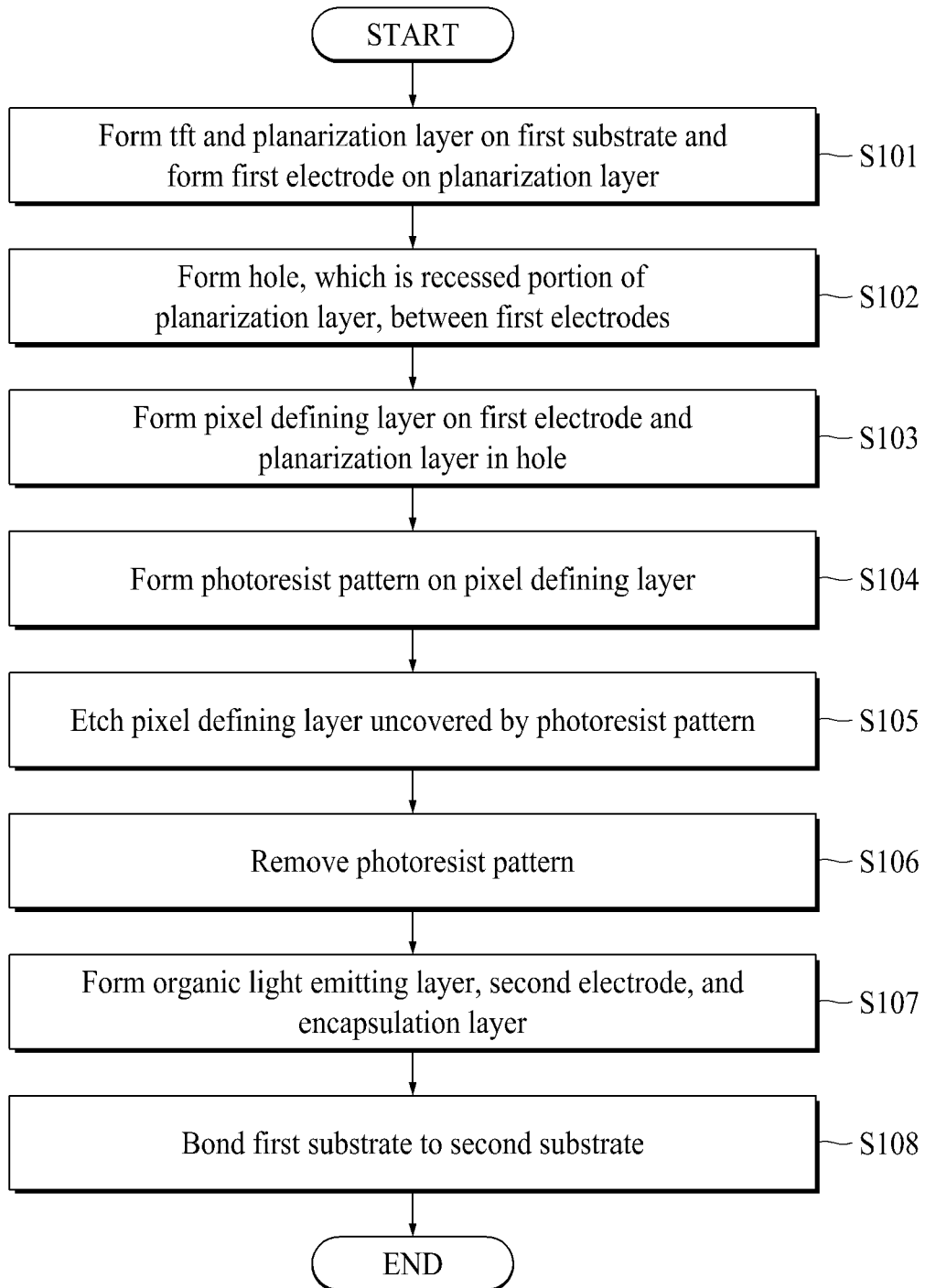


FIG. 9A

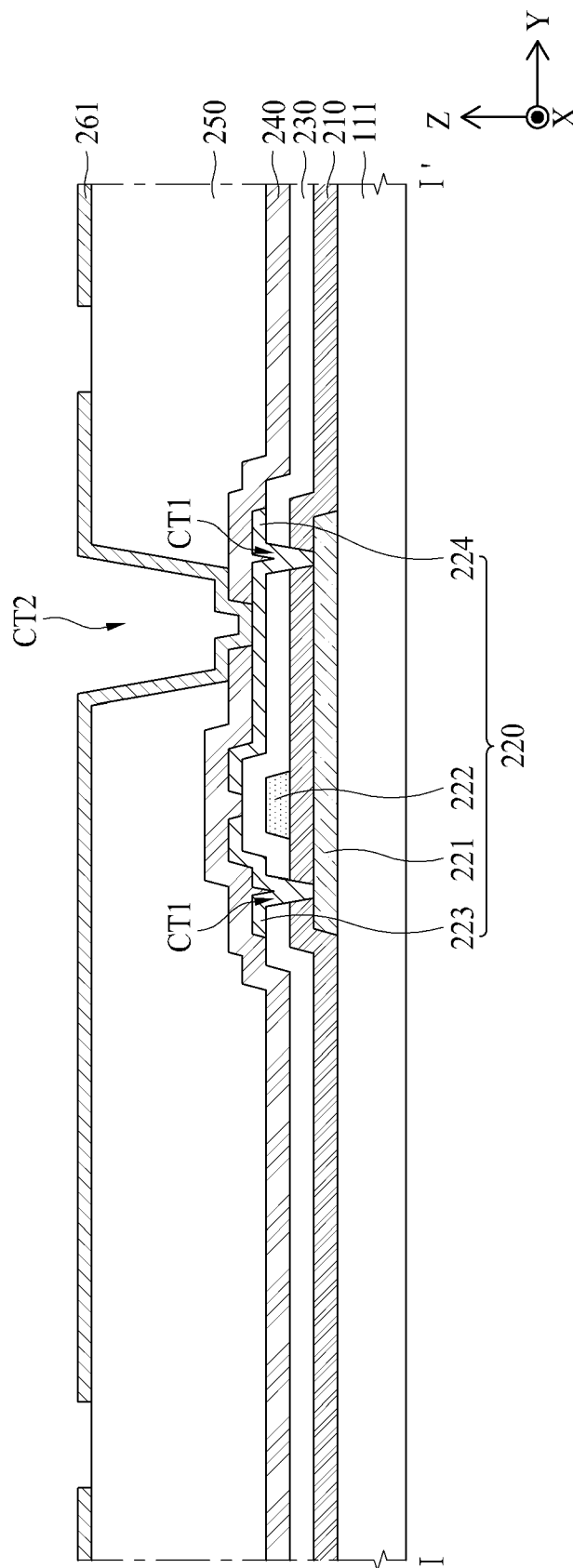


FIG. 9B

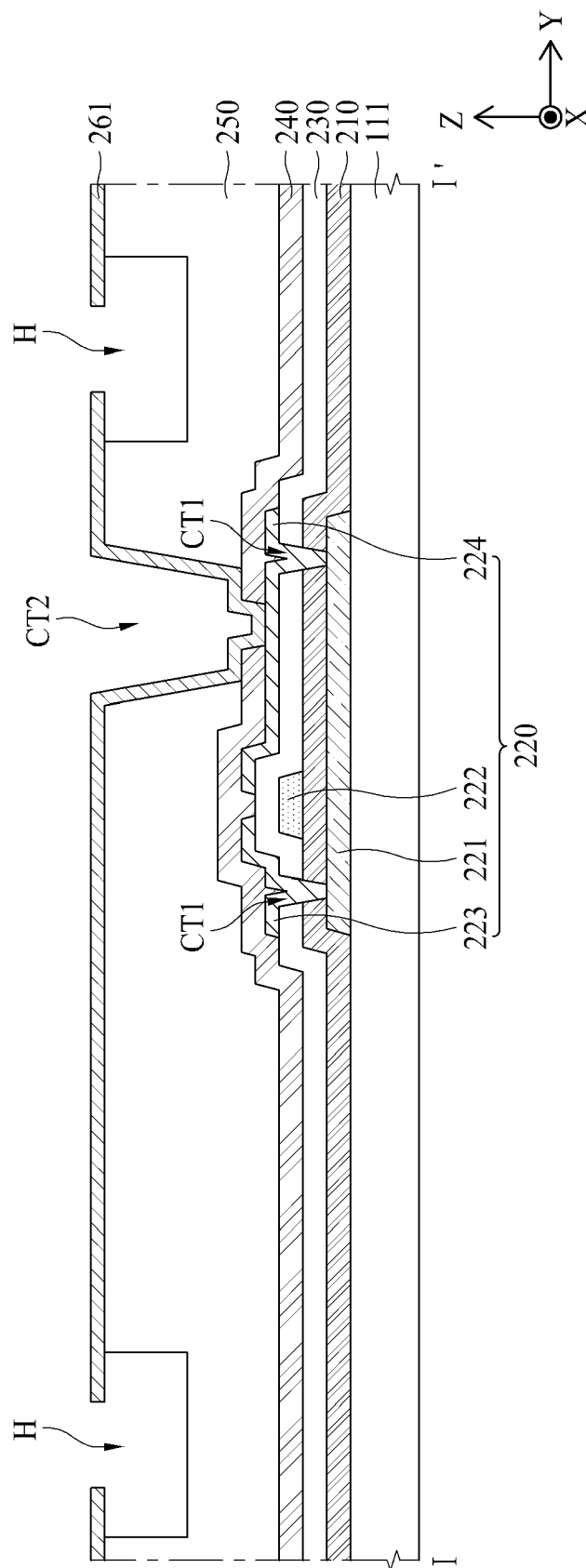


FIG. 9C

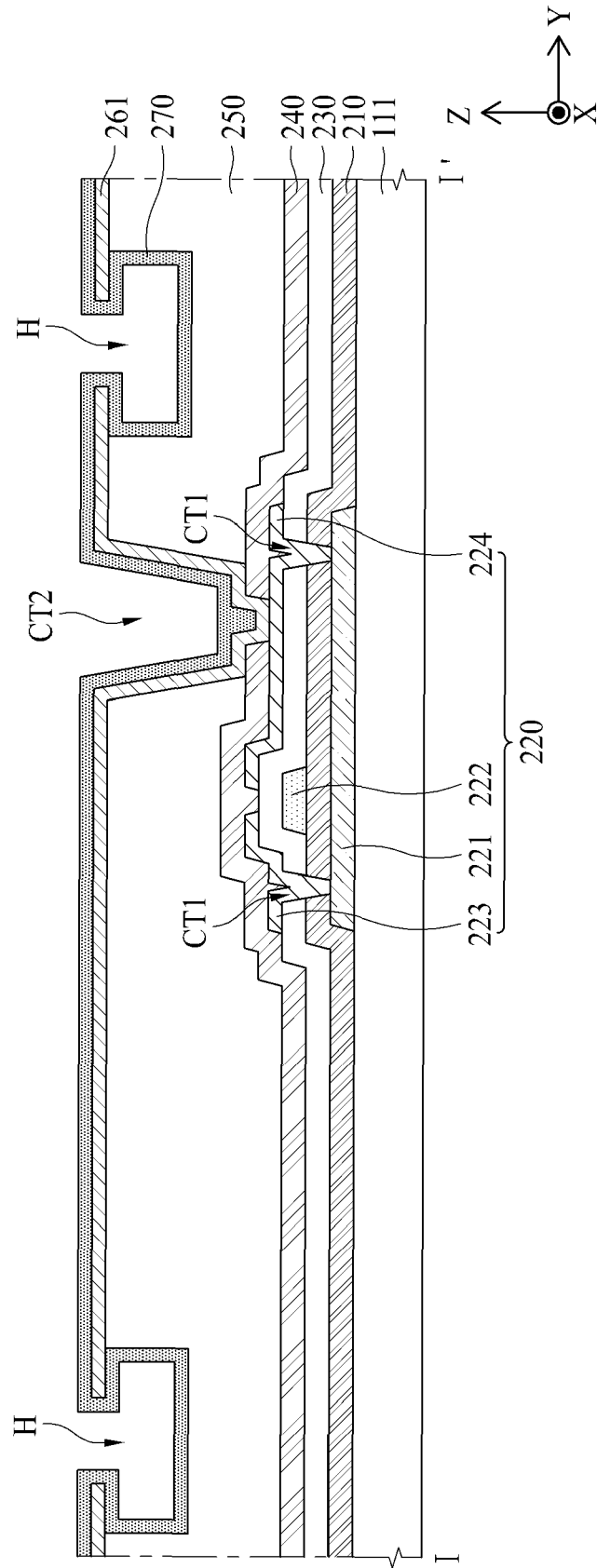


FIG. 9D

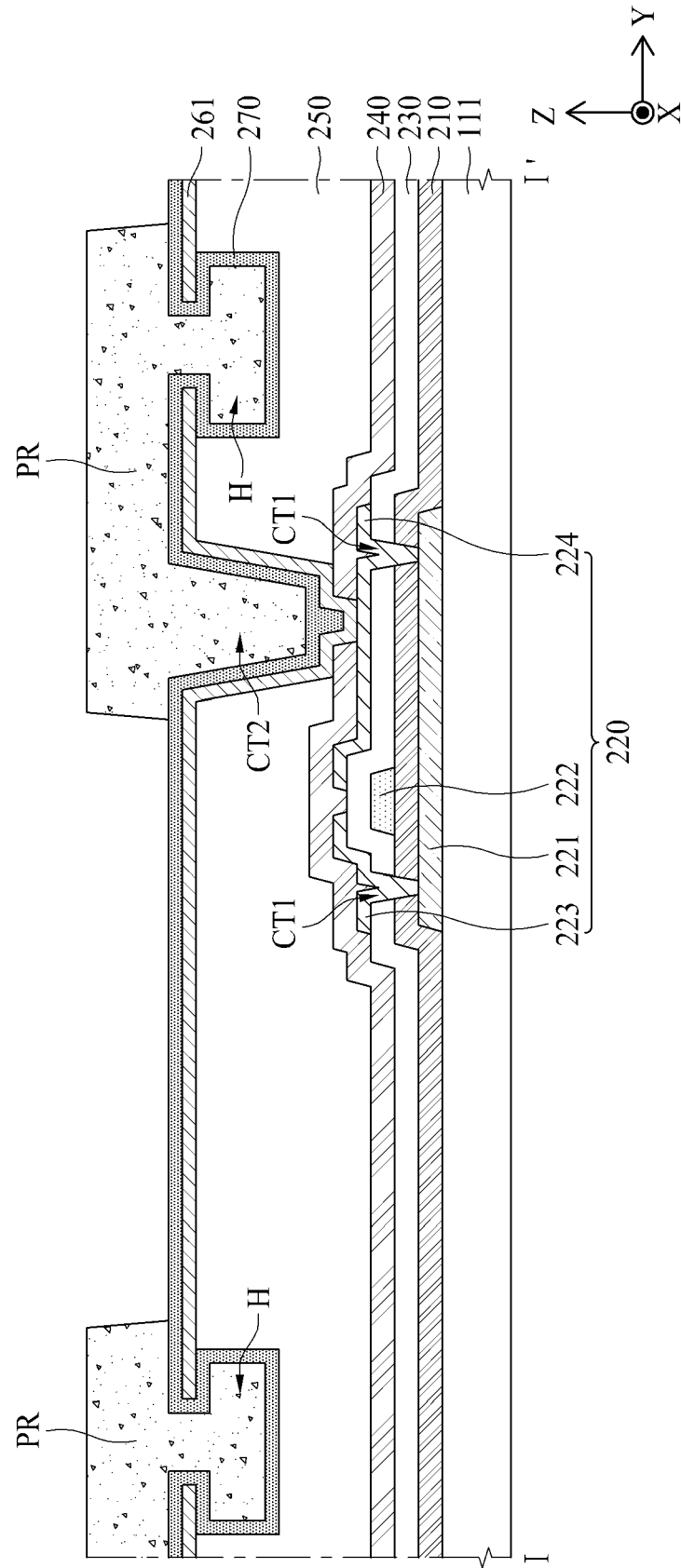


FIG. 9E

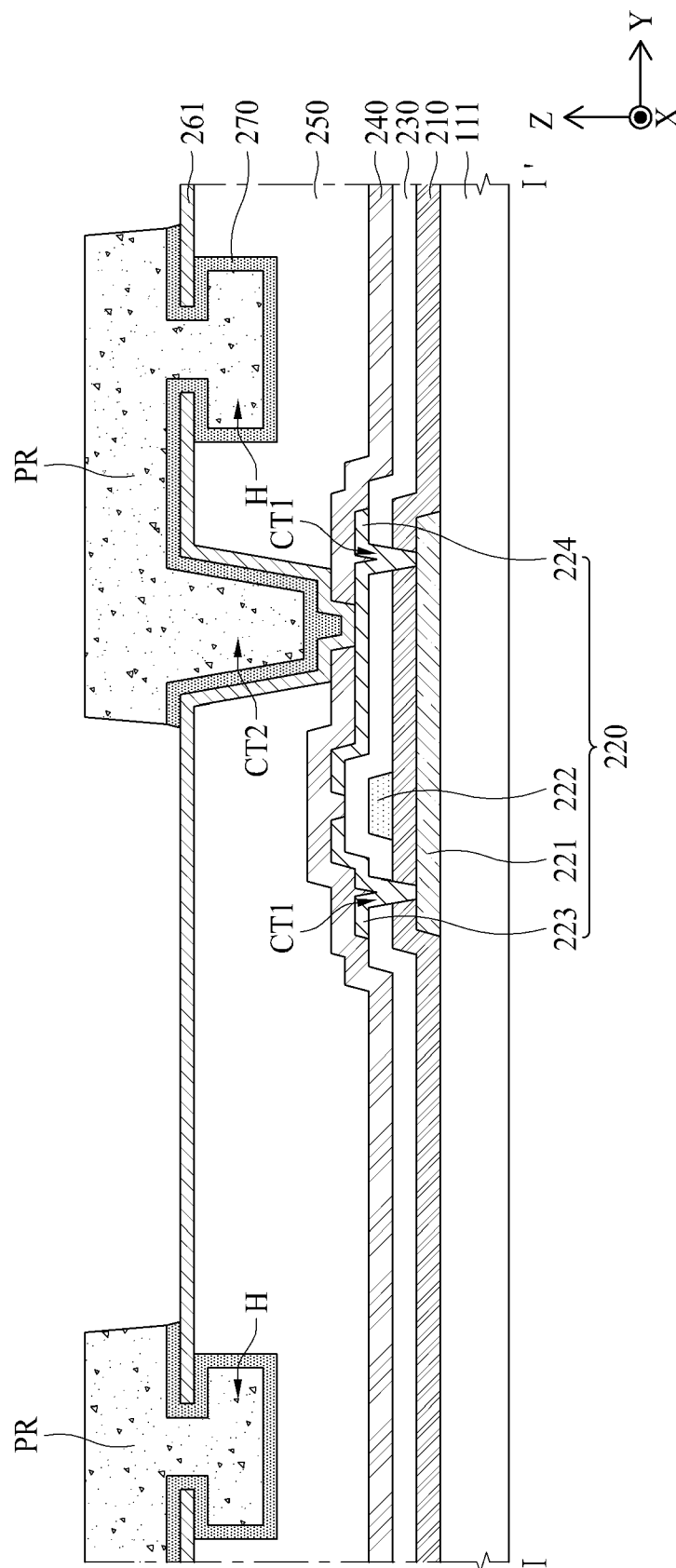


FIG. 9F

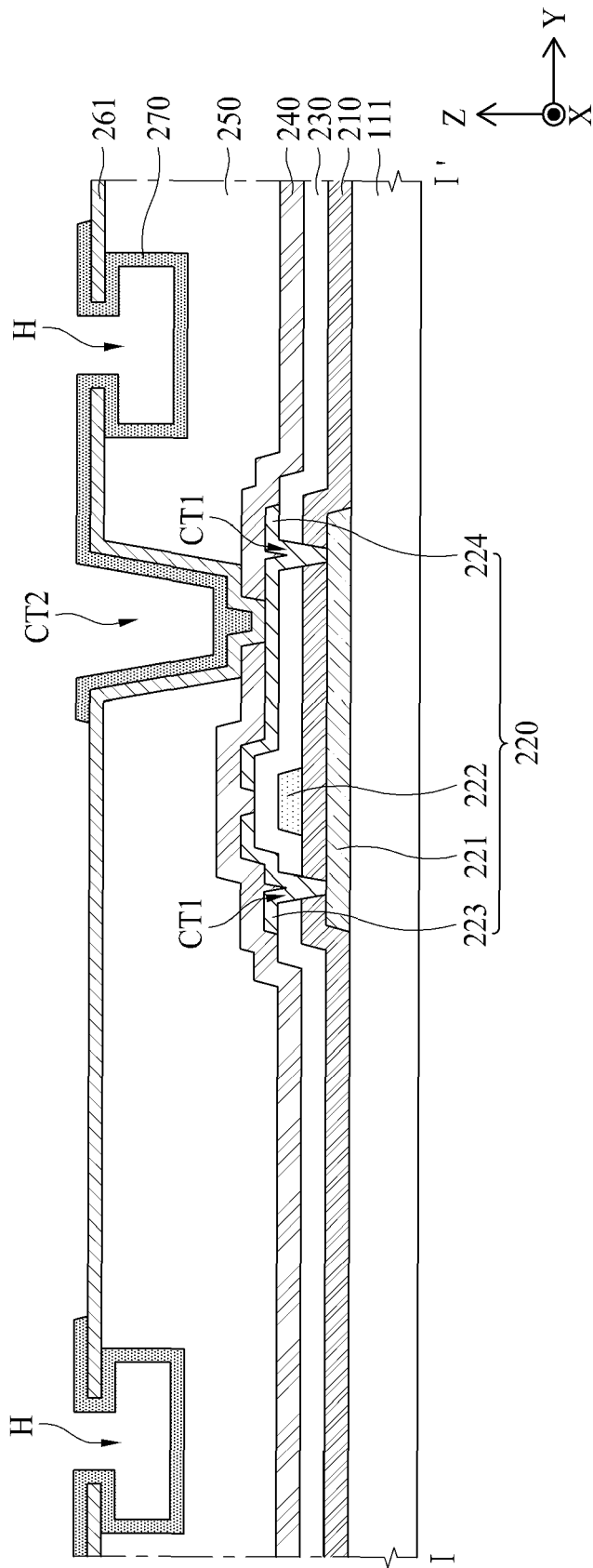


FIG. 9G

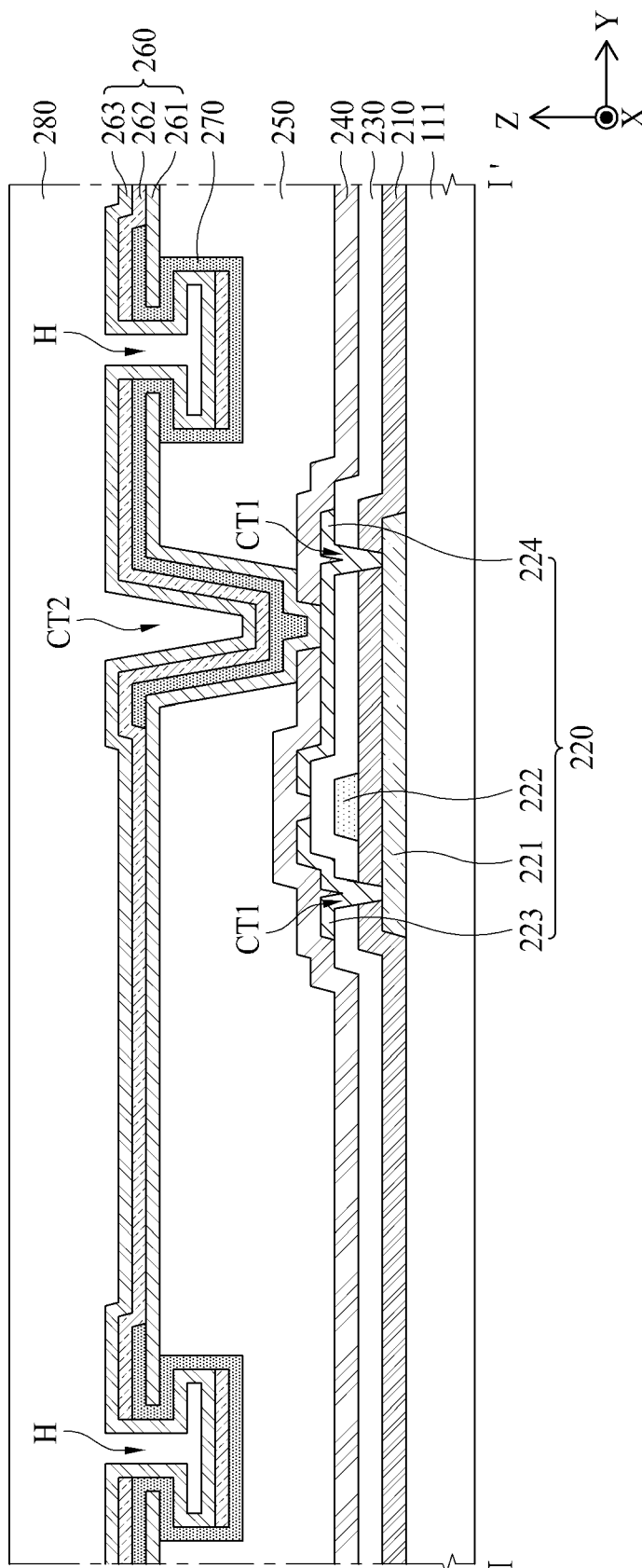
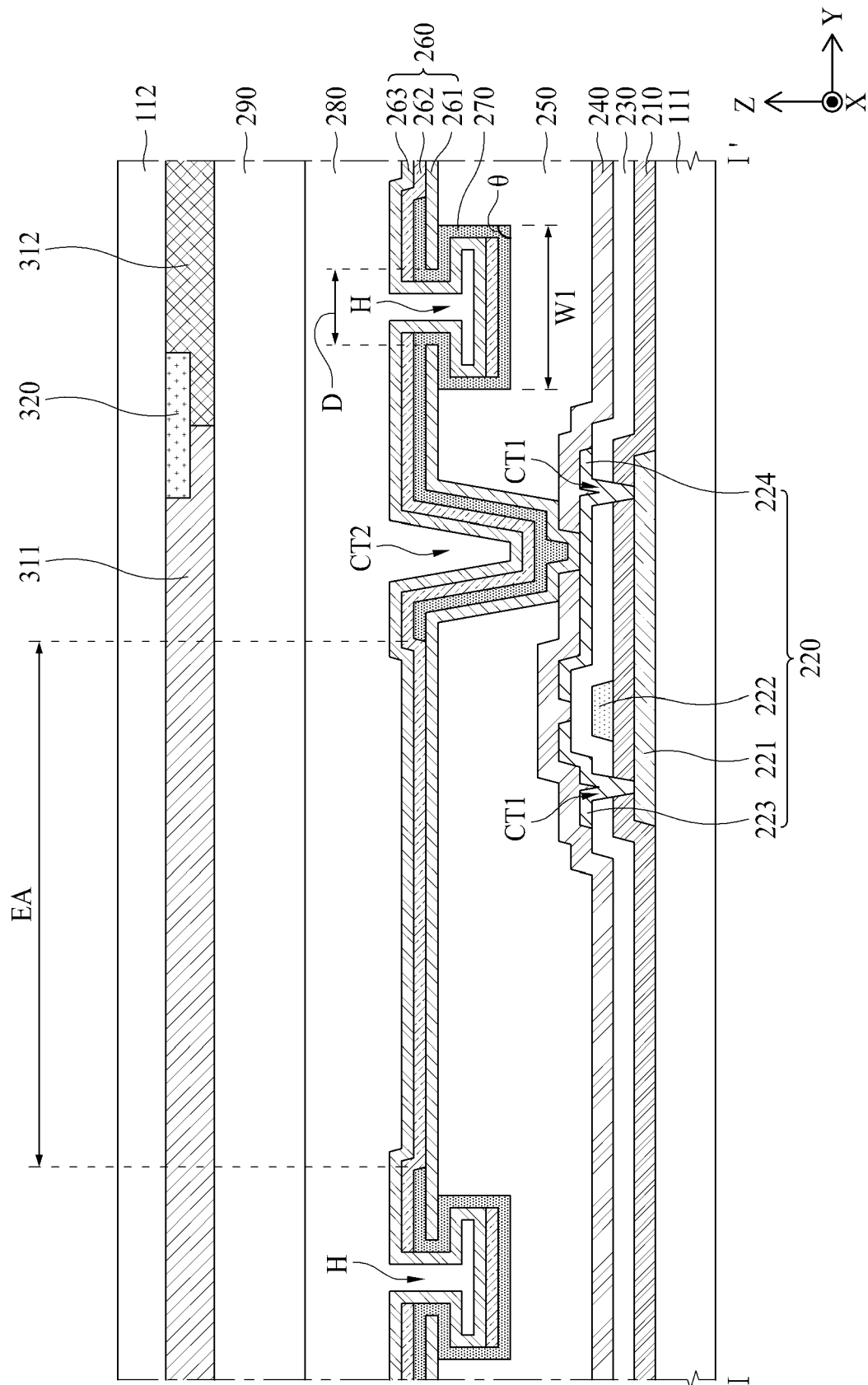


FIG. 9H



专利名称(译)	有机发光显示装置及其制造方法		
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摘要(译)

本发明公开了一种有机发光显示装置，包括：衬底上的薄膜晶体管；薄膜晶体管上的平坦化层；穿过平坦化层以暴露薄膜晶体管的源极或漏极的接触孔；第一电极在所述平坦化层上，所述第一电极通过所述接触孔连接到所述薄膜晶体管的源电极或漏电极，所述第一电极和与其相邻的另一第一电极之间的孔，所述孔是所述平坦化层的凹部，覆盖穿过接触孔和设置在孔中的平坦化层的第一电极的像素限定层，在第一电极和像素限定层上的发光层以及在发光层上的第二电极。

FIG. 5

