



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.11.2016 Bulletin 2016/48

(51) Int Cl.:
H01L 27/32 (2006.01)

(21) Application number: **15190597.3**

(22) Date of filing: **20.10.2015**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

(72) Inventors:
• **LEE, Joonsuk**
151-017 Seoul (KR)
• **KIM, Se June**
Paju-si, Gyeonggi-do 413-100 (KR)

(74) Representative: **Viering, Jentschura & Partner mbB**
Patent- und Rechtsanwälte
Am Brauhaus 8
01099 Dresden (DE)

(30) Priority: **29.05.2015 KR 20150076678**

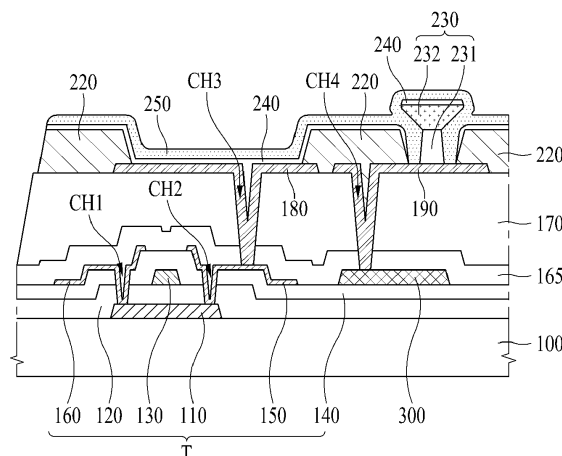
(71) Applicant: **LG Display Co., Ltd.**
Seoul 150-721 (KR)

(54) **ORGANIC LIGHT EMITTING DISPLAY APPARATUS**

(57) Disclosed is an organic light emitting display apparatus (Fig. 2). The organic light emitting display apparatus includes a plurality of anode electrodes (180) disposed on a substrate (100), an auxiliary electrode (190) disposed on the substrate (100), an organic emission layer (240) disposed on the anode electrode (180), a cathode electrode (250) disposed on the organic emission layer (240), an insulating bank (220) disposed to overlap a first portion of the auxiliary electrode (190) and to expose a second portion of the auxiliary electrode (190), and a partition wall (230) disposed above the exposed second portion of the auxiliary electrode (190), the

partition wall (230) covering the exposed second portion while leaving a separation space between the partition wall (230) and the bank (220), the cathode electrode (250) being electrically connected to the auxiliary electrode (190) through the separation space between the partition wall (230) and the bank (220). The partition wall (230) comprises a first partition wall (231) disposed on the auxiliary electrode (190) and a second partition wall (232) disposed on the first partition wall (231). The second partition wall (232) is supported by the first partition wall (231) and the bank (220).

FIG. 2



Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of the Korean Patent Application No. 10-2015-0076678 filed on May 29, 2015, which is hereby incorporated by reference as if fully set forth herein.

BACKGROUND

Field of the Invention

[0002] The present invention relates to an organic light emitting display apparatus, and more particularly, to a top emission type organic light emitting display apparatus.

Discussion of the Related Art

[0003] Organic light emitting display apparatuses are self-emitting apparatuses and have low power consumption, a fast response time, high emission efficiency, high luminance, and a wide viewing angle.

[0004] The organic light emitting display apparatuses are classified into a top emission type and a bottom emission type, based on a transmission direction of light emitted from an organic light emitting device. In the bottom emission type, a circuit element is disposed between an emission layer and an image displaying surface, and for this reason, an aperture ratio is lowered. On the other hand, in the top emission type, the circuit element is not disposed between the emission layer and the image displaying surface, and thus, an aperture ratio is enhanced.

[0005] FIG. 1 is a schematic cross-sectional view of a related art top emission type organic light emitting display apparatus.

[0006] As seen in FIG. 1, a thin film transistor (TFT) layer T which includes an active layer 11, a gate insulation layer 12, a gate electrode 13, an interlayer dielectric 14, a source electrode 15, and a drain electrode 16 is formed on a substrate 10, and a passivation layer 20 and a planarization layer 30 are sequentially formed on the TFT layer T.

[0007] An anode electrode 40 and an auxiliary electrode 50 are formed on the planarization layer 30. The auxiliary electrode 50 decreases a resistance of a cathode electrode 80 to be described below.

[0008] A bank 60 is formed on the anode electrode 40 and the auxiliary electrode 50 and defines a pixel area. An organic emission layer 70 is formed in the pixel area defined by the bank 60, and the cathode electrode 80 is formed on the organic emission layer 70.

[0009] In the top emission type, light emitted from the organic emission layer 70 passes through the cathode electrode 80 and travels. Therefore, the cathode electrode 80 is formed of a transparent conductive material, and for this reason, a resistance of the cathode electrode

80 increases. In order to decrease the resistance of the cathode electrode 80, the cathode electrode 80 is connected to the auxiliary electrode 50.

[0010] The related art top emission type organic light emitting display apparatus has the following problems.

[0011] The related art organic light emitting display apparatus is an organic light emitting display apparatus to which a top emission type is applied, and has a drawback where it is difficult to deposit the organic emission layer 70. In the related art organic light emitting display apparatus, an additional process may be needed to deposit the organic emission layer 70 on only the anode electrode 40. Also, in a case of blanket-depositing the organic emission layer 70, the auxiliary electrode 50 cannot be connected to the cathode electrode 80. Also, since the organic emission layer 70 is not patterned to be separated in each of a plurality of pixels, defective driving can occur.

SUMMARY

[0012] Accordingly, the present invention is directed at providing an organic light emitting display apparatus that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[0013] An aspect of the present invention is directed to provide a top emission type organic light emitting display apparatus and a method of manufacturing the same, in which an auxiliary electrode is connected to a cathode electrode despite an organic emission layer being blanket-deposited, and defective driving between pixels is prevented. To this end, a partition wall is stably formed.

[0014] In addition to the aforesaid objects of the present invention, other features and advantages of the present invention will be described below, but will be clearly understood by those skilled in the art from descriptions below.

[0015] Additional advantages and features of the invention 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 invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0016] To achieve these and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, there is provided an organic light emitting display apparatus comprising: an anode electrode disposed on a substrate; an auxiliary electrode disposed on the substrate; an organic emission layer disposed on the anode electrode; a cathode electrode disposed on the organic emission layer and on the auxiliary electrode; an insulating bank disposed on the auxiliary electrode, the bank overlapping a first portion of the auxiliary electrode and exposing a second portion of the auxiliary electrode; a first partition wall disposed on the auxiliary electrode; a second partition wall dis-

posed on the first partition wall and covering the exposed second portion of the auxiliary electrode while leaving a separation space between the second partition wall and the bank; the cathode electrode being electrically connected to the auxiliary electrode through the separation space between the second partition wall and the bank; wherein the second partition wall is supported by the first partition wall and the bank.

[0017] In a more specific embodiment, there is provided an organic light emitting display apparatus including: a plurality of anode electrodes disposed on a substrate; an auxiliary electrode disposed on the same layer as a layer on which the plurality of anode electrodes are disposed; a first partition wall disposed on the auxiliary electrode; a second partition wall disposed on the first partition wall; a cathode electrode connected to the auxiliary electrode; and a bank disposed to overlap a portion of the auxiliary electrode, wherein the second partition wall is supported by the first partition wall and the bank.

[0018] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiments of the invention and together with the description serve to explain the principle of the invention. In the drawings:

FIG. 1 is a schematic cross-sectional view of a related art top emission type organic light emitting display apparatus;

FIG. 2 is a cross-sectional view of an organic light emitting display apparatus, taken along line II-II in Figure 3 and Figure 4, respectively;

FIG. 3 is a plan view of an organic light emitting display apparatus;

FIG. 4 is a plan view of an organic light emitting display apparatus according to an embodiment of the present invention;

FIG. 5 is a plan view of an organic light emitting display apparatus according to another embodiment of the present invention;

FIGS. 6A to 6C are schematic cross-sectional views of the organic light emitting display apparatus according to Figure 5;

FIG. 7 is a cross-sectional view of an organic light emitting display apparatus according to another embodiment of the present invention; and

FIG. 8 is a cross-sectional view of an organic light emitting display apparatus according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0020] Reference will now be made in detail to the exemplary embodiments of the present invention, 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.

[0021] Advantages and features of the present invention, and implementation methods thereof will be clarified through following embodiments described with reference to the accompanying drawings. The present invention 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 invention to those skilled in the art. Further, the present invention is only defined by scopes of claims.

[0022] A shape, a size, a ratio, an angle, and a number disclosed in the drawings for describing embodiments of the present invention are merely an example, and thus, the present invention is not limited to the illustrated details. Like reference numerals refer to like elements throughout. 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 invention, the detailed description will be omitted. In a case where 'comprise', 'have', and 'include' described in the present specification are used, another part may be added unless 'only~' is used. The terms of a singular form may include plural forms unless referred to the contrary.

[0023] In construing an element, the element is construed as including an error range although there is no explicit description.

[0024] 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.

[0025] In describing a time relationship, for example, when the temporal order is described as 'after~', 'subsequent~', 'next~', and 'before~', a case which is not continuous may be included unless 'just' or 'direct' is used.

[0026] 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 invention.

[0027] Features of various embodiments of the present invention 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 embod-

iments of the present invention may be carried out independently from each other, or may be carried out together in co-dependent relationship.

[0028] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0029] FIG. 2 is a cross-sectional view of an organic light emitting display apparatus according to an embodiment of the present invention.

[0030] As seen in FIG. 2, in the organic light emitting display apparatus according to an embodiment of the present invention, a thin film transistor (TFT) T, an auxiliary line 300, a passivation layer 165, a planarization layer 170, an anode electrode 180, an auxiliary electrode 190, a bank 220, a partition wall 230, an organic emission layer 240, and a cathode electrode 250 may be formed on a substrate 100.

[0031] The TFT T may include an active layer 110, a gate insulation layer 120, a gate electrode 130, an interlayer dielectric 140, a source electrode 150, and a drain electrode 160.

[0032] The active layer 110 may be formed on the substrate 100 to overlap the gate electrode 130. The active layer 110 may be formed of a silicon-based semiconductor material, or may be formed of an oxide-based semiconductor material. Although not shown, a light shielding layer may be further formed between the substrate 100 and the active layer 110, and in this case, external light incident through a bottom of the substrate 100 is blocked by the light shielding layer, thereby preventing the active layer 110 from being damaged by the external light.

[0033] The gate insulation layer 120 may be formed on the active layer 110. The gate insulation layer 120 may insulate the active layer 110 from the gate electrode 130. The gate insulation layer 120 may be formed of an inorganic insulating material, for example, silicon oxide (SiO_x), silicon nitride (SiN_x), or a multilayer thereof, but is not limited thereto.

[0034] The gate electrode 130 may be formed on the gate insulation layer 120. The gate electrode 130 may be formed to overlap the active layer 110 with the gate insulation layer 120 therebetween. The gate electrode 130 may be formed of a single layer or a multilayer formed of one of molybdenum (Mo), aluminum (Al), chromium (Cr), gold (Au), titanium (Ti), nickel (Ni), neodymium (Nd), and copper (Cu) or an alloy thereof, but is not limited thereto.

[0035] The interlayer dielectric 140 may be formed on the gate electrode 130. The interlayer dielectric 140 may be formed of the same inorganic insulating material as that of the gate insulation layer 120, for example, silicon oxide (SiO_x), silicon nitride (SiN_x), or a multilayer thereof, but is not limited thereto.

[0036] The source electrode 150 and the drain electrode 160 may be formed to face each other on the interlayer dielectric 140. A first contact hole CH1 exposing one end region of the active layer 110 and a second contact hole CH2 exposing the other end region of the active

layer 110 may be included in the gate insulation layer 120 and the interlayer dielectric 140. The source electrode 150 may be connected to the other end region of the active layer 110 through the second contact hole CH2, and the drain electrode 160 may be connected to the one end region of the active layer 110 through the first contact hole CH1.

[0037] A structure of the TFT T is not limited to the illustrated structure, and may be variously modified to structures known to those skilled in the art. For example, a top gate structure where the gate electrode 130 is formed on the active layer 110 is illustrated in the drawing, but the TFT T may be formed in a bottom gate structure where the gate electrode 130 is formed under the active layer 110.

[0038] The auxiliary line 300 may be disposed on the same layer as a layer on which the source electrode 150 and the drain electrode 160 are disposed, and may be disposed to be separated from the source electrode 150 and the drain electrode 160. The auxiliary line 300 may be formed through the same process simultaneously with the source electrode 150 and the drain electrode 160 and may be formed of the same material as those of the source electrode 150 and the drain electrode 160. The auxiliary line 300 may be connected to the below-described auxiliary electrode 190 through a fourth contact hole CH4. Since the auxiliary line 300 is connected to the auxiliary electrode 190 through the fourth contact hole CH4, resistances of the auxiliary electrode 190 and the cathode electrode 250 are lowered.

[0039] The passivation layer 165 may be formed on the TFT T, and in more detail, may be formed on tops of the source electrode 150, the drain electrode 160, and the auxiliary line 300. The passivation layer 165 protects the TFT T. The passivation layer 165 may be formed of an inorganic insulating material (for example, SiO_x and SiN_x), but is not limited thereto.

[0040] The planarization layer 170 may be formed on the passivation layer 165. The planarization layer 170 may planarize an upper surface of the substrate 100 including the TFT T. The planarization layer 170 may be formed of an organic insulating material such as acryl resin, epoxy resin, phenolic resin, polyamide resin, polyimide resin, or the like, but is not limited thereto.

[0041] The anode electrode 180 and the auxiliary electrode 190 may be formed on the planarization layer 170. That is, the anode electrode 180 and the auxiliary electrode 190 may be formed on the same layer. A third contact hole CH3 exposing the source electrode 150 may be included in the passivation layer 165 and the planarization layer 170, and the source electrode 150 may be connected to the anode electrode 180 through the third contact hole CH3. Also, the fourth contact hole CH4 exposing the auxiliary line 300 may be included in the passivation layer 165 and the planarization layer 170, and the auxiliary line 300 may be connected to the auxiliary electrode 190 through the fourth contact hole CH4.

[0042] The bank 220 may be formed on the anode elec-

trode 180 and the auxiliary electrode 190. The bank 220 may be formed on one side and the other side of the anode electrode 180 to expose tops of the anode electrode 180 and the auxiliary electrode 190 and to cover side surfaces of the anode electrode 180 and the auxiliary electrode 190. Since the bank 220 is formed to expose the top of the anode electrode 180, an area where an image is displayed is secured. Also, since the bank 220 is formed to expose the tops of the anode electrode 180 and the auxiliary electrode 190, an electrical connection space between the auxiliary electrode 190 and the cathode electrode 250 is secured.

[0043] Moreover, the bank 220 may be formed between the anode electrode 180 and the auxiliary electrode 190 and may insulate the anode electrode 180 from the auxiliary electrode 190. The bank 220 may be formed of an organic insulating material such as polyimide resin, acryl resin, benzocyclobutene (BCB), or the like, but is not limited thereto.

[0044] The partition wall 230 may be formed on the auxiliary electrode 190. The partition wall 230 may be separated from the bank 220 by a certain distance, and the auxiliary electrode 190 may be electrically connected to the cathode electrode 250 through a separation space between the partition wall 230 and the bank 220.

[0045] In the related art organic light emitting display apparatus, the auxiliary electrode 190 is electrically connected to the cathode electrode 250 without forming the partition wall 230. On the other hand, according to an embodiment of the present invention, the partition wall 230 is formed, and thus, the organic emission layer 240 is more easily deposited. This will be described below in detail.

[0046] If the partition wall 230 is not formed, a mask pattern which covers a top of the auxiliary electrode 190 is needed in depositing the organic emission layer 240, in order for the top of the auxiliary electrode 190 not to be covered by the organic emission layer 240. However, if the partition wall 230 is formed, a top of the partition wall 230 may act as eaves in depositing the organic emission layer 240, and thus, since the organic emission layer 240 is not deposited under the eaves, the mask pattern which covers the top of the auxiliary electrode 190 is not needed. That is, with respect to a case where the organic light emitting display apparatus is seen from the front thereof, when the top of the partition wall 230 that acts as eaves is formed to cover a separation space between the partition wall 230 and the bank 220, the organic emission layer 240 cannot penetrate into the separation space between the partition wall 230 and the bank 220, and thus, the auxiliary electrode 190 may be exposed in the separation space between the partition wall 230 and the bank 220. Particularly, the organic emission layer 240 may be formed by a deposition process such as an evaporation process which is excellent in straightness of a deposited material, and thus, the organic emission layer 240 cannot be deposited in the separation space between the partition wall 230 and the bank 220.

[0047] As described above, a width of the top of the partition wall 230 may be formed greater than that of a bottom of the partition wall 230, in order for the top of the partition wall 230 to act as the eaves. The partition wall 230 may include a lower first partition wall 231 and an upper second partition wall 232. The first partition wall 231 may be formed on a top of the auxiliary electrode 190 and may be formed of the same material as that of the bank 220 through the same process as that of the bank 220. The second partition wall 232 may be formed on a top of the first partition wall 231. A width of a top of the second partition wall 232 may be formed greater than that of a bottom of the second partition wall 232, and particularly, the top of the second partition wall 232 may be formed to cover the separation space between the partition wall 230 and the bank 220 and may act as eaves.

[0048] In this case, the first partition wall 231 may be formed not to overlap the fourth contact hole CH4 that connects the auxiliary electrode 190 to the auxiliary line 300. When the fourth contact hole CH4 and the first partition wall 231 are formed to overlap each other, the auxiliary electrode 190 formed under the first partition wall 231 cannot uniformly be formed due to the fourth contact hole CH4, and for this reason, the first partition wall 231 cannot uniformly be formed. When the first partition wall 231 is not uniformly formed, the second partition wall 232 formed on the first partition wall 231 is inclined, and the organic emission layer 240 is formed on the auxiliary electrode 190, causing a defect where the cathode electrode 250 cannot be connected to the auxiliary electrode 190.

[0049] The organic emission layer 240 may be formed on the anode electrode 180. The organic emission layer 240 may include a hole injection layer, a hole transport layer, an emission layer, an electron transport layer, and an electron injection layer. The organic emission layer 240 may be modified to have various structures known to those skilled in the art.

[0050] The organic emission layer 240 may extend to the top of the bank 220. However, the organic emission layer 240 may not extend to the top of the auxiliary electrode 190 in a state of covering the top of the auxiliary electrode 190. This is because when the organic emission layer 240 covers the top of the auxiliary electrode 190, it is difficult to electrically connect the auxiliary electrode 190 to the cathode electrode 250. As described above, the organic emission layer 240 may be formed by a deposition process without a mask that covers the top of the auxiliary electrode 190, and in this case, the organic emission layer 240 may be formed on the top of the partition wall 230.

[0051] The cathode electrode 250 may be formed on the organic emission layer 240. The cathode electrode 250 may be formed on a surface from which light is emitted, and thus may be formed of a transparent conductive material. Since the cathode electrode 250 is formed of a transparent conductive material, a resistance of the cathode electrode 250 is high, and for this reason, in order

to lower the resistance of the cathode electrode 250, the cathode electrode 250 may be connected to the auxiliary electrode 190. That is, the cathode electrode 250 may be connected to the auxiliary electrode 190 through the separation space between the partition wall 230 and the bank 220. The cathode electrode 250 may be formed by a deposition process such as a sputtering process which is not good in straightness of a deposited material, and thus, the cathode electrode 250 may be deposited in the separation space between the partition wall 230 and the bank 220 in a process of depositing the cathode electrode 250.

[0052] Although not shown, an encapsulation layer may be further formed on the cathode electrode 250 and prevents penetration of water. The encapsulation layer may use various materials known to those skilled in the art. Also, although not shown, a color filter may be further formed for each pixel and on the cathode electrode 250, and in this case, white light may be emitted from the organic emission layer 240.

[0053] FIG. 3 is a plan view of an organic light emitting display apparatus.

[0054] FIG. 3 illustrates a plan view of the above-described organic light emitting display apparatus of FIG. 2. Thus, like reference numerals refer to like elements, and in a material and a structure of each element, the same or similar descriptions are not repeated.

[0055] As seen in FIG. 3, the organic light emitting display apparatus may include an anode electrode 180, an auxiliary electrode 190, a bank 220, a first partition wall 231, a second partition wall 232, and an auxiliary line 300.

[0056] The anode electrode 180 may be formed in plurality on a substrate of the organic light emitting display apparatus. A plurality of the auxiliary lines 300 may be respectively formed between the plurality of anode electrodes 180 and arranged in one direction to have a stripe structure.

[0057] The auxiliary electrode 190 may be formed on the auxiliary line 300 in a rectangular shape. However, the present embodiment is not limited thereto.

[0058] The bank 220 may be formed to overlap a portion of the auxiliary electrode 190.

[0059] The first partition wall 231 may be formed at a center portion of the auxiliary electrode 190 to support the second partition wall 232. The first partition wall 231 and the second partition wall 232 may be formed in an island shape on the auxiliary electrode 190 to be separated from the other elements.

[0060] A fourth contact hole CH4 may be formed on the auxiliary electrode 190 and may be connected to the auxiliary line 300.

[0061] A cathode electrode may be formed without an organic emission layer being formed in a partial region (i.e., a portion of the auxiliary electrode 190 overlapping the second partition wall 232) other than a partial region, where the first partition wall 231 is formed, in a region of the auxiliary electrode 190 corresponding to the second partition wall 232, and thus, the auxiliary electrode 190

may be electrically connected to the cathode electrode.

[0062] As described above, if the second partition wall 232 is formed, a top of the second partition wall 232 may act as eaves in depositing the organic emission layer, and thus, since the organic emission layer is not deposited under the eaves, a mask pattern which covers a top of the auxiliary electrode 190 is not needed.

[0063] However, a width of a top of the second partition wall 232 may be formed greater than that of a bottom of the second partition wall 232, and since the first partition wall 231 is formed under the second partition wall 232 according to a size of the bottom of the second partition wall 232, the first partition wall 231 unstably supports the second partition wall 232. Due to such a problem, if the first partition wall 231 cannot support the second partition wall 232, the top of the second partition wall 232 acting as eaves cannot cover a separation space between the partition wall and the bank 220, and for this reason, the organic emission layer penetrates into the separation space between the partition wall and the bank 220. Therefore, the auxiliary electrode 190 is not exposed, causing a defect where the cathode electrode cannot be electrically connected to the auxiliary electrode 190. Also, when a total size of the auxiliary electrode 190 increases for forming the second partition wall 232 having a stable size, a size of the anode electrode 180 formed on the same layer as a layer on which the auxiliary electrode 190 is disposed is reduced, causing a reduction in an aperture ratio.

[0064] FIG. 4 is a plan view of an organic light emitting display apparatus according to an embodiment of the present invention.

[0065] FIG. 4 illustrates a plan view of the above-described organic light emitting display apparatus of FIG. 2. Thus, like reference numerals refer to like elements, and in a material and a structure of each element, the same or similar descriptions are not repeated.

[0066] As seen in FIG. 4, the organic light emitting display apparatus according to an embodiment of the present invention may include an anode electrode 180, an auxiliary electrode 190, a bank 220, a first partition wall 231, a second partition wall 232, and an auxiliary line 300. Elements other than the first partition wall 231 and the second partition wall 232 are the same as those of the above-described organic light emitting display apparatus of FIG. 3, and thus, their detailed descriptions are not repeated.

[0067] The first partition wall 231 of the organic light emitting display apparatus of FIG. 3 is formed in an island shape on the auxiliary electrode 190 to be separated from the other elements. On the other hand, both ends of the first partition wall 231 of the organic light emitting display apparatus according to an embodiment of the present invention may contact the bank 220. Therefore, according to the present embodiment, the first partition wall 231 may not be formed in an island shape on the auxiliary electrode 190 to be separated from the other elements but may be formed to contact the bank 220, and thus,

the first partition wall 231 stably supports the second partition wall 232.

[0068] Moreover, the second partition wall 232 of the organic light emitting display apparatus of FIG. 3 is formed on top of the first partition wall 231 to be supported by only the first partition wall 231. On the other hand, the second partition wall 232 of the organic light emitting display apparatus according to another embodiment of the present invention may be formed to contact the bank 220, and the partition wall 231 may be formed on the same layer as a layer on which the bank 220 is disposed, whereby the second partition wall 232 is more stably supported by the first partition wall 231 and the bank 220. For this reason, a defect where the cathode electrode cannot electrically be connected to the auxiliary electrode 190 is prevented from occurring. Also, the second partition wall 232 is stably formed even without any increase in a total size of the auxiliary electrode 190, and thus does not affect a size of the anode electrode 180 which is formed on the same layer as a layer thereof, thereby preventing an aperture ratio from being reduced.

[0069] The first partition wall 231 may include a portion contacting the bank 220 and another portion which does not contact the bank 220. The auxiliary electrode 190 may be formed to be exposed in a region between the bank 220 and the other portion of the first partition wall 231 which does not contact the bank 220. Therefore, the exposed auxiliary electrode 190 may be electrically connected to the cathode electrode, thereby lowering a resistance.

[0070] An organic emission layer is not formed in an exposed region of the auxiliary electrode 190, where the first partition wall 231 and the bank 220 are not formed. Accordingly, the cathode electrode may be electrically connected to the auxiliary electrode 190 in the exposed region of the auxiliary electrode 190.

[0071] FIG. 5 is a plan view of an organic light emitting display apparatus according to another embodiment of the present invention.

[0072] FIG. 5 illustrates a plan view of the above-described organic light emitting display apparatus of FIG. 2. Thus, like reference numerals refer to like elements, and in a material and a structure of each element, the same or similar descriptions are not repeated.

[0073] As seen in FIG. 5, the organic light emitting display apparatus according to another embodiment of the present invention may include an anode electrode 180, an auxiliary electrode 190, a bank 220, a first partition wall 231, a second partition wall 232, and an auxiliary line 300. Elements other than the auxiliary line 300 are the same as those of the above-described organic light emitting display apparatus of FIG. 4, and thus, their detailed descriptions are not repeated.

[0074] The auxiliary lines 300 of the organic light emitting display apparatus of FIG. 4 are respectively formed between the plurality of anode electrodes 180 and arranged in one direction to have the stripe structure. On the other hand, in the organic light emitting display ap-

paratus according to the present embodiment, a plurality of the auxiliary lines 300 may be formed in a mesh structure where the plurality of auxiliary lines 300 are arranged to intersect each other between a plurality of the anode electrodes 180. Therefore, an area of each of the auxiliary lines 300 more increases in a case, where the auxiliary lines 300 are formed in the mesh structure, than a case where the auxiliary lines 300 are formed in the stripe structure, and thus, a resistance of the organic light emitting display apparatus according to another embodiment of the present invention is further lowered.

[0075] The auxiliary electrode 190 may be formed at a portion where the auxiliary lines 300 intersect each other.

[0076] FIGS. 6A to 6C are schematic cross-sectional views of an organic light emitting display apparatus according to an embodiment of the present invention and illustrate cross-sectional views of the above-described auxiliary electrode of FIG. 5. Thus, like reference numerals refer to like elements, and in a material and a structure of each element, the same or similar descriptions are not repeated.

[0077] FIG. 6A illustrates a cross-sectional surface taken along line A-A of FIG. 5. As seen in FIG. 6A, the anode electrode 180 and the auxiliary electrode 190 may be formed on a planarization layer 170 to be separated from each other, and the bank 220 may be formed between the anode electrode 180 and the auxiliary electrode 190 and may insulate the anode electrode 180 from the auxiliary electrode 190. The first partition wall 231 may be formed in an island shape on an exposed portion of a top of the auxiliary electrode 190, and the second partition wall 232 may be formed on a top of the first partition wall 231.

[0078] FIG. 6B illustrates a cross-sectional surface taken along line B-B of FIG. 5. As seen in FIG. 6B, the anode electrode 180, the auxiliary electrode 190, and the bank 220 may be formed on the planarization layer 170. Since line B-B is located in a region which is exposed without the first partition wall 231 being formed in the auxiliary electrode 190, the first partition wall 231 is not illustrated. Both ends of the second partition wall 232 may be formed to contact the bank 220.

[0079] FIG. 6C illustrates a cross-sectional surface taken along line C-C of FIG. 5. As seen in FIG. 6C, the anode electrode 180, the auxiliary electrode 190, and the bank 220 may be formed on the planarization layer 170. The first partition wall 231 may extend and may be connected to the bank 220, and the second partition wall 232 may be formed to be supported by the first partition wall 231 and the bank 220.

[0080] FIG. 7 is a cross-sectional view of an organic light emitting display apparatus according to another embodiment of the present invention.

[0081] Except that a first anode electrode 180, a second anode electrode 200, a first auxiliary electrode 190, and a second auxiliary electrode 210 are added, the organic light emitting display apparatus of FIG. 7 is the

same as the above-described organic light emitting display apparatus of FIG. 2, and thus, repetitive descriptions are not provided.

[0082] The first anode electrode 180 and the first auxiliary electrode 190 may be formed on the planarization layer 170. That is, the first anode electrode 180 and the first auxiliary electrode 190 may be formed on the same layer. A third contact hole CH3 exposing the source electrode 150 may be included in the above-described passivation layer 165 and planarization layer 170, and the source electrode 150 may be connected to the first anode electrode 180 through the third contact hole CH3.

[0083] The first anode electrode 180 may include a first lower anode electrode 181 and a first upper anode electrode 182.

[0084] The first lower anode electrode 181 may be formed between the planarization layer 170 and the first upper anode electrode 182 and enhances an adhesive force between the planarization layer 170 and the first upper anode electrode 182. Also, the first lower anode electrode 181 protects a bottom of the first upper anode electrode 182, thereby preventing the bottom of the first upper anode electrode 182 from being corroded.

[0085] The first upper anode electrode 182 may be formed on a top of the first lower anode electrode 181. The first upper anode electrode 182 may be formed of metal which is relatively lower in resistance than the first lower anode electrode 181.

[0086] Similarly to the above-described first anode electrode 180, the first auxiliary electrode 190 may include a first lower auxiliary electrode 191 and a second upper auxiliary electrode 192.

[0087] The first lower auxiliary electrode 191 may be formed between the planarization layer 170 and the first upper auxiliary electrode 192. The first lower auxiliary electrode 191 enhances an adhesive force between the planarization layer 170 and the first upper auxiliary electrode 192 and prevents a bottom of the first upper auxiliary electrode 192 from being corroded.

[0088] The first upper auxiliary electrode 192 may be formed of low-resistance metal on a top of the first lower auxiliary electrode 191.

[0089] The second anode electrode 200 may be formed to cover a top and a side surface of the first anode electrode 180, thereby preventing the top and side surface of the first anode electrode 180 from being corroded.

[0090] The second anode electrode 200 may include a second lower anode electrode 201, a second center anode electrode 202, and a second upper anode electrode 203.

[0091] The second lower anode electrode 201 may be formed between the first anode electrode 180 and the second center anode electrode 202. The second lower anode electrode 201 may be formed to cover the top and side surface of the first anode electrode 180, thereby preventing the first anode electrode 180 from being corroded.

[0092] The second center anode electrode 202 may

be formed between the second lower anode electrode 201 and the second upper anode electrode 203. The second center anode electrode 202 may be formed of a material which is lower in resistance than and better in reflectivity than the second lower anode electrode 201 and the second upper anode electrode 203.

[0093] The second upper anode electrode 203 may be formed on a top of the second center anode electrode 202, thereby preventing the top of the second center anode electrode 202 from being corroded.

[0094] The second auxiliary electrode 210 may be formed on a top of the first auxiliary electrode 190. The second auxiliary electrode 210 may be formed on the same layer as a layer on which the second anode electrode 200 is disposed. The second auxiliary electrode 210 may be formed to cover a top and a side surface of the first auxiliary electrode 190, thereby preventing the top and side surface of the first auxiliary electrode 190 from being corroded. The second auxiliary electrode 210 lowers a resistance of the cathode electrode 250 along with the first auxiliary electrode 190.

[0095] The second auxiliary electrode 210 may include a second lower auxiliary electrode 211, a second center auxiliary electrode 212, and a second upper auxiliary electrode 213.

[0096] The second lower auxiliary electrode 211 may be formed between the first auxiliary electrode 190 and the second center auxiliary electrode 212. The second lower auxiliary electrode 211 may be formed to cover the top and side surface of the first auxiliary electrode 190, thereby preventing the first auxiliary electrode 190 from being corroded.

[0097] The second center auxiliary electrode 212 may be formed between the second lower auxiliary electrode 211 and the second upper auxiliary electrode 213. The second center auxiliary electrode 212 may be formed of a material which is lower in resistance than and better in reflectivity than the second lower auxiliary electrode 211 and the second upper auxiliary electrode 213.

[0098] The second upper auxiliary electrode 213 may be formed on a top of the second center auxiliary electrode 212, thereby preventing the top of the second center auxiliary electrode 212 from being corroded.

[0099] FIG. 8 is a cross-sectional view of an organic light emitting display apparatus according to another embodiment of the present invention.

[0100] Except that a first connection line 185, a second connection line 195, and a second planarization layer 175 are added, the organic light emitting display apparatus of FIG. 8 is the same as the above-described organic light emitting display apparatus of FIG. 2, and thus, repetitive descriptions are not provided.

[0101] In the above-described organic light emitting display apparatus of FIG. 7, the second anode electrode 200 and the second auxiliary electrode 210 are respectively formed on the first anode electrode 180 and the first auxiliary electrode 190, and thus, resistances of the anode electrode 180 and the cathode electrode 250 are

lowered. However, since the auxiliary electrode 190 and the anode electrode 180 are formed on the same layer, a space for forming the anode electrode 180 and the auxiliary electrode 190 is still limited. To overcome such limitations, in the organic light emitting display apparatus of FIG. 8 according to the present embodiment, the first connection line 185 connected to the anode electrode 180 may be formed under the anode electrode 180, and the second connection line 195 connected to the auxiliary electrode 190 may be formed under the auxiliary electrode 190. The anode electrode 180 and the auxiliary electrode 190 are respectively connected to the first connection line 185 and the second connection line 195 and thus are broad in area, and accordingly, resistances of the anode electrode 180 and the cathode electrode 250 are more lowered.

[0102] The first connection line 185 and the second connection line 195 may be formed on the first planarization layer 170. That is, the first connection line 185 and the second connection line 195 may be formed on the same layer to be separated from each other. A third contact hole CH3 exposing the source electrode 150 may be included in the passivation layer 165 and the first planarization layer 170, and the source electrode 150 may be connected to the first connection line 185 through the third contact hole CH3. Also, a fourth contact hole CH4 exposing the auxiliary line 300 may be included in the passivation layer 165 and the first planarization layer 170, and the auxiliary line 300 may be connected to the second connection line 195 through the fourth contact hole CH4.

[0103] The second planarization layer 175 may be formed on the first and second connection lines 185 and 195. The anode electrode 180 and the auxiliary electrode 190 may be formed on the second planarization layer 175. A fifth contact hole CH5 exposing the first connection line 185 may be included in the second planarization layer 175, and the first connection line 185 may be connected to the anode electrode 180 through the fifth contact hole CH5. That is, the anode electrode 180 may be connected to the source electrode 150 through the first connection line 185. Also, a sixth contact hole CH6 exposing the second connection line 195 may be included in the second planarization layer 175, and the second connection line 195 may be connected to the auxiliary electrode 190 through the sixth contact hole CH6. That is, the auxiliary electrode 190 may be connected to the auxiliary line 300 through the second connection line 195.

[0104] As described above, according to the embodiments of the present invention, the partition wall is stably formed in the existing size of the auxiliary electrode without any reduction in an aperture ratio.

[0105] Moreover, according to the embodiments of the present invention, the organic emission layer may be formed without a mask pattern covering a top of the auxiliary electrode, and thus, one masking process is saved.

[0106] Moreover, according to the embodiments of the present invention, the first partition wall stably supports

the second partition wall, thereby preventing a defect from occurring.

[0107] Moreover, according to embodiments of the present invention, two anode electrodes (for example, the first and second anode electrodes) may be stack-formed for lowering the resistance of the anode electrode, and thus, the desired resistance characteristic of the anode electrode is more easily adjusted.

[0108] Moreover, according to embodiments of the present invention, two auxiliary electrodes (for example, the first and second auxiliary electrodes) may be stack-formed for lowering the resistance of the cathode electrode, and thus, the desired resistance characteristic of the auxiliary electrode is more easily adjusted.

[0109] Moreover, according to embodiments of the present invention, the auxiliary line may be connected to the auxiliary electrode by the connection line, and thus, the desired resistance characteristic of the auxiliary electrode is more easily adjusted.

Claims

1. An organic light emitting display apparatus comprising:

an anode electrode (180) disposed on a substrate (100);
 an auxiliary electrode (190) disposed on the substrate (100);
 an organic emission layer (240) disposed on the anode electrode (180);
 a cathode electrode (250) disposed on the organic emission layer (240) and on the auxiliary electrode (190);
 an insulating bank (220) disposed on the auxiliary electrode (190), the bank (220) overlapping a first portion of the auxiliary electrode (190) and exposing a second portion of the auxiliary electrode (190);
 a first partition wall (231) disposed on the auxiliary electrode (190);
 a second partition wall (232) disposed on the first partition wall (231) and covering the exposed second portion of the auxiliary electrode (190) while leaving a separation space between the second partition wall (232) and the bank (220);
 the cathode electrode (250) being electrically connected to the auxiliary electrode (190) through the separation space between the second partition wall (232) and the bank (220);
 wherein the second partition wall (232) is supported by the first partition wall (231) and the bank (220).

2. The organic light emitting display apparatus according to claim 1, wherein two sides of the first partition

wall (231) contact the bank (220).

3. The organic light emitting display apparatus according to claim 1 or 2, wherein the first partition wall (231) comprises a portion that does not contact the bank (220), and the auxiliary electrode (190) is exposed in a region between the bank (220) and the portion of the first partition wall (231) that does not contact the bank (220). 5
10
4. The organic light emitting display apparatus of claim 3, wherein the cathode electrode (250) is connected to the auxiliary electrode (190) that is exposed in the region between the bank (220) and the portion of the first partition wall (231) that does not contact the bank (220). 15
5. The organic light emitting display apparatus according to any of claims 1 to 4, wherein the cathode electrode (250) is connected to a portion of the auxiliary electrode (190) overlapping the second partition wall (232). 20
6. The organic light emitting display apparatus according to any of claims 1 to 5, wherein the first partition wall (231) is disposed on the same layer as a layer on which the bank (220) is disposed. 25
7. The organic light emitting display apparatus according to any of claims 1 to 6, further comprising an auxiliary line (300) between a plurality of anode electrodes (180), the auxiliary line (300) being connected to the auxiliary electrode (190) through a contact hole (CH4). 30
35
8. The organic light emitting display apparatus according to claim 7, wherein the auxiliary line (300) has a stripe structure where a plurality of the auxiliary lines (300) are arranged in one direction, or a mesh structure where a plurality of auxiliary lines (300) are arranged to intersect each other. 40
9. The organic light emitting display apparatus according to claim 7 or 8, further comprising a thin film transistor (T) disposed on the substrate (100), the thin film transistor (T) including a source electrode (150), wherein the auxiliary line (300) is disposed on the same layer as a layer on which the source electrode (150) is disposed. 45
50
10. The organic light emitting display apparatus according to any of claims 7 to 9, wherein the contact hole (CH4) which connects the auxiliary electrode (190) to the auxiliary line (300) is provided not to overlap the first partition wall (231). 55
11. The organic light emitting display apparatus accord-

ing to any of claims 1 to 10, wherein

the anode electrode comprises a first anode electrode (180) and a second anode electrode (200) covering a top and a side surface of the first anode electrode (180), and

the auxiliary electrode comprises a first auxiliary electrode (190) and a second auxiliary electrode (210) covering a top and a side surface of the first auxiliary electrode (190).

12. The organic light emitting display apparatus according to any of claims 1 to 11, further comprising a connection line (195) disposed on the auxiliary line (300) to be connected to the auxiliary line (300), the connection line (195) being connected to the auxiliary electrode (190).
13. The organic light emitting display apparatus according to any of claims 1 to 12, wherein the auxiliary electrode (190) is disposed on the same layer as a layer on which the anode electrode (180) is disposed.

FIG. 1

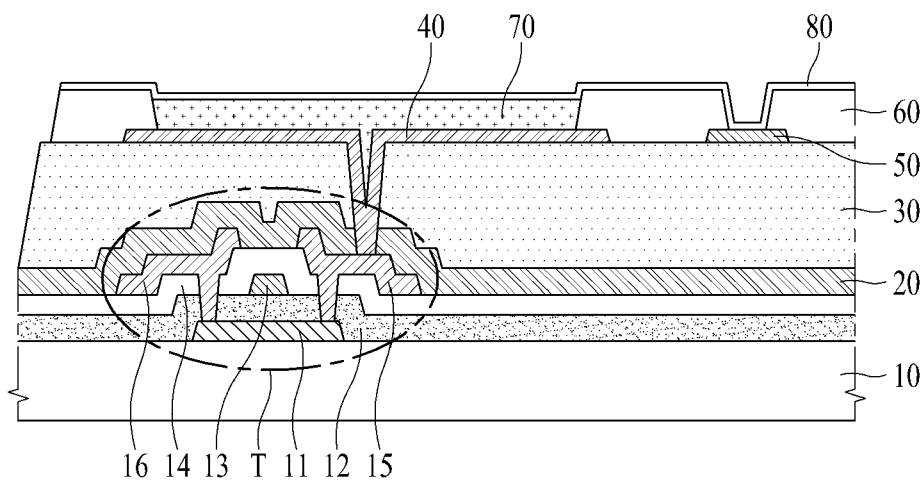


FIG. 2

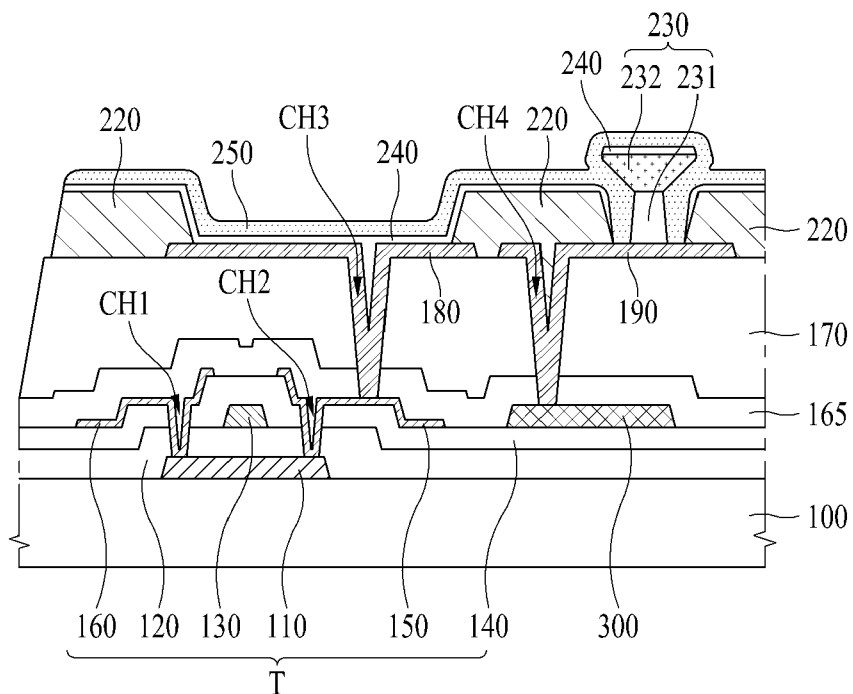


FIG. 3

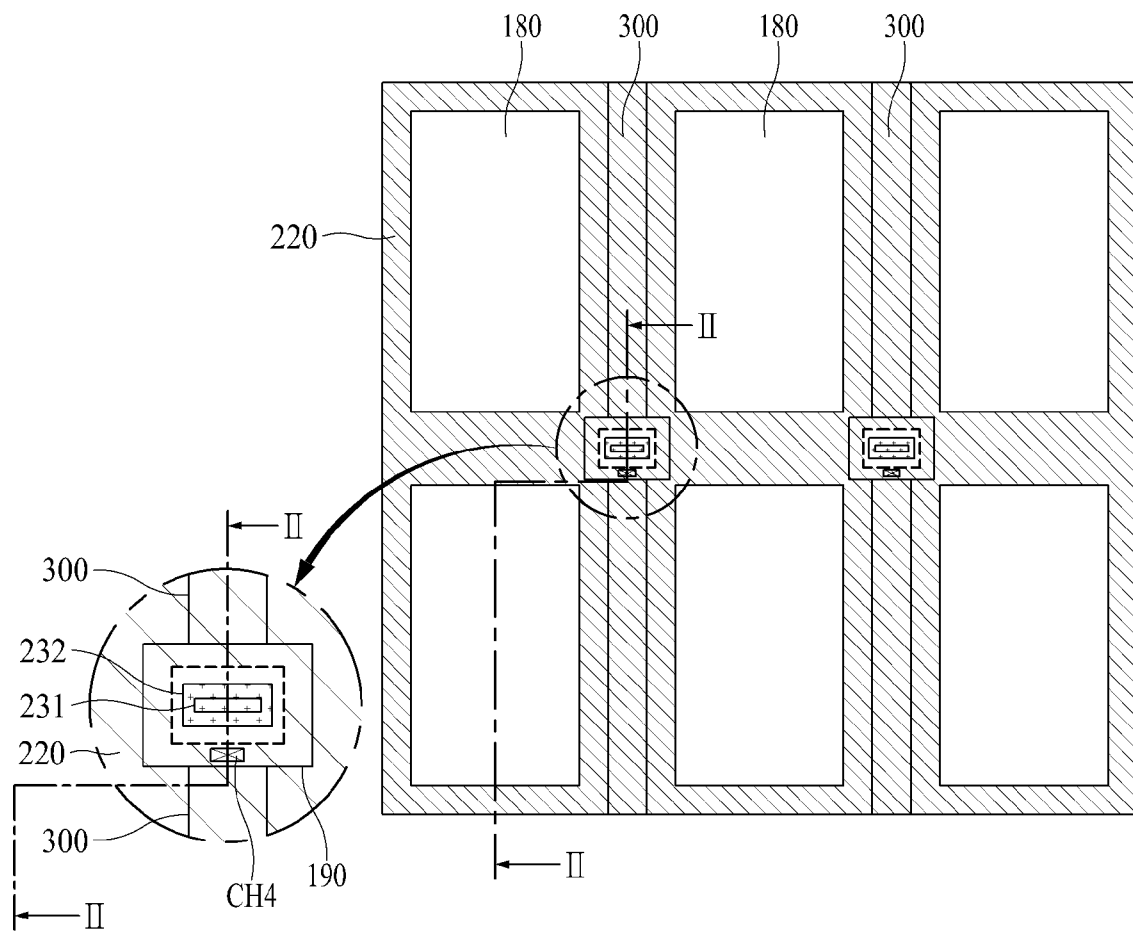


FIG. 4

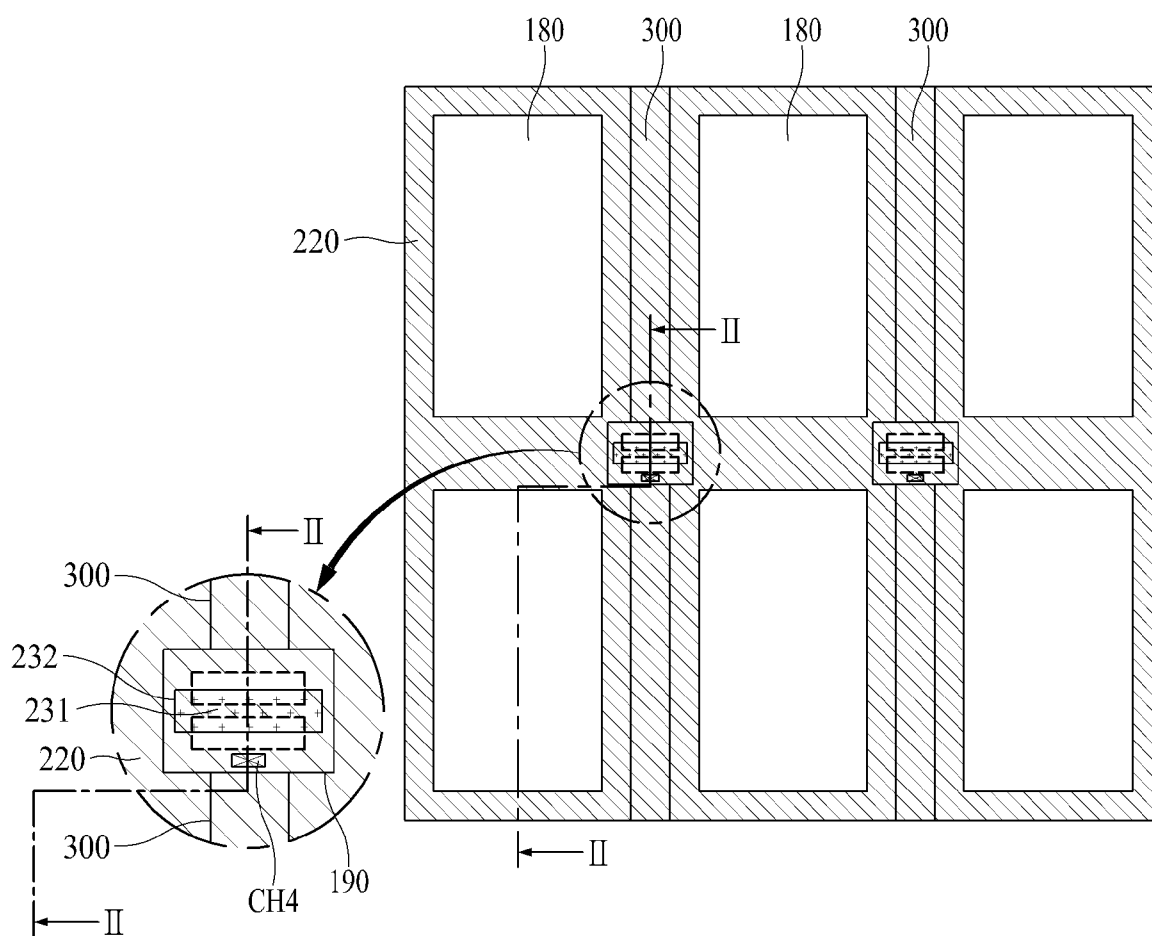


FIG. 5

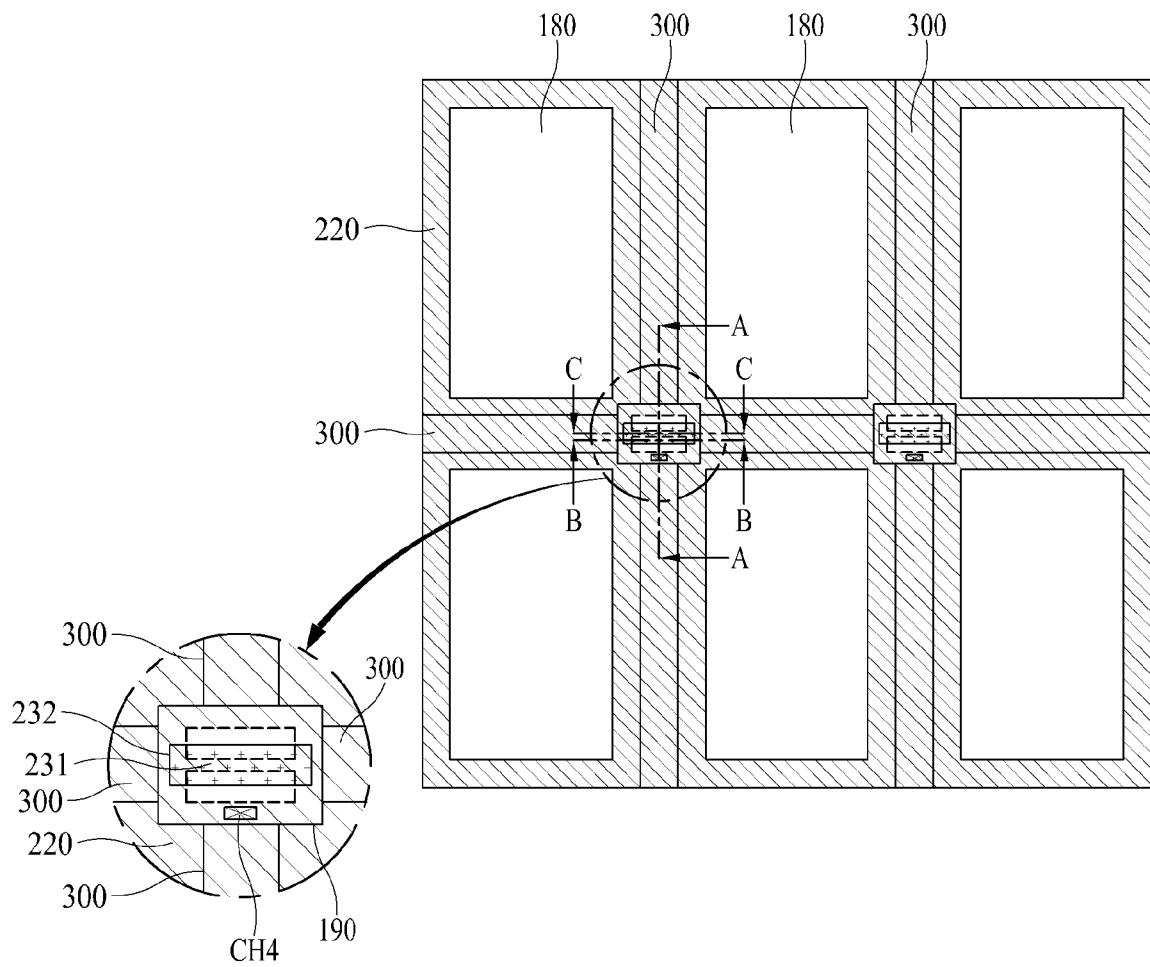


FIG. 6A

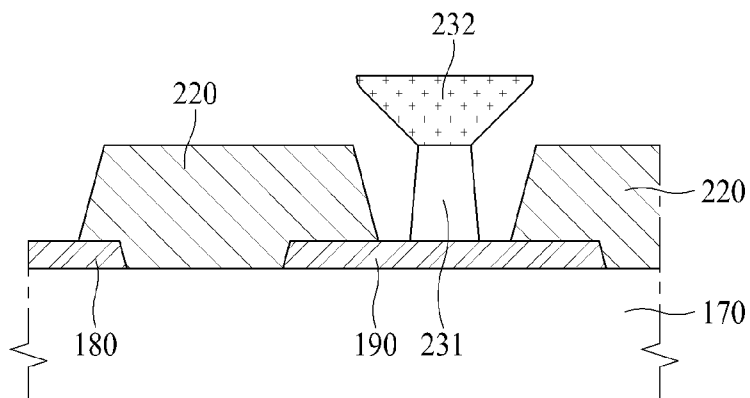


FIG. 6B

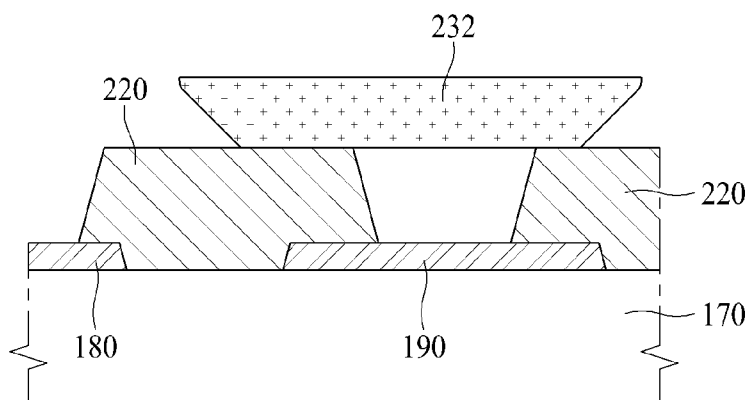


FIG. 6C

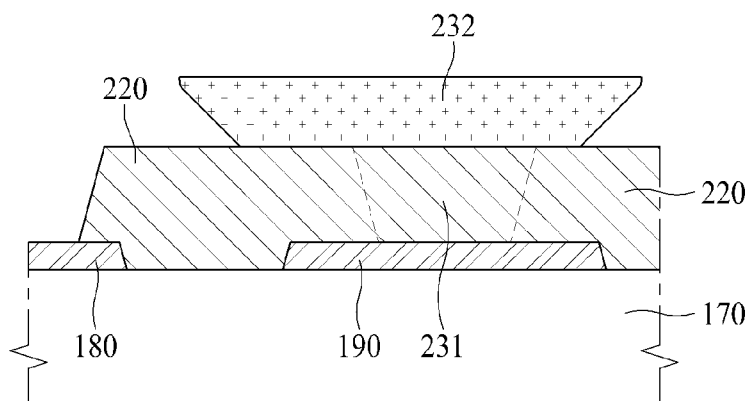


FIG. 7

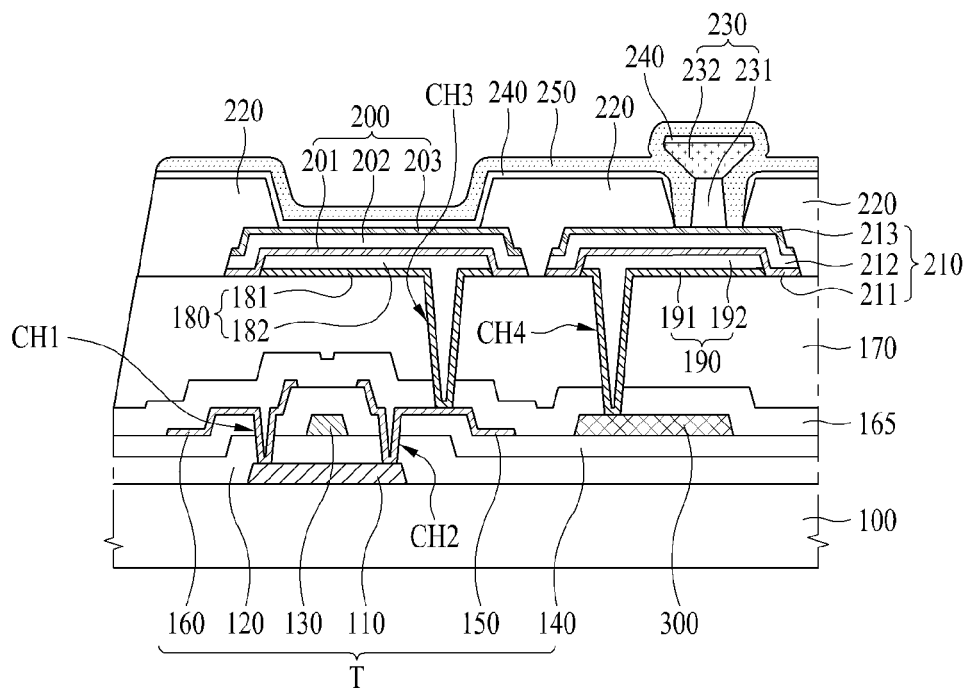
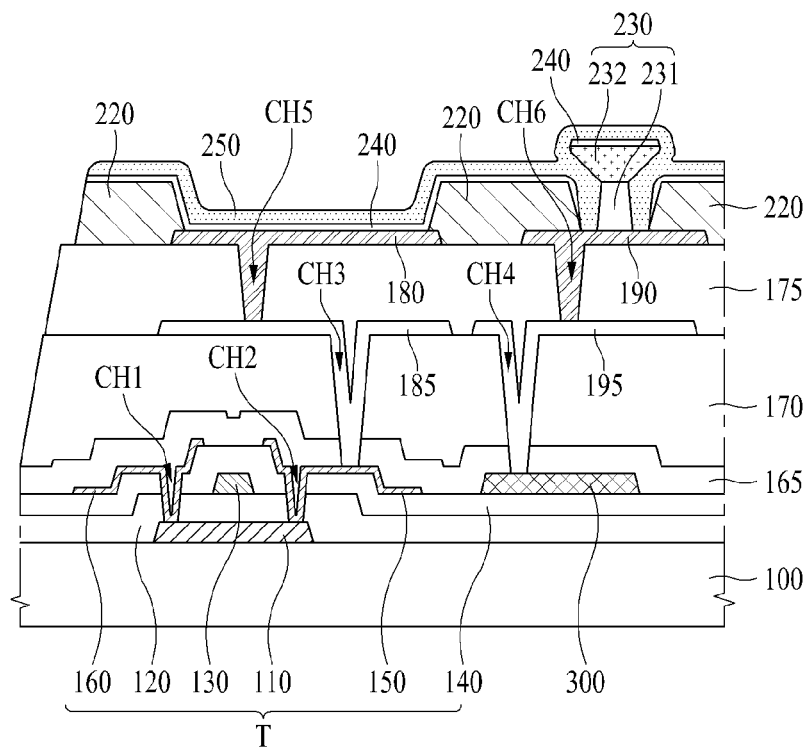


FIG. 8





EUROPEAN SEARCH REPORT

Application Number
EP 15 19 0597

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2013/099218 A1 (LEE JOON-SUK [KR] ET AL) 25 April 2013 (2013-04-25) * paragraph [0071] - paragraph [0092]; figures 8E,9 *	1-13	INV. H01L27/32
A	EP 2 827 371 A1 (LG DISPLAY CO LTD [KR]) 21 January 2015 (2015-01-21) * paragraph [0024] - paragraph [0067]; figure 2 *	1-13	
A	US 2013/056784 A1 (LEE JOON-SUK [KR] ET AL) 7 March 2013 (2013-03-07) * paragraph [0025] - paragraph [0036]; figure 4 *	1-13	
			TECHNICAL FIELDS SEARCHED (IPC)
			H01L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 October 2016	Examiner Bernabé Prieto, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 19 0597

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-10-2016

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2013099218 A1	25-04-2013	NONE	
EP 2827371 A1	21-01-2015	CN 104253144 A EP 2827371 A1 US 2015001507 A1	31-12-2014 21-01-2015 01-01-2015
US 2013056784 A1	07-03-2013	CN 103066212 A DE 102012107977 A1 KR 20130025806 A US 2013056784 A1	24-04-2013 07-03-2013 12-03-2013 07-03-2013

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- KR 1020150076678 [0001]

公开了一种有机发光显示装置（图2）。有机发光显示装置包括设置在基板（100）上的多个阳极电极（180），设置在基板（100）上的辅助电极（190），设置在阳极电极上的有机发射层设置在所述有机发射层上的阴极电极，设置为与所述辅助电极的第一部分重叠并且暴露所述辅助电极的第二部分的绝缘堤岸（220）和设置在所述辅助电极（190）的暴露的第二部分上方的分隔壁（230），所述分隔壁（230）覆盖所述暴露的第二部分，同时在所述分隔壁（230）220），所述阴极电极（250）通过所述隔壁（230）和所述隔堤（220）之间的分隔空间与所述辅助电极（190）电连接。分隔壁（230）包括设置在辅助电极（190）上的第一分隔壁（231）和设置在第一分隔壁（231）上的第二分隔壁（232）。第二分隔壁232由第一分隔壁231和堤岸220支撑。

[illegible]