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(54) **METHOD OF MANUFACTURING AN ORGANIC LIGHT EMITTING DISPLAY DEVICE**

VERFAHREN ZUR HERSTELLUNG EINER ORGANISCHEN LICHTEMITTIERENDEN ANZEIGEVORRICHTUNG

PROCÉDÉ DE FABRICATION D'UN DISPOSITIF D'AFFICHAGE ÉLECTROLUMINESCENT ORGANIQUE

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Description

BACKGROUND

1. Field

[0001] The invention relates to a method of manufacturing an organic light emitting display device.

2. Description of the Related Art

[0002] Displays include a plurality of pixels which emit light to form an image. The pixels of OLED displays include an organic light emitting diode (OLED). The OLEDs emit light having a wavelength that depends on the type of organic material included in the light-emitting layer of the OLED. For example, the OLEDs can include different types of organic materials in order to emit one of a red, green and blue colored light. The OLED displays mixed light having different colors emitted by the OLEDs to form a color image. Recently, OLED displays having a predetermined transmittance have been studied.

[0003] US 2014/077186 A1 discloses an organic light-emitting diode display device comprising a pixel unit formed on a substrate and including a plurality of sub-pixels, and a non-pixel unit immediately neighboring the pixel unit, wherein the non-pixel may include a light-transmission portion from which light is transmitted.

[0004] US2012/301986 A1 discloses an organic layer deposition apparatus for forming an emission layer in an active-matrix organic light-emitting display device comprising a deposition source that contains and heats the deposition material, a patterning slit sheet including a plurality of patterning slits arranged, or spaced from one another. A deposition material that has been vaporized in the deposition source and passed through the deposition source nozzle passes through the patterning slits toward a substrate. The deposition is continuously performed while the substrate, which is disposed such as to face the organic layer deposition assembly, is moved relative to said organic layer deposition assembly.

SUMMARY

[0005] The invention sets out to provide a simplified method of manufacturing an organic light emitting display device, and embodiments of the disclosure also include an organic light emitting display device manufactured by such a method.

[0006] The invention also seeks to provide a method of manufacturing an organic light emitting display device having an improved transmittance for an external light.

[0007] According to example embodiments of the present disclosure, an organic light emitting display device includes a substrate having a first width in a first direction and a second width in a second direction substantially perpendicular to the first direction, the first width being greater than the second width, and a plurality of pixel regions disposed on the substrate, each of the plurality of pixel regions being divided into a first region and a second region, each of the plurality of pixel regions including a first light emitting portion, a second light emitting portion, a third light emitting portion and a transmission portion arranged along the second direction, and each of the first light emitting portion, the second light emitting portion and the third light emitting portion extending in the first direction, wherein the first light emitting portion, the second light emitting portion, and the third light emitting portion are disposed in the first region of each of the pixel regions, and the transmission portion is disposed in the second region of each of the pixel regions.

[0008] In example embodiments, the organic light emitting display device may further include a plurality of first lower electrodes disposed in the first light emitting portions, a plurality of second lower electrodes disposed in the second light emitting portions and a plurality of third lower electrodes disposed in the third light emitting portions.

[0009] In example embodiments, the organic light emitting display device may further include a first organic light emitting layer pattern disposed on the plurality of the first lower electrodes, a second organic light emitting layer pattern disposed on the plurality of the second lower electrodes, and a third organic light emitting layer pattern disposed on the plurality of the third lower electrodes. The first organic light emitting layer pattern may extend in the first direction, the second organic light emitting layer pattern may extend in the first direction, and the third organic light emitting layer pattern may extend in the first direction.

[0010] In example embodiments, the first organic light emitting layer pattern may cover the first light emitting portions, and may exposure the transmission portions. The second organic light emitting layer pattern may cover the second light emitting portions, and may exposure the transmission portions. The third organic light emitting layer pattern may cover the third light emitting portions, and may exposure the transmission portions.

[0011] In example embodiments, the organic light emitting display device may further include an upper electrode disposed on the first organic light emitting layer pattern, the second organic light emitting layer pattern and the third organic light emitting layer pattern. The upper electrode may cover the first light emitting portions, the second light emitting portions, the third light emitting portions and the transmission portions.

[0012] In example embodiments, the organic light emitting display device may further include an upper electrode disposed on the first organic light emitting layer pattern, the second organic light emitting layer pattern and the third organic light emitting layer pattern. The upper electrode may cover the first light emitting portions, the second light emitting portions and the third light emitting portions, and may exposure the transmission portions.

[0013] In example embodiments, the upper electrode may include aluminum (Al), platinum (Pt), silver (Ag), magnesium (Mg), gold (Au), chromium (Cr), tungsten (W), molybdenum (Mo), titanium (Ti) or an alloy thereof.

[0014] In example embodiments, the organic light emitting display device may further include an organic layer pattern covering the transmission portions. The organic layer pattern may have a relatively low adhesive characteristic with respect to the upper electrode.

[0015] In example embodiments, the organic layer pattern may include lithium quinoline.

[0016] In example embodiments, the transmission portions do not overlap the first light emitting portion, the second light emitting portion and the third light emitting portion in the first direction.

[0017] In example embodiments, a length of the first light emitting portion in the first direction may be substantially greater than a width of the first light emitting portion in the second direction. A length of the second light emitting portion in the first direction may be substantially greater than a width of the second light emitting portion in the second direction. A length of the third light emitting portion in the first direction may be substantially greater than a width of the third light emitting portion in the second direction.

[0018] In example embodiments, the organic light emitting display device may further include a first pixel circuit disposed in the first light emitting portion, a second pixel circuit disposed in the second light emitting portion and a third pixel circuit disposed in the third light emitting portion. The first pixel circuit may be electrically connected to the first lower electrode, the second pixel circuit may be electrically connected to the second lower electrode, and the third pixel circuit may be electrically connected to the third lower electrode.

[0019] In example embodiments, the organic light emitting display device may further include a driving circuit disposed in an edge of the substrate and a plurality of wirings electrically connecting the driving circuit with the first pixel circuit, the second pixel circuit or the third pixel circuit.

[0020] In example embodiments, the wirings may include a scan line, a data line and a Vdd line.

[0021] In example embodiments, the scan line may extend in the second direction, and the data line and the Vdd line may extend in the first direction.

[0022] In example embodiments, the scan line may extend in the first direction. The data line and the Vdd line may extend in the second direction.

[0023] In example embodiments, the organic light emitting display device can be bent about an axis extending in the second direction.

[0024] In example embodiments, the first organic light emitting layer pattern, the second organic light emitting layer pattern and the third light emitting layer pattern may not be disposed in the transmission portion.

[0025] According to example embodiments not forming part of the invention, an organic light emitting display device includes a substrate and a plurality of pixel regions disposed on the substrate. The substrate has a first width in a first direction and a second width in a second direction substantially perpendicular to the first direction, and the first width is greater than the second width. Each of the pixel regions is divided into a first region and a second region. Each of the pixel regions includes a first emitting portion, a second emitting portion, a third emitting portion and a transmission portion arranged along the first direction. Each of the first emitting portion, the second emitting portion and the third emitting portion extends in the second direction. The first light emitting portion, the second light emitting portion and the third light emitting portion are disposed in the first region of each of the pixel regions, and the transmission portion is disposed in the second region of each of the pixel regions.

[0026] In example embodiments, the organic light emitting display device may further include a plurality of first lower electrodes disposed in the first light emitting portions, a plurality of second lower electrodes disposed in the second light emitting portions and a plurality of third lower electrodes disposed in the third light emitting portions.

[0027] In example embodiments, the organic light emitting display device may further include a first organic light emitting layer pattern disposed on the plurality of the first lower electrodes, a second organic light emitting layer pattern disposed on the plurality of the second lower electrodes and a third organic light emitting layer pattern disposed on the plurality of the third lower electrodes. The first organic light emitting layer pattern may extend in the second direction, the second organic light emitting layer pattern may extend in the second direction; and the third organic light emitting layer pattern may extend in the second direction.

[0028] In example embodiments, the first organic light emitting layer pattern may cover the first light emitting portions, and may exposure the transmission portions. The second organic light emitting layer pattern may cover the second light emitting portions, and may exposure the transmission portions. The third organic light emitting layer pattern may cover the third light emitting portions, and may exposure the transmission portions.

[0029] In example embodiments, the organic light emitting display device may further include an upper electrode disposed on the first organic light emitting layer pattern, the second organic light emitting layer pattern and the third organic light emitting layer pattern. The upper electrode may cover the first light emitting portions, the second light emitting portions, the third light emitting portions and the transmission portions.

[0030] In example embodiments, the organic light emitting display device may further include an upper electrode disposed on the first organic light emitting layer pattern, the second organic light emitting layer pattern and the third organic light emitting layer pattern. The upper electrode may cover the first light emitting portions, the second light emitting portions and the third light emit-

ting portions, and may exposure the transmission portions.

[0031] In example embodiments, the transmission portions may not overlap the first light emitting portion, the second light emitting portion and the third light emitting portion in the second direction.

[0032] In example embodiments, a length of the first light emitting portion in the second direction may be substantially greater than a width of the first light emitting portion in the first direction. A length of the second light emitting portion in the second direction may be substantially greater than a width of the second light emitting portion in the first direction. A length of the third light emitting portion in the second direction may be substantially greater than a width of the third light emitting portion in the first direction.

[0033] According to example embodiments, a substrate is provided to have a first width in a first direction and a second width in a second direction substantially perpendicular to the first direction. The first width is greater than the second width. A plurality of pixel regions is defined on the substrate. Each of the pixel regions includes a first light emitting portion, a second light emitting portion, a third light emitting portion and a transmission portion arranged along the second direction. A first organic light emitting layer pattern is formed to extend in the first direction. The first organic light emitting layer pattern overlaps the first light emitting portions. A second organic light emitting layer pattern is formed to extend in the first direction. The first organic light emitting layer pattern overlaps the second light emitting portions. A third organic light emitting layer pattern is formed to extend in the first direction. The first organic light emitting layer pattern overlaps the third light emitting portions.

[0034] In example embodiments, a plurality of first lower electrodes is formed in the first light emitting portions, a plurality of second lower electrodes is formed in the second light emitting portions, and a plurality of third lower electrodes is formed in the third light emitting portions, before forming the first organic light emitting layer pattern.

[0035] In example embodiments, an upper electrode is formed on the first organic light emitting layer pattern, the second organic light emitting layer pattern and the third organic light emitting layer pattern, after forming the third organic light emitting layer pattern.

[0036] In example embodiments, forming the first organic light emitting layer pattern may include arranging a mask structure over a deposition apparatus, the mask structure including a plurality of openings; emitting deposition particles from the deposition apparatus by heating the deposition apparatus; and transferring the substrate above the mask structure in the first direction.

[0037] In example embodiments, the mask structure may have the second width in the second direction.

[0038] In example embodiments, after forming the third organic light emitting layer pattern, an organic layer pattern is formed to cover the transmission portion, and an upper electrode is formed on the first organic light emitting layer pattern, the second organic light emitting layer pattern and the third organic light emitting layer pattern. The upper electrode may expose the transmission portion.

[0039] In example embodiments, the organic layer pattern may include lithium quinoline. The upper electrode may include aluminum (Al), platinum (Pt), silver (Ag), magnesium (Mg), gold (Au), chromium (Cr), tungsten (W), molybdenum (Mo), titanium (Ti) or an alloy thereof.

[0040] In example embodiments, the upper electrode may not overlap the organic layer pattern, or may overlap an edge portion of the organic layer pattern.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] Features of the invention will be made more apparent to those of ordinary skill in the art by describing in detail embodiments thereof with reference to the attached drawings, in which:

FIG. 1 illustrates a plan view of an organic light emitting display device obtained by using some example embodiments of the method of the invention;

FIG. 2 illustrates an enlarged plan view of FIG. 1;

FIG. 3 illustrates a schematic view of a pixel circuit of an organic light emitting display device obtained by using some example embodiments of the method of the invention;

FIG. 4 illustrates a plan view of an organic light emitting display device obtained by using some example embodiments of the method of the invention;

FIG. 5 illustrates a cross sectional view cut along a line A-A' of FIG. 2 in accordance with some example embodiments of the invention;

FIG. 6 illustrates a cross sectional view cut along a line B-B' of FIG. 2 in accordance with some example embodiments of the invention;

FIG. 7 illustrates a perspective view of an organic light emitting display device obtained by using some example embodiments of the method of the invention;

FIGS. 8 to 23 are plan views, cross sectional views and perspective views of stages in a method of manufacturing an organic light emitting display device in accordance with some example embodiments of the invention;

FIG. 24 illustrates a plan view of an organic light emitting display device obtained by using some example embodiments of the method of the invention;

FIG. 25 illustrates a plan view of an organic light emitting display device obtained by using some example embodiments of the method of the invention;

FIG. 26 illustrates a plan view of an organic light emitting display device obtained by using some example embodiments of the method of the invention;

FIG. 27 illustrates a cross sectional view cut along a line B-B' of FIG. 26 in accordance with some ex-

ample embodiments of the invention;

FIGS. 28 to 32 are plan views, cross sectional views and perspective views of stages in a method of manufacturing an organic light emitting display device in accordance with some example embodiments of the invention;

FIG. 33 illustrates a plan view of an organic light emitting display device not forming part of the invention;

FIG. 34 illustrates an enlarged plan view of FIG. 33;

FIG. 35 illustrates a schematic view of a pixel circuit of an organic light emitting display device not forming part of the invention;

FIG. 36 illustrates a cross sectional view cut along a line B-B' of FIG. 35 in accordance with some example embodiments of the invention; and

FIG. 37 illustrates a cross sectional view cut along a line A-A' of FIG. 35 in accordance with some example embodiments of the invention.

DETAILED DESCRIPTION

[0042] Example embodiments of the invention will now be described more fully hereinafter with reference to the accompanying drawings; however, the invention may 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, and will convey implementations of the invention to those skilled in the art.

[0043] It will be understood that when an element or layer is referred to as being "on," "connected to" or "coupled to" another element or layer, it can be directly on, connected or coupled to the other element or layer or intervening elements or layers may be present. In contrast, when an element is referred to as being "directly on," "directly connected to" or "directly coupled to" another element or layer, there are no intervening elements or layers present. Like numerals refer to like elements throughout. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0044] It will be understood that, although the terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of example embodiments.

[0045] Spatially relative terms, such as "beneath," "below," "lower," "above," "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the exemplary term "below" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

[0046] The terminology used herein is for the purpose of describing particular example embodiments only and is not intended to be limiting of example embodiments. As used herein, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0047] Example embodiments are described herein with reference to cross-sectional illustrations that are schematic illustrations of idealized example embodiments (and intermediate structures). As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. Thus, example embodiments should not be construed as limited to the particular shapes of regions illustrated herein but are to include deviations in shapes that result, for example, from manufacturing. The regions illustrated in the figures are schematic in nature and their shapes are not intended to illustrate the actual shape of a region of a device and are not intended to limit the scope of example embodiments.

[0048] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which example embodiments belong. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0049] FIG. 1 illustrates a plan view of an organic light emitting display device obtained by using some example embodiments of the method of the invention, and FIG. 2 is an enlarged plan view of region (Z) of FIG. 1.

[0050] Referring to FIG. 1, a substrate 100 of the organic light emitting display device may be divided in to a display region (X) and a peripheral region (Y). In example embodiments, the display region (X) may be disposed at a center of the substrate 100, and the peripheral region (Y) may be disposed at edges of the substrate 100. That is, the peripheral region (Y) may surround at least one

side of the display region (X). For example, the peripheral region (Y) may surround four sides of the display region (X) as illustrated in FIG. 1, however embodiments are not limited thereto. For example, the peripheral region (Y) may be disposed at a left side, a right side, an upper side and/or a lower side of the display region (X).

[0051] The substrate 100 of the organic light emitting display device may have a first width W1 in a first direction, and may have a second width W2 in a second direction. In example embodiments, the first width W1 may be greater than the second width W2. That is, the substrate 100 may have a rectangular shape which may extend in the first direction.

[0052] A driving circuit portion (IC) may be disposed in the peripheral region (Y) of the substrate 100. The driving circuit portion (IC) may include a data driver, a scan driver, a level shifter and a buffer circuit which may control and transfer electrical signals into the pixel regions (P). In example embodiments, the driving circuit portion (IC) may be disposed at a lower side or an upper side of the display region (X). Further, the driving circuit portion (IC) may extend in the first direction as illustrated in FIG. 1.

[0053] Referring to FIGS. 1 and 2, a plurality of pixel regions (P) may be disposed in the display region (X) of the substrate 100. In example embodiments, the plurality of pixel regions (P) may be arranged on the substrate 100 in the first direction and the second direction. As mentioned above, the substrate 100 may have a rectangular shape which may extend in the first direction, so that the number of pixel regions (P) arranged in the first direction may be greater than the number of pixel regions (P) arranged in the second direction. As illustrated in FIG. 2, each of the pixel regions (P) may include a first region (E) and a second region (T), the first region (E) may include a first light emitting portion (I), a second light emitting portion (II), and a third light emitting portion (III), and the second region (T) may include a transmission portion (IV).

[0054] In example embodiments, the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may correspond to a red light, a green light, and a blue light. That is, light emitting structures disposed in the first to third light emitting portions (I, II, III) may generate the red light, the green light, and the blue light

[0055] In example embodiments, each of the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may have a polygonal shape extending in the first direction. That is, a length of the first light emitting portion (I) in the first direction may be greater than a width of the first light emitting portion (I) in the second direction, a length of the second light emitting portion (II) in the first direction may be greater than a width of the second light emitting portion (II) in the second direction, and a length of the third light emitting portion (III) in the first direction may be greater than a width of the third light emitting portion (III) in the second direction.

[0056] In some example embodiments, the third light emitting portion (III) may have an area greater than those of the first light emitting portion (I) and the second light emitting portion (II). However, embodiments are not limited thereto. For example, the third light emitting portion (III) may have an area substantially identical to those of the first light emitting portion (I) and the second light emitting portion (II).

[0057] The first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may be sequentially arranged in the second direction. That is, the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may be spaced apart from each other in the second direction. When viewed from the first direction, the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) of a same pixel (P) may not overlap each other.

[0058] Further, the transmission portion (IV) may be spaced apart from the third light emitting portion (III) in the second direction. In example embodiment, the transmission portion (IV) may occupy a ratio in the range of about 20% to about 90% with respect to an area of the pixel region (P).

[0059] Referring now to FIG. 2, the first light emitting portions (I), the second light emitting portions (II), the third light emitting portions (III) and the transmission portions (IV) of adjacent pixel regions (P) may be arranged in the first direction. That is, the first light emitting portions (I) of adjacent pixel regions (P) may be arranged in the first direction. The second light emitting portions (II) of adjacent pixel regions (P) may be arranged in the first direction. The third light emitting portions (III) of adjacent pixel regions (P) may be arranged in the first direction. Further, the transmission portions (IV) of adjacent pixel regions (P) may be arranged in the first direction. Accordingly, when viewed from the first direction, the transmission portion (IV) of a pixel region (P) may not overlap the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) of a same pixel region (P) or of adjacent pixel regions (P). Further, an organic light emitting structure and a pixel circuit for electrically controlling the organic light emitting structure may be disposed in each of the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III).

[0060] FIG. 3 illustrates a schematic view of a pixel circuit of an organic light emitting display device obtained by using some example embodiments of the method of the invention, and FIG. 4 is a plan view of an organic light emitting display device obtained by using some example embodiments of the method of the invention.

[0061] Referring to FIG. 3, a scan line (S), a data line (D), and a Vdd line (V) may be electrically connected to the pixel circuit (C). In example embodiments, other lines may be electrically connected to the pixel circuit (C) depending on a structure of the pixel circuit (C).

[0062] In example embodiments, the pixel circuit (C)

may include a first transistor (TR1), a second transistor (TR2), and a storage capacitor (Cst). In this case, the first transistor (TR1) may be electrically connected to the scan line (S) and the data line (D), the second transistor (TR2) may be electrically connected to the first transistor (TR1) and the Vdd line (V), and the storage capacitor (Cst) may be electrically connected to the first transistor (TR1) and the Vdd line (V). That is, a first electrode of the second transistor (TR2) may be electrically connected to the Vdd line (V) and the storage capacitor (Cst), and a second electrode of the second transistor (TR2) may be electrically connected to organic light emitting diode (EL). The first transistor (TR1) may be a switching transistor, and the second transistor (TR2) may be a driving transistor.

[0063] The pixel circuit (C) in FIG. 3 is an exemplary embodiment, and embodiments are not limited thereto. For example, the pixel circuit (C) may include seven transistors and two capacitors.

[0064] Referring to FIG. 4, a single scan line (S) may be electrically connected to a first pixel circuit (C1), a second pixel circuit (C2), and a third pixel circuit (C3). That is, pixel circuits (C1, C2, C3) arranged in a same column may be electrically connected to the single scan line (S), i.e., to a same scan line (S). The first pixel circuit (C1), the second pixel circuit (C2), and the third pixel circuit (C3) may be disposed in the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III), respectively. The first pixel circuit (C1), the second pixel circuit (C2), and the third pixel circuit (C3) may not disposed in the transmission portion (IV), so that the first pixel circuit (C1), the second pixel circuit (C2), and the third pixel circuit (C3) may not degrade transmittance of the transmission portion (IV).

[0065] The first pixel circuit (C1), the second pixel circuit (C2), and the third pixel circuit (C3) may be disposed adjacent to the transmission portion (IV), so that a first data line (D1), a second data line (D2), and a third data line (D3) electrically connected to the first pixel circuit (C1), the second pixel circuit (C2), and the third pixel circuit (C3), respectively, may be disposed adjacent to the transmission portion (IV). Referring to FIG. 4, the first data line (D1) may be disposed above the first light emitting portion (I), and the second data line (D2) and the third data line (D3) may be disposed between the third light emitting portion (III) and the transmission portion (IV). Therefore, the first data line (D1), the second data line (D2), and the third data line (D3) may not overlap the transmission portion (IV).

[0066] Further, a first Vdd line (V1), a second Vdd line (V2), and a third Vdd line (V3) electrically connected to the first pixel circuit (C1), the second pixel circuit (C2), and the third pixel circuit (C3), respectively, may be disposed adjacent to the transmission portion (IV). However, the first Vdd line (V1), the second Vdd line (V2), and the third Vdd line (V3) may not overlap the transmission portion (IV). The first Vdd line (V1), the second Vdd line (V2), and the third Vdd line (V3) may not degrade transmittance of the transmission portion (IV).

[0067] FIG. 5 illustrates a cross sectional view cut along line A-A' of FIG. 2 in accordance with some example embodiments of the invention, and FIG. 6 is a cross sectional view cut along line B-B' of FIG. 2 in accordance with some example embodiments of the invention.

[0068] Referring to FIGS. 5 and 6, the pixel circuits and the light emitting structures may be disposed on the light emitting portions (I, II, III) of the substrate 100. The organic light emitting display device may include the substrate 100, a switching structure of the pixel circuit, lower electrodes 152, 154 and 156, the light emitting structures, and upper electrodes 170.

[0069] The substrate 100 may include a transparent insulation substrate. For example, the substrate 100 may include a glass substrate, a quartz substrate, a transparent resin substrate, or the like. Alternatively, the substrate 100 may include a flexible substrate.

[0070] A buffer layer 105 may be disposed on the substrate 100. The buffer layer 105 may provide a flat top surface, and may prevent impurities from diffusing into the substrate 100. The buffer layer 105 may include an inorganic material, an organic material, or a stacked structure thereof. For example, the inorganic material may include silicon oxide, silicon nitride, silicon oxy nitride, aluminum oxide, aluminum nitride, titanium oxide or titanium nitride, the organic material may include polyimide, polyester or acryl. In other example embodiments, the buffer layer 105 may be omitted.

[0071] Transistors and capacitors constituting the pixel circuit may be disposed on the buffer layer 105. The pixel circuit may be disposed in the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III).

[0072] For convenience of description, the second transistor (TR2) is illustrated in FIGS. 5 and 6, however the first transistor (not shown) and the capacitor (not shown) may be further disposed on the buffer layer 105.

[0073] The active pattern 110 may include oxide semiconductor, polysilicon, doped polysilicon, amorphous silicon, doped amorphous silicon, and the like. In example embodiments, the oxide semiconductor may include a binary compound (AB_x), a ternary compound (AB_xC_y), a quaternary compound ($AB_xC_yO_z$), etc. which may contain indium (In), zinc (Zn), gallium (Ga), tin (Sn), titanium (Ti), aluminum (Al), hafnium (Hf), zirconium (Zr), magnesium (Mg), etc. These may be used alone or in a mixture thereof. For example, the oxide semiconductor may include a G-I-Z-O layer [$(In_2O_3)_a(Ga_2O_3)_b(ZnO)_c$ layer], wherein a, b, and c are each a real number satisfying $a \geq 0$, $b \geq 0$, $c > 0$. When the active pattern 110 is formed of the oxide semiconductor, transmittance of external light of the light emitting portions (I, II, III) may be increased.

[0074] Further, the active portion 110 may include a channel region 112, a source region 114, and a drain region 116. The source region 114 and the drain region 116 may be doped with impurities, and the channel region

112 may be disposed between the source region 114 and the drain region 116.

[0075] A gate insulation layer 120 may be disposed to cover the active pattern 110, and a gate electrode 125 may be disposed on the gate insulation layer 120. In example embodiments, the gate electrode 125 may overlap the channel region 112 of the active pattern 110.

[0076] A first insulating interlayer 130 may be disposed to cover the gate electrode 125, and a source electrode 132 and a drain electrode 134 may be electrically connected to the source region 114 and the drain region 116 through the first insulating interlayer 130 and the gate insulation layer 120.

[0077] The second transistor TR2 illustrated in FIG. 5 may have a top gate structure in which the gate electrode 125 is disposed above the active pattern 110, however embodiments are not limited thereto. For example, the transistors may have a bottom gate structure in which the active patterns are disposed above the gate electrodes.

[0078] Further, a second insulating interlayer 140 may be disposed to cover the pixel circuit including the second transistor (Tr2). In example embodiments, the second insulating interlayer 140 may have an upper surface which is substantially flat.

[0079] The lower electrodes 152, 154, and 156 may be disposed on the second insulating interlayer 140. The lower electrodes 152, 154, and 156 may be disposed in the light emitting portions (I, II, III), respectively. In example embodiments, the first lower electrode 152 may be disposed in the first light emitting portion (I), the second lower electrode 154 may be disposed in the second light emitting portion (II), and the third lower electrode 156 may be disposed in the third light emitting portion (III). That is, the lower electrode 152, 154, and 156 may not be disposed in the transmission portion (IV). The lower electrodes 152, 154, and 156 may include a transparent conductive material such as indium zinc oxide (IZO) or indium tin oxide (ITO).

[0080] A pixel defining layer 155 may be disposed on the second insulating interlayer 140 to partially cover the lower electrodes 152, 154 and 156. In example embodiments, the pixel defining layer 155 may include an organic insulation material or an inorganic insulation material such as silicon oxide or silicon nitride.

[0081] A hole transfer layer 160 may be disposed on the lower electrode 152, 154, and 156 and the pixel defining layer 155. In example embodiment, hole transfer layer 160 may be formed without using a mask or performing an etching process using an etching solution.

[0082] Organic light emitting layer patterns 162, 164, and 166 may be disposed on top surfaces of the lower electrodes 152, 154, and 156 and sidewalls of the pixel defining layer 155. In example embodiments, the organic light emitting layer patterns 162, 164, and 166 may have a thickness in a range of about 200 Å to about 500 Å, e.g., about 250 Å to about 350 Å.

[0083] Referring to FIGS. 2, 5 and 6, the first organic light emitting layer pattern 162 extends in the first direction, so that the first organic light emitting layer pattern 162 overlaps the plurality of first light emitting portions (I). The second organic light emitting layer pattern 164 extends in the first direction, so that the second organic light emitting layer pattern 164 overlaps the plurality of second light emitting portions (II). The third organic light emitting layer pattern 166 extends in the first direction, so that the third organic light emitting layer pattern 166 overlaps the plurality of third light emitting portions (III). Further, the first organic light emitting layer 162, the second organic light emitting layer pattern 164, and the third organic light emitting layer pattern 166 may be spaced apart from each other in the second direction.

[0084] As mentioned above, when viewed from the first direction, the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may not overlap the transmission portion (IV), so that the first organic light emitting layer 162, the second organic light emitting layer pattern 164, and the third organic light emitting layer pattern 166 may not overlap the transmission portion (IV). That is, external light passing through the transmission portion (IV) may not pass through the organic light emitting layer patterns 162, 164, and 166, so that transmittance of external light in the transmission portion (IV) may be increased, and a color shift problem due to the organic light emitting layer patterns 162, 164, and 166 may be prevented.

[0085] In example embodiments, the first organic light emitting layer pattern 162 may include a material for emitting red light, the second organic light emitting layer pattern 164 may include a material for emitting green light, and the third organic light emitting layer pattern 166 may include a material for emitting blue light.

[0086] In other example embodiments, a hole injection layer (HIL) may be further disposed below the hole transfer layer 160, and an electron transfer layer (ETL) and/or an electrode injection layer (EIL) may be further disposed on the organic light emitting layer patterns 162, 164, and 166.

[0087] The upper electrode 170 may be disposed on the organic light emitting layer patterns 162, 164, and 166 and hole transfer layer 160. For example, the upper electrode 170 may include aluminum (Al), platinum (Pt), silver (Ag), magnesium (Mg), gold (Au), chromium (Cr), tungsten (W), molybdenum (Mo), titanium (Ti) or an alloy thereof. However, the upper electrode 170 may have a relatively thin thickness, so that the upper electrode 170 may have a relatively high transmittance.

[0088] FIG. 7 illustrates a perspective view of an organic light emitting display device obtained by using some example embodiments of the method of the invention. The organic light emitting display device may be substantially similar to those described with reference to FIGS. 1 to 6. The organic light emitting display device may have a predetermined flexibility and may be curved in a predetermined direction.

[0089] Referring to FIG. 7, the organic light emitting

display device may be curved along the first direction about an axis extending in the second direction. Therefore, when a user views the organic light emitting display device, a length of the organic light emitting display device in the first direction may decrease.

[0090] As mentioned above, each of the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may have a rectangular shape extending in the first direction. When the organic light emitting display device is curved along the first direction about an axis extending in the second direction, each of the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may have a rectangular shape with reduced length. Therefore, visibility of each of the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may not be degraded due to the curved shape.

[0091] FIGS. 8 to 23 illustrate plan views, cross sectional views, and perspective views of stages in a method of manufacturing an organic light emitting display device in accordance with some example embodiments of the invention.

[0092] Referring to FIG. 8, the substrate 100 including the plurality of pixel regions (P) may be provided. The plurality of pixel regions (P) may be arranged in the first direction and the second direction. Each of the pixel region (P) may include the first light emitting portion (I), the second light emitting portion (II), the third light emitting portion (III), and the transmission portion (IV).

[0093] In example embodiments, each of the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may have a rectangular shape extending in the first direction. That is, a length of the first light emitting portion (I) in the first direction may be greater than a width of the first light emitting portion (I) in the second direction, a length of the second light emitting portion (II) in the first direction may be greater than a width of the second light emitting portion (II) in the second direction, and a length of the third light emitting portion (III) in the first direction may be greater than a width of the third light emitting portion (III) in the second direction.

[0094] The first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may be spaced apart from each other in the second direction. The first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may be sequentially arranged in the second direction.

[0095] Further, the transmission portion (IV) may be spaced apart from the third light emitting portion (III) in the second direction. In example embodiment, the transmission portion (IV) may occupy a ratio in the range of about 20% to about 90% with respect to an area of the pixel region (P).

[0096] Referring now to FIG. 8, the first light emitting portions (I), the second light emitting portions (II), the third light emitting portions (III), and the transmission portions (IV) of adjacent pixel regions (P) may be arranged in the first direction. That is, the first light emitting portions (I) of adjacent pixel regions (P) may be arranged in the first direction. The second light emitting portions (II) of adjacent pixel regions (P) may be arranged in the first direction. The third light emitting portions (III) of adjacent pixel regions (P) may be arranged in the first direction. Further, the transmission portions (IV) of adjacent pixel regions (P) may be arranged in the first direction. Accordingly, when viewed from the first direction, the transmission portion (IV) may not overlap the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III).

[0097] Referring to FIGS. 9 and 10, a pixel circuit including the second transistor (TR2) may be formed on the substrate 100. For convenience of description, the second transistor (TR2) is illustrated in FIGS. 9 and 10, however the first transistor (not shown) and the capacitor (not shown) may be disposed on the substrate 100.

[0098] Firstly, the buffer layer 105 may be formed on the substrate 100. In example embodiments, the buffer layer 105 may be formed by a deposition process or a coating process using an inorganic material, an organic material, or a stacked structure thereof. For example, the inorganic material may include silicon oxide, silicon nitride, silicon oxy nitride, aluminum oxide, aluminum nitride, titanium oxide or titanium nitride, the organic material may include polyimide, polyester or acryl. In other example embodiments, the buffer layer 105 may be omitted.

[0099] A semiconductor layer may be formed on the buffer layer 105 using oxide semiconductor, polysilicon, doped polysilicon, amorphous silicon, doped amorphous silicon, and the like, and then the semiconductor layer may be partially etched to form active patterns 110. In example embodiment, the semiconductor layer may be formed using oxide semiconductor by a sputtering process using a plurality of targets.

[0100] Then, a gate insulation layer 120 may be formed to cover the active patterns 110, and a gate electrode 125 may be formed on the gate insulation layer 120 to overlap the active pattern 110. Further, impurities may be implanted into portions of the active pattern 110 by using the gate electrode 125 as an ion implantation mask, thereby forming a source region 114 and a drain region 116.

[0101] A first insulating interlayer 130 may be formed to cover the gate electrode 125. A source electrode 132 and a drain electrode 134 may be formed through the first insulating interlayer 130 and the gate insulation layer 120, so that the source electrode 132 and the drain electrode 134 may be electrically connected to the source region 114 and the drain region 116, respectively.

[0102] Then, a second insulating interlayer 140 may be formed on the first insulating interlayer 130 to cover the source electrode 132 and the drain electrode 134. The second insulating interlayer 140 may have a top sur-

face which may be substantially flat.

[0103] Referring to FIGS. 11 to 13, lower electrodes 152, 154, and 156 and a pixel defining layer 155 may be formed on the second insulating interlayer 140. The second insulating interlayer 140 may be partially removed to form a contact hole exposing the drain electrode 134, a lower electrode layer may be formed on the second insulating interlayer 140 to fill the contact hole, and then the lower electrode layer may be partially removed to form the lower electrodes 152, 154 and 156.

[0104] The lower electrodes 152, 154, and 156 may be disposed in the light emitting portions (I, II, III), respectively. That is, the lower electrode 152, 154, and 156 may not be disposed in the transmission portion (IV). In example embodiments, the lower electrode layer may be formed using a transparent conductive material such as indium zinc oxide (IZO) or indium tin oxide (ITO).

[0105] Then, the pixel defining layer 155 may be formed to partially cover the lower electrodes 152, 154, and 156. In example embodiments, the pixel defining layer 155 may partially expose the first lower electrode 152 in the first light emitting portion (I), may partially expose the second lower electrode 154 in the second light emitting portion (II), and may partially expose the third lower electrode 156 in the third light emitting portion (III). In example embodiments, the pixel defining layer 155 may be formed in the transmission portion (IV) as illustrated in FIG. 12. Alternatively, the pixel defining layer 155 is not formed in the transmission portion (IV).

[0106] Referring to FIG. 14, a hole transfer layer 160 may be formed on the lower electrodes 152, 154, and 156 and the pixel defining layer 155. In example embodiments, the hole transfer layer 160 may be formed in the first light emitting portion (I), the second light emitting portion (II), the third light emitting portion (III), and the transmission portion (IV). That is, the hole transfer layer 160 may be formed without using an additional mask or without performing an additional patterning process.

[0107] Referring to FIGS. 15 to 19, a first organic light emitting layer pattern 162 may be formed to overlap a plurality of first light emitting portions (I) by using a first mask structure 200. FIG. 15 illustrates an enlarged plan view of a method of manufacturing an organic light emitting display device in accordance with some example embodiments, FIG. 16 is a perspective view of a process for forming the first organic light emitting layer pattern 162, and FIG. 17 is a plan view of the first mask structure 200 in accordance with some example embodiments.

[0108] Referring to FIG. 17, the first mask structure 200 includes a mask body 210 and a plurality of openings 221, 222, 223, 224, and 225 penetrating the mask body 210. In example embodiments, the mask body 210 may have a planar shape extending in the second direction, and the mask body 210 may have the second width (W2) in the second direction. That is, the mask body 210 and the substrate 100 may have the same width (that is, the second width (W2) in the second direction). Further, the mask body 210 may have a width in the first direction that is smaller than the second width (W2).

[0109] The plurality of openings 221, 222, 223, 224, and 225 may be arranged in the second direction, such that the plurality of openings 221, 222, 223, 224, and 225 may be separated from each other in the second direction. In example embodiments, the first opening 221 disposed at a central portion of the mask body 210 may have a relatively small length in the first direction, and the fifth opening 225 disposed at an edge portion of the mask body 210 may have a relatively large length in the first direction. That is, lengths of the openings 221, 222, 223, 224, and 225 in the first direction may gradually increase from the central portion to the edge portion of the mask body 210 as illustrated in FIG. 17. Alternatively, the openings 221, 222, 223, 224, and 225 may have the same length in the first direction.

[0110] Referring to FIG. 16, the substrate 100 disposed above the deposition apparatus 300 and the first mask structure 200 are transferred in the first direction during a deposition process. The deposition apparatus 300 may include a body 310 and a plurality of opening portions 330 disposed at a top surface of the body 310, and the body 310 may contain deposition particles 320. The deposition particles 320 may flow through the plurality of opening portions 330.

[0111] As the body 310 of the deposition apparatus 300 is heated, the deposition particles 320 in the body 310 are emitted through the plurality of opening portions 330 in the third direction. The deposition particles 320 pass through the openings 221, 222, 223, 224, and 225 of the first mask structure 200, and then arrive at the substrate 100, thereby forming the first organic light emitting layer pattern 162 on the substrate 100.

[0112] The first organic light emitting layer pattern 162 has a uniform thickness across the substrate 100. If the first mask structure 200 is omitted, the number of the deposition particles 320 arriving at a central portion of the substrate 100 may be greater than the number of the deposition particles 320 arriving at an edge portion of the substrate 100. However, the fifth opening 225 disposed at the edge portion of the mask body 210 may have an area greater than that of the first opening 221 disposed at a central portion of the mask body 210. That is, areas of the openings 221, 222, 223, 224, and 225 may be adjusted to control the number of the deposition particles 320 passing through the openings 221, 222, 223, 224, and 225, so that the first organic light emitting layer pattern 162 may have a uniform thickness at the central portion and the edge portion of the substrate 100. Further, the second width (W2) of the substrate 100 in the second direction may be smaller than the first width (W1) of the substrate 100 in the first direction. When the substrate 100 is transferred in the first direction relative to the first mask structure 200 during a deposition process, the uniformity of the thickness of the first organic light emitting layer pattern 162 may be improved, e.g., compared to transfer of the substrate 100 in the second direction relative to the first mask structure 200. Accordingly, the dep-

osition process may be used to manufacture an organic light emitting display device having a large screen such as a monitor or a television.

[0113] Referring now to FIGS. 15, 18, and 19, as the substrate 100 is transferred in the first direction relative to the first mask structure 200 during a deposition process, the first organic light emitting layer pattern 162 is formed across the substrate 100 by using the first mask structure 200 which may have an area smaller than that of the substrate 100. Further, each of the first organic light emitting layer patterns 162 is formed to overlap the plurality of first light emitting portion (I) of the plurality of pixel regions (P).

[0114] As mentioned above, when viewed from the first direction, the first light emitting portion (I) may not overlap the transmission portion (IV). Therefore, the first organic light emitting layer patterns 162 extending in the first direction and overlapping the first light emitting portion (I) may not overlap the transmission portion (IV). That is, external light passing through the transmission portion (IV) may not pass through the first organic light emitting layer pattern 162, so that transmittance of external light in the transmission portion (IV) may be increased, and a color shift problem due to the first organic light emitting layer pattern 162 may be prevented.

[0115] Referring to FIGS. 20 and 21, the second organic light emitting layer pattern 164 is formed to overlap a plurality of second light emitting portions (II) by using a second mask structure. A process for forming the second organic light emitting layer pattern 164 is substantially similar to those of the first organic light emitting layer pattern 162. However, the second organic light emitting layer pattern 164 and the first organic light emitting layer pattern 162 may include materials which may emit different colors of light. Further, the second organic light emitting layer pattern 164 is formed to overlap the second light emitting portions (II), and not to overlap the transmission portion (IV).

[0116] Referring to FIGS. 22 and 23, the third organic light emitting layer pattern 166 is formed to overlap a plurality of third light emitting portions (III) by using a third mask structure. A process for forming the third organic light emitting layer pattern 166 is substantially similar to those of the first organic light emitting layer pattern 162. However, the third organic light emitting layer pattern 166, the second organic light emitting layer pattern 164, and the first organic light emitting layer pattern 162 may include materials which may emit different colors of light. Further, the third organic light emitting layer pattern 166 is formed to overlap the third light emitting portions (III), and not to overlap the transmission portion (IV)

[0117] Then, an upper electrode may be formed to manufacture the organic light emitting display device. According to example embodiments, when viewed from the first direction, the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may not overlap the transmission portion (IV), so that the first organic light emitting layer 162, the second organic light emitting layer pattern 164, and the third organic light emitting layer pattern 166 may not overlap the transmission portion (IV). That is, external light passing through the transmission portion (IV) may not pass through the organic light emitting layer patterns 162, 164, and 166, so that transmittance of external light of the transmission portion (IV) may be increased, and a color shift problem due to the organic light emitting layer patterns 162, 164 and 166 may be prevented.

[0118] FIG. 24 illustrates a plan view of an organic light emitting display device obtained by using some example embodiments of the method, and FIG. 25 is a plan view of an organic light emitting display device obtained by using some example embodiments of the method. The organic light emitting display device may be substantially similar to those described with reference to FIGS. 1 to 7, except for arrangements of a driving circuit portion (IC) and lines.

[0119] Referring to FIG. 24, the substrate 100 of the organic light emitting display device may be divided in to the display region (X) and the peripheral region (Y). The driving circuit portion (IC) may be disposed in the peripheral region (Y) of the substrate 100. The driving circuit portion (IC) may include a data driver, a scan driver, a level shifter and a buffer circuit which may control and transfer electrical signals into the pixel regions (P). In example embodiments, the driving circuit portion (IC) may be disposed at a left side of the display region (X) as illustrated in FIG. 24. Further, the driving circuit portion (IC) may extend in the second direction. As the driving circuit portion (IC) may be disposed at a left side or a right side of the display region (X), arrangements and directions of to the scan line (S), the data line (D) and the Vdd line (V) may be different from those described with reference to FIGS. 1 to 7.

[0120] Referring to FIG. 25, the scan line (S), the data line (D), the Vdd line (V) may be electrically connected to the pixel circuits (C1, C2, C3). Single scan line (S) may be electrically connected to the first pixel circuit (C1), the second pixel circuit (C2) and the third pixel circuit (C3). That is, pixel circuits (C1, C2, C3) arranged in the same row may be electrically connected to the single scan line (S).

[0121] The first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may be disposed adjacent to the transmission portion (IV), so that a first data line (D1), a second data line (D2) and a third data line (D3) electrically connected to the first pixel circuit (C1), the second pixel circuit (C2) and the third pixel circuit (C3), respectively, may be disposed adjacent to the transmission portion (IV). Referring to FIG. 25, the first data line (D1), the second data line (D2) and the third data line (D3) may be disposed at a left side of the transmission portion (IV). Therefore, the first data line (D1), the second data line (D2) and the third data line (D3) may not overlap the transmission portion (IV).

[0122] On the other hand, the first Vdd line (V1), the

second Vdd line (V2), and the third Vdd line (V3) electrically connected to the first pixel circuit (C1), the second pixel circuit (C2), and the third pixel circuit (C3), respectively, may be disposed adjacent to the transmission portion (IV). Referring to FIG. 25, the first Vdd line (V1), the second Vdd line (V2), and the third Vdd line (V3) may be disposed at a right side of the transmission portion (IV). Therefore, the first Vdd line (V1), the second Vdd line (V2), and the third Vdd line (V3) may not overlap the transmission portion (IV). Accordingly, the lines (S, D1, D2, D3, V1, V2, V3) may be disposed not to overlap the transmission portion (IV), so that the lines (S, D1, D2, D3, V1, V2, V3) may not degrade transmittance of the transmission portion (IV).

[0123] FIG. 26 illustrates a plan view of an organic light emitting display device obtained by using some example embodiments of the method, and FIG. 27 is a cross sectional view cut along line B-B' of FIG. 26 in accordance with some example embodiments. The organic light emitting display device may be substantially similar to those described with reference to FIGS. 1 to 7, except for an organic layer pattern 168 and an upper electrode 172.

[0124] Referring to FIGS. 26-27, pixel circuits including the thin film transistor (TR2) and a capacitor may be disposed on the substrate 100 in the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III), respectively. The second insulating interlayer 140 may be disposed to cover the pixel circuits.

[0125] The lower electrodes 152, 154 and 156 may be disposed on the second insulating interlayer 140, and the pixel defining layer 155 may be disposed on the second insulating interlayer 140 to partially cover the lower electrodes 152, 154 and 156. Further, the organic light emitting layer patterns 162, 164 and 166 may be disposed on top surfaces of the lower electrodes 152, 154 and 156 and a sidewall of the pixel defining layer 155, respectively.

[0126] The organic layer pattern 168 may be disposed on the pixel defining layer 155. The organic layer pattern 168 may extend in the first direction, and may cover a plurality of transmission portion (IV). In example embodiments, the organic layer pattern 168 may extend from the transmission portion (IV) into the third light emitting portion (III), so that the organic layer pattern 168 may partially overlap the third light emitting portion (III). Alternatively, the organic layer pattern 168 may not be disposed in the third light emitting portion (III).

[0127] The organic layer pattern 168 may include a material which may have a relatively weak adhesion characteristic with respect to the upper electrode 172. For example, the organic layer pattern 168 may include a transparent organic material such as lithium quinoline (LiQ). That is, the organic layer pattern 168 may have transmittance which is better than that of the upper electrode 172. Therefore, degradation of transmittance of the transmission portion (IV) by the organic layer pattern 168 may be reduced or minimized.

[0128] The upper electrode 172 may be disposed on the organic light emitting layer patterns 162, 164 and 166 and a hole transfer layer 160. However, the upper electrode 172 may not overlap the organic layer pattern 168, or may overlap an edge portion of the organic layer pattern 168. That is, the upper electrode 172 may not be disposed in the transmission portion (IV).

[0129] According to example embodiments, the upper electrode 172 may not overlap the transmission portion (IV), so that transmittance of the transmission portion (IV) may be improved. Further, the upper electrode 172 and the organic layer pattern 168 may have a relatively weak adhesion characteristic, so that the upper electrode 172 may be formed by a metal self patterning process without using a mask.

[0130] FIGS. 28 to 32 illustrate plan views, cross sectional views, and perspective views of a method of manufacturing an organic light emitting display device in accordance with some example embodiments of the invention.

[0131] Referring to FIG. 28, processes described with reference to FIGS. 8 to 23 may be performed. That is, a pixel circuit including the thin film transistor (TR2) may be formed on the substrate 100, and the second insulating interlayer 140 may be formed to cover the pixel circuit. The lower electrodes 152, 154 and 156 and the pixel defining layer 155 may be formed on the second insulating interlayer 140, and then he hole transfer layer 160 may be formed on the lower electrodes 152, 154 and 156 and the pixel defining layer 155. While transferring the substrate 100 in the first direction, the first organic light emitting layer pattern 162 may be formed to overlap the first light emitting portion (I), the second organic light emitting layer pattern 164 may be formed to overlap the second light emitting portion (II), and the third organic light emitting layer pattern 166 may be formed to overlap the third light emitting portion (III).

[0132] Referring to FIGS. 29 to 31, the organic layer pattern 168 may be formed to overlap the transmission portion (IV). A process for forming the organic layer pattern 168 may be substantially the same as or similar to those described with reference to FIGS. 15 to 19. That is, while transferring the substrate 100 in the first direction, deposition particles 322 emitted from the deposition apparatus 300 may pass through a fourth mask structure 202, and then may arrive at the substrate 100 to form the organic layer pattern 168.

[0133] In example embodiments, the deposition particles 322 may include a material which may have a relatively weak adhesion characteristic with respect to the upper electrode 172. For example, the deposition particles 322 may include a transparent organic material such as lithium quinoline (LiQ).

[0134] In example embodiments, the organic layer pattern 168 may be formed on the pixel defining layer 155. The organic layer pattern 168 may extend in the first direction, and may cover a plurality of transmission portion (IV). In example embodiments, the organic layer pattern

168 may extend from the transmission portion (IV) into the third light emitting portion (III), so that the organic layer pattern 168 may partially overlap the third light emitting portion (III). Alternatively, the organic layer pattern 168 may not disposed in the third light emitting portion (III).

[0135] Referring to FIG. 32, an upper electrode 172 may be formed to overlap the first to third organic light emitting layer patterns 162, 164 and 166. In example embodiments, the upper electrode 172 may be formed using a metal such as aluminum (Al), platinum (Pt), silver (Ag), magnesium (Mg), gold (Au), chromium (Cr), tungsten (W), molybdenum (Mo), titanium (Ti) or an alloy thereof. The metal of the upper electrode 172 may have a relatively weak adhesion characteristic with respect to the organic layer pattern 168. Therefore, the upper electrode 172 may be formed not to overlap the organic layer pattern 168, or to overlap an edge portion of the organic layer pattern 168. Accordingly, the upper electrode 172 may not overlap the transmission portion (IV), so that transmittance in the transmission portion (IV) may be improved.

[0136] FIG. 33 illustrates a plan view of an organic light emitting display device not forming part of the present invention, and FIG. 34 is an enlarged plan view of FIG. 33. Referring to FIG. 33, the substrate 100 of the organic light emitting display device may be divided in to the display region (X) and the peripheral region (Y).

[0137] In example embodiments, the display region (X) may be disposed at a center of the substrate 100, and the peripheral region (Y) may be disposed at edges of the substrate 100. That is, the peripheral region (Y) may surround at least one side of the display region (X).

[0138] The substrate 100 of the organic light emitting display device may have a first width W1 in a first direction, and may have a second width W2 in a second direction. In example embodiment, the first width W1 may be greater than a second width W2. That is, the substrate 100 may have a rectangular shape which may extend in the first direction.

[0139] On the other hand, the driving circuit portion (IC) may be disposed in the peripheral region (Y) of the substrate 100. The driving circuit portion (IC) may include a data driver, a scan driver, a level shifter and a buffer circuit which may control and transfer electrical signals into the pixel regions (P). In example embodiments, the driving circuit portion (IC) may be disposed at a lower side or an upper side of the display region (X). Further, the driving circuit portion (IC) may extend in the first direction as illustrated in FIG. 33.

[0140] Referring to FIGS. 33 and 34, the plurality of pixel regions (P) may be disposed in the display region (X) of the substrate 100. The plurality of pixel regions (P) may be arranged in the first direction and the second direction. Each of the pixel regions (P) may include a first region (E) and a second region (T), the first region (E) may include a first light emitting portion (I), a second light emitting portion (II) and a third light emitting portion (III), and the second region (T) may include a transmission portion (IV).

[0141] In example embodiments, the first light emitting portion (I), the second light emitting portion (II) and the third light emitting portion (III) may correspond to a red light, a green light and a blue light. That is, light emitting structures disposed in the first to third light emitting portions (I, II, III) may generate the red light, the green light and the blue light.

[0142] In example embodiments, each of the first light emitting portion (I), the second light emitting portion (II) and the third light emitting portion (III) may have a polygonal shape extending in the second direction. That is, a length of the first light emitting portion (I) in the second direction may be greater than a width of the first light emitting portion (I) in the first direction, a length of the second light emitting portion (II) in the second direction may be greater than a width of the second light emitting portion (II) in the first direction, and a length of the third light emitting portion (III) in the second direction may be greater than a width of the third light emitting portion (III) in the first direction.

[0143] The first light emitting portion (I), the second light emitting portion (II) and the third light emitting portion (III) may be sequentially arranged in the first direction. That is, the first light emitting portion (I), the second light emitting portion (II) and the third light emitting portion (III) may be spaced apart from each other in the first direction. When viewed from the second direction, the first light emitting portion (I), the second light emitting portion (II) and the third light emitting portion (III) may not overlap each other.

[0144] Further, the transmission portion (IV) may be spaced apart from the third light emitting portion (III) in the first direction. In example embodiments, the transmission portion (IV) may occupy a ratio in the range of about 20% to about 90% with respect to an area of the pixel region (P).

[0145] Referring now to FIG. 34, the first light emitting portions (I), the second light emitting portions (II), the third light emitting portions (III) and the transmission portions (IV) of adjacent pixel regions (P) may be arranged in the second direction. That is, the first light emitting portions (I) of adjacent pixel regions (P) may be arranged in the second direction. The second light emitting portions (II) of adjacent pixel regions (P) may be arranged in the second direction. The third light emitting portions (III) of adjacent pixel regions (P) may be arranged in the second direction. Further, the transmission portions (IV) of adjacent pixel regions (P) may be arranged in the second direction. Accordingly, when viewed from the second direction, the transmission portion (IV) may not overlap the first light emitting portion (I), the second light emitting portion (II) and the third light emitting portion (III).

[0146] Further, an organic light emitting structure and a pixel circuit for electrically controlling the organic light emitting structure may be disposed in each of the first light emitting portion (I), the second light emitting portion

(II) and the third light emitting portion (III).

[0147] FIG. 35 illustrates a schematic view illustrating a pixel circuit of an organic light emitting display device not forming part of the present invention.

[0148] Referring to FIG. 35, a scan line (S), a data line (D1, D2, D3), a Vdd line (VI, V2, V3) may be electrically connected to the pixel circuit (C1, C2, C3). In example embodiments, other lines may be electrically connected to the pixel circuit (C1, C2, C3) depending on a structure of the pixel circuit (C1, C2, C3).

[0149] In example embodiments, single scan line (S) may be electrically connected to the first pixel circuit (C1), the second pixel circuit (C2) and the third pixel circuit (C3). That is, pixel circuits (C1, C2, C3) arranged in the same column may be electrically connected to the single scan line (S). The first pixel circuit (C1), the second pixel circuit (C2) and the third pixel circuit (C3) may be disposed in the first light emitting portion (I), the second light emitting portion (II) and the third light emitting portion (III), respectively. The first pixel circuit (C1), the second pixel circuit (C2) and the third pixel circuit (C3) may not disposed in the transmission portion (IV), so that the first pixel circuit (C1), the second pixel circuit (C2) and the third pixel circuit (C3) may not degrade transmittance of the transmission portion (IV).

[0150] The first data line (D1), the second data line (D2) and the third data line (D3) electrically connected to the first pixel circuit (C1), the second pixel circuit (C2) and the third pixel circuit (C3), respectively, may be disposed adjacent to the transmission portion (IV). Referring to FIG. 35, the first data line (D1), the second data line (D2) and the third data line (D3) may be disposed above the transmission portion (IV), so that the first data line (D1), the second data line (D2) and the third data line (D3) may not overlap the transmission portion (IV).

[0151] Further, the first Vdd line (V1), the second Vdd line (V2) and the third Vdd line (V3) may be disposed adjacent to the transmission portion (IV). However, the first Vdd line (V1), the second Vdd line (V2) and the third Vdd line (V3) may not overlap the transmission portion (IV), so that the first Vdd line (V1), the second Vdd line (V2) and the third Vdd line (V3) may not degrade transmittance of the transmission portion (IV).

[0152] FIG. 36 illustrates a cross sectional view cut along a line B-B' of FIG. 35 and FIG. 37 is a cross sectional view cut along a line A-A' of FIG. 35.

[0153] Referring to FIGS. 36 and 37, the pixel circuits and the light emitting structures may be disposed on the light emitting portions (I, II, III) of the substrate 100.

[0154] The organic light emitting display device may include the substrate 100, a switching structure of the pixel circuit, lower electrodes 152, 154 and 156, the light emitting structures, and upper electrodes 170.

[0155] The substrate 100 may include a transparent insulation substrate. For example, the substrate 100 may include a glass substrate, a quartz substrate, a transparent resin substrate, or the like. Alternatively, the substrate 100 may include a flexible substrate.

[0156] The buffer layer 105 may be disposed on the substrate 100. The buffer layer 105 may provide a flat top surface, and may prevent impurities from diffusing into the substrate 100. Transistors and capacitors constituting the pixel circuit may be disposed on the buffer layer 105. The pixel circuits may be disposed in the first light emitting portion (I), the second light emitting portion (II) and the third light emitting portion (III), respectively.

[0157] For convenience of description, the second transistor (TR2) is illustrated in FIGS. 36 and 37, however the first transistor (not shown) and the capacitor (not shown) may be further disposed on the buffer layer 105. The second thin film transistor (TR2) may include a active pattern 110, a gate electrode 125, a source electrode 132 and a drain electrode 134.

[0158] The active pattern 110 may include oxide semiconductor, polysilicon, doped polysilicon, amorphous silicon, doped amorphous silicon, and the like. Further, the active portion 110 may include a channel region 112, a source region 114 and a drain region 116. The source region 114 and the drain region 116 may be doped with impurities, and the channel region 112 may be disposed between the source region 114 and the drain region 116.

[0159] The gate insulation layer 120 may be disposed to cover the active pattern 110, and the gate electrode 125 may be disposed on the gate insulation layer 120. In example embodiments, the gate electrode 125 may overlap the channel region 112 of the active pattern 110.

[0160] The first insulating interlayer 130 may be disposed to cover the gate electrode 125, and the source electrode 132 and the drain electrode 134 may be electrically connected to the source region 114 and the drain region 116 through the first insulating interlayer 130 and the gate insulation layer 120. Further, the second insulating interlayer 140 may be disposed to cover the pixel circuit including the second transistor (Tr2). In example embodiments, the second insulating interlayer 140 may have an upper surface which is substantially flat.

[0161] The lower electrodes 152, 154 and 156 may be disposed on the second insulating interlayer 140. The lower electrodes 152, 154 and 156 may be disposed in the light emitting portions (I, II, III), respectively. The lower electrodes 152, 154 and 156 may include a transparent conductive material such as indium zinc oxide (IZO) or indium tin oxide (ITO).

[0162] The pixel defining layer 155 may be disposed on the second insulating interlayer 140 to partially cover the lower electrodes 152, 154 and 156. In example embodiments, the pixel defining layer 155 may include an organic insulation material or an inorganic insulation material such as silicon oxide or silicon nitride.

[0163] The hole transfer layer 160 may be disposed on the lower electrode 152, 154 and 156 and the pixel defining layer 155. In example embodiment, hole transfer layer 160 may be formed without using a mask or performing an etching process using an etching solution.

[0164] Organic light emitting layer patterns 182, 184 and 186 may be disposed on top surfaces of the lower

electrodes 152, 154 and 156 and sidewalls of the pixel defining layer 155. In example embodiments, the organic light emitting layer patterns 182, 184 and 186 may have a thickness in a range of about 200Å to about 500Å.

[0165] Referring to FIGS. 36 and 37, the first organic light emitting layer pattern 182 may extend in the second direction, so that the first organic light emitting layer pattern 182 may overlap the plurality of first light emitting portions (I). The second organic light emitting layer pattern 184 may extend in the second direction, so that the first organic light emitting layer pattern 184 may overlap the plurality of second light emitting portions (II). The third organic light emitting layer pattern 186 may extend in the second direction, so that the third organic light emitting layer pattern 186 may overlap the plurality of third light emitting portions (III). Further, the first organic light emitting layer 182, the second organic light emitting layer pattern 184 and the third organic light emitting layer pattern 186 may be spaced apart from each other in the first direction.

[0166] As mentioned above, when viewed from the second direction, the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may not overlap the transmission portion (IV), so that the first organic light emitting layer 182, the second organic light emitting layer pattern 184, and the third organic light emitting layer pattern 186 may not overlap the transmission portion (IV). That is, external light passing through the transmission portion (IV) may not pass through the organic light emitting layer patterns 182, 184 and 186, so that transmittance of external light in the transmission portion (IV) may be increased, and a color shift problem due to the organic light emitting layer patterns 182, 184 and 186 may be prevented.

[0167] The upper electrode 170 may be disposed on the organic light emitting layer patterns 182, 184 and 186 and hole transfer layer 160. For example, the upper electrode 170 may include aluminum (Al), platinum (Pt), silver (Ag), magnesium (Mg), gold (Au), chromium (Cr), tungsten (W), molybdenum (Mo), titanium (Ti) or an alloy thereof. However, the upper electrode 170 may have a relatively thin thickness, so that the upper electrode 170 may have a relatively high transmittance.

[0168] According to example embodiments, the first organic light emitting layer 182, the second organic light emitting layer pattern 184, and the third organic light emitting layer pattern 186 may extend in the second direction. Further, when viewed from the second direction, the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) may not overlap the transmission portion (IV). While transferring the substrate 100 in the second direction, each of the first organic light emitting layer 182, the second organic light emitting layer pattern 184, and the third organic light emitting layer pattern 186 may be formed not to overlap the transmission portion (IV). Therefore, transmittance of external light in the transmission portion (IV) may be increased, and a color shift problem due to the organic light emitting layer patterns 182, 184 and 186 may be prevented.

[0169] According to example embodiments, when viewed from the first direction, a first light emitting portion (I), a second light emitting portion (II) and a third light emitting portion (III) may not overlap a transmission portion (IV), so that a first organic light emitting layer, a second organic light emitting layer pattern and a third organic light emitting layer pattern may not overlap the transmission portion (IV). That is, an external light passing through the transmission portion (IV) may not pass through the organic light emitting layer patterns, so that transmittance of external light in the transmission portion (IV) may be increased, and a color shift problem due to the organic light emitting layer patterns may be prevented.

Claims

1. A method of manufacturing an organic light emitting display device, the method comprising:

providing a substrate (100) having a first width (W1) in a first direction and a second width (W2) in a second direction substantially perpendicular to the first direction, the first width being greater than the second width;

defining a plurality of pixel regions (P) on the substrate, each of the plurality of pixel regions being divided into a first region (E) and a second region (T), each of the pixel regions including a first light emitting portion (I), a second light emitting portion (II), a third light emitting portion (III) and a transmission portion (IV) configured to transmit external light arranged along the second direction;

forming a first organic light emitting layer pattern (162) extending in the first direction, the first organic light emitting layer pattern (162) overlapping the first light emitting portions (I);

forming a second organic light emitting layer pattern (164) extending in the first direction, the second organic light emitting layer pattern (164) overlapping the second light emitting portions (II); and

forming a third organic light emitting layer pattern (166) extending in the first direction, the third organic light emitting layer pattern (166) overlapping the third light emitting portions (III), wherein the first light emitting portion (I), the second light emitting portion (II), and the third light emitting portion (III) are formed in the first region (E) of each of the pixel regions (P), and the transmission portion (IV) is disposed in the second region (T) of each of the pixel regions (P),

wherein forming the first organic light emitting layer pattern (162) includes:

arranging a mask structure (200) over a

deposition apparatus (300), the mask structure including a plurality of openings (221, 222, 223, 224, 225);
emitting deposition particles (320) from the deposition apparatus (300) by heating the deposition apparatus; and
transferring the substrate (100) above the mask structure (200) in the first direction.

2. The method as claimed in claim 1, wherein the mask structure (200) has the second width (W2) in the second direction.

3. The method as claimed in claim 1 or 2, further comprising forming a plurality of first lower electrodes (152) in the first light emitting portions (I), a plurality of second lower electrodes (154) in the second light emitting portions (II), and a plurality of third lower electrodes (156) in the third light emitting portions (III), before forming the first organic light emitting layer pattern (162).

4. The method as claimed in claim 3, further comprising:

forming an upper electrode (172) on the first organic light emitting layer pattern (162), the second organic light emitting layer pattern (164), and the third organic light emitting layer pattern (166),
wherein the upper electrode (172) covers the first light emitting portions (I), the second light emitting portions (II), the third light emitting portions (III), and the transmission portions (IV).

5. The method as claimed in claim 3, further comprising:

forming an upper electrode (172) on the first organic light emitting layer pattern (162), the second organic light emitting layer pattern (164), and the third organic light emitting layer pattern (166),
wherein the upper electrode (172) covers the first light emitting portions (I), the second light emitting portions (II), and the third light emitting portions (III), while exposing the transmission portions (IV).

6. The method as claimed in claim 5, further comprising forming an organic layer pattern (168) covering the transmission portions (IV), the organic layer pattern (168) having a relatively low adhesive characteristic with respect to the upper electrode.

7. The method as claimed in claim 6, wherein the organic layer pattern (168) includes lithium quinoline.

8. The method as claimed in any preceding claim, wherein the transmission portions (IV) do not overlap the first light emitting portion (I), the second light emitting portion (II), or the third light emitting portion (III) in the first direction.

9. The method as claimed in any preceding claim, wherein:

a length of the first light emitting portion (I) in the first direction is substantially greater than a width of the first light emitting portion (I) in the second direction,
a length of the second light emitting portion (II) in the first direction is substantially greater than a width of the second light emitting portion (II) in the second direction, and
a length of the third light emitting portion (III) in the first direction is substantially greater than a width of the third light emitting portion (III) in the second direction.

10. The method as claimed in any preceding claim, wherein the organic light emitting display device is bendable about an axis extending in the second direction.

Patentansprüche

1. Verfahren zum Herstellen einer organischen lichtemittierenden Anzeigevorrichtung, das Verfahren umfassend:

Bereitstellen eines Substrats (100) mit einer ersten Breite (W1) in einer ersten Richtung und einer zweiten Breite (W2) in einer zweiten Richtung im Wesentlichen senkrecht zu der ersten Richtung, wobei die erste Breite größer als die zweite Breite ist;
Definieren einer Vielzahl von Bildpunktregionen (P) auf dem Substrat, wobei jede der Vielzahl von Bildpunktregionen in eine erste Region (E) und eine zweite Region (T) aufgeteilt ist, jede der Bildpunktregionen einen ersten lichtemittierenden Abschnitt (I), einen zweiten lichtemittierenden Abschnitt (II), einen dritten lichtemittierenden Abschnitt (III) und einen Übertragungsabschnitt (IV), konfiguriert zum Übertragen von externem Licht, angeordnet entlang einer zweiten Richtung, enthält;
Bilden eines ersten organischen lichtemittierenden Schichtmusters (162), das sich in der ersten Richtung erstreckt, wobei das erste organische lichtemittierende Schichtmuster (162) die ersten lichtemittierenden Abschnitte (I) überlappt;
Bilden eines zweiten organischen lichtemittierenden Schichtmusters (164), das sich in der

ersten Richtung erstreckt, wobei das zweite organische lichtemittierende Schichtmuster (164) die zweiten lichtemittierenden Abschnitte (II) überlappt; und

Bilden eines dritten organischen lichtemittierenden Schichtmusters (166), das sich in der ersten Richtung erstreckt, wobei das dritte organische lichtemittierende Schichtmuster (166) die dritten lichtemittierenden Abschnitte (III) überlappt,

wobei der erste lichtemittierende Abschnitt (I), der zweite lichtemittierende Abschnitt (II) und der dritte lichtemittierende Abschnitt (III) in der ersten Region (E) jeder der Bildpunktregionen (P) gebildet werden und der Übertragungsabschnitt (IV) in der zweiten Region (T) jeder der Bildpunktregionen (P) angeordnet ist,

wobei Bilden des ersten organischen lichtemittierenden Schichtmusters (162) enthält:

Anordnen einer Maskenstruktur (200) über einem Ablagerungsgerät (300), wobei die Maskenstruktur eine Vielzahl von Öffnungen (221, 222, 223, 224, 225) enthält;

Abgeben von Ablagerungspartikeln (320) von dem Ablagerungsgerät (300) durch Erwärmen des Ablagerungsgeräts; und

Transferieren des Substrats (100) über der Maskenstruktur (200) in der ersten Richtung.

2. Verfahren nach Anspruch 1, wobei die Maskenstruktur (200) die zweite Breite (W2) in der zweiten Richtung aufweist.

3. Verfahren nach Anspruch 1 oder 2, ferner umfassend Bilden einer Vielzahl von ersten unteren Elektroden (152) in den ersten lichtemittierenden Abschnitten (I), einer Vielzahl von zweiten unteren Elektroden (154) in den zweiten lichtemittierenden Abschnitten (II) und einer Vielzahl von dritten unteren Elektroden (156) in den dritten lichtemittierenden Abschnitten (III) vor dem Bilden des ersten organischen lichtemittierenden Schichtmusters (162).

4. Verfahren nach Anspruch 3, ferner umfassend:

Bilden einer oberen Elektrode (172) auf dem ersten organischen lichtemittierenden Schichtmuster (162), dem zweiten organischen lichtemittierenden Schichtmuster (164) und dem dritten organischen lichtemittierenden Schichtmuster (166),

wobei die obere Elektrode (172) die ersten lichtemittierenden Abschnitte (I), die zweiten lichtemittierenden Abschnitte (II), die dritten lichtemittierenden Abschnitte (III) und die Übertragungsabschnitte (IV) abdeckt.

5. Verfahren nach Anspruch 3, ferner umfassend:

Bilden einer oberen Elektrode (172) auf dem ersten organischen lichtemittierenden Schichtmuster (162), dem zweiten organischen lichtemittierenden Schichtmuster (164) und dem dritten organischen lichtemittierenden Schichtmuster (166),

wobei die obere Elektrode (172) die ersten lichtemittierenden Abschnitte (I), die zweiten lichtemittierenden Abschnitte (II), die dritten lichtemittierenden Abschnitte (III) abdeckt, während sie die Übertragungsabschnitte (IV) exponiert.

6. Verfahren nach Anspruch 5, ferner umfassend Bilden eines organischen Schichtmusters (168), das die Übertragungsabschnitte (IV) abdeckt, wobei das organische Schichtmuster (168) ein Charakteristikum relativ niedriger Adhäsion in Bezug auf die obere Elektrode aufweist.

7. Verfahren nach Anspruch 6, wobei das organische Schichtmuster (168) Lithiumchinolin enthält.

8. Verfahren nach einem der vorstehenden Ansprüche, wobei die Übertragungsabschnitte (IV) den ersten lichtemittierenden Abschnitt (I), den zweiten lichtemittierenden Abschnitt (II) oder den dritten lichtemittierenden Abschnitt (III) in der ersten Richtung nicht überlappen.

9. Verfahren nach einem der vorstehenden Ansprüche, wobei:

eine Länge des ersten lichtemittierenden Abschnitts (I) in der ersten Richtung im Wesentlichen größer ist als eine Breite des ersten lichtemittierenden Abschnitts (I) in der zweiten Richtung,

eine Länge des zweiten lichtemittierenden Abschnitts (II) in der ersten Richtung im Wesentlichen größer ist als eine Breite des zweiten lichtemittierenden Abschnitts (II) in der zweiten Richtung, und

eine Länge des dritten lichtemittierenden Abschnitts (III) in der ersten Richtung im Wesentlichen größer ist als eine Breite des dritten lichtemittierenden Abschnitts (III) in der zweiten Richtung.

10. Verfahren nach einem der vorstehenden Ansprüche, wobei die organische lichtemittierende Anzeigevorrichtung um eine Achse, die sich in der zweiten Richtung erstreckt, biegbar ist.

Revendications

1. Procédé de fabrication d'un dispositif d'affichage électroluminescent organique, le procédé comprenant :

   la fourniture d'un substrat (100) présentant une première largeur (W1) dans une première direction et une seconde largeur (W2) dans une seconde direction sensiblement perpendiculaire à la première direction, la première largeur étant supérieure à la seconde largeur ;
   la définition d'une pluralité de régions de pixel (P) sur le substrat, chacune de la pluralité de régions de pixel étant divisée en une première région (E) et une seconde région (T), chacune des régions de pixel incluant une première partie électroluminescente (I), une deuxième partie électroluminescente (II), une troisième partie électroluminescente (III), et une partie de transmission (IV) configurée afin de transmettre une lumière extérieure agencée le long de la seconde direction ;
   la formation d'un premier motif de couche électroluminescente organique (162) s'étendant dans la première direction, le premier motif de couche électroluminescente organique (162) recouvrant les premières parties électroluminescentes (I) ;
   la formation d'un deuxième motif de couche électroluminescente organique (164) s'étendant dans la première direction, le deuxième motif de couche électroluminescente organique (164) recouvrant les secondes parties électroluminescentes (II) ; et
   la formation d'un troisième motif de couche électroluminescente organique (166) s'étendant dans la première direction, le troisième motif de couche électroluminescente organique (166) recouvrant les troisièmes parties électroluminescentes (III),
   dans lequel la première partie électroluminescente (I), la deuxième partie électroluminescente (II), et la troisième partie électroluminescente (III) sont formées dans la première région (E) de chacune des régions de pixel (P), et la partie de transmission (IV) est disposée dans la seconde région (T) de chacune des régions de pixel (P),
   dans lequel la formation du premier motif de couche électroluminescente organique (162) inclut :

      l'agencement d'une structure de masque (200) sur un appareil de déposition (300), la structure de masque incluant une pluralité d'ouvertures (221, 222, 223, 224, 225) ;
      l'émission de particules de déposition (320) depuis l'appareil de déposition (300) en chauffant l'appareil de déposition ; et
      le transfert du substrat (100) au-dessus de la structure de masque (200) dans la première direction.

2. Procédé selon la revendication 1, dans lequel la structure de masque (200) présente la seconde largeur (W2) dans la seconde direction.

3. Procédé selon la revendication 1 ou 2, comprenant en outre la formation d'une pluralité de premières électrodes inférieures (152) dans les premières parties électroluminescentes (I), une pluralité de deuxièmes électrodes inférieures (154) dans les deuxièmes parties électroluminescentes (II), et une pluralité de troisièmes électrodes inférieures (156) dans les troisièmes parties électroluminescentes (III), avant de former le premier motif de couche électroluminescente organique (162).

4. Procédé selon la revendication 3, comprenant en outre :

   la formation d'une électrode supérieure (172) sur le premier motif de couche électroluminescente organique (162), le deuxième motif de couche électroluminescente organique (164), et le troisième motif de couche électroluminescente organique (166),
   dans lequel l'électrode supérieure (172) couvre les premières parties électroluminescentes (I), les deuxièmes parties électroluminescentes (II), les troisièmes parties électroluminescentes (III), et les parties de transmission (IV).

5. Procédé selon la revendication 3, comprenant en outre :

   la formation d'une électrode supérieure (172) sur le premier motif électroluminescent organique (162), le deuxième motif électroluminescent organique (164), et le troisième motif électroluminescent organique (166),
   dans lequel l'électrode supérieure (172) couvre les premières parties électroluminescentes (I), les deuxièmes parties électroluminescentes (II), et les troisièmes parties électroluminescentes (III), tout en exposant les parties de transmission (IV).

6. Procédé selon la revendication 5, comprenant en outre la formation d'un motif de couche organique (168) couvrant les parties de transmission (IV), le motif de couche organique (168) présentant une caractéristique adhésive relativement basse relativement à l'électrode supérieure.

7. Procédé selon la revendication 6, dans lequel le mo-

tif de couche organique (168) inclut de la quinoline de lithium.

8. Procédé selon l'une quelconque des revendications précédentes, dans lequel les parties de transmission (IV) ne recouvrent pas la première partie électroluminescente (I), la deuxième partie électroluminescente (II), ou la troisième partie électroluminescente (III) dans la première direction.

9. Procédé selon l'une quelconque des revendications précédentes, dans lequel :

une longueur de la première partie électroluminescente (I) dans la première direction est sensiblement supérieure à une largeur de la première électroluminescente (II) dans la seconde direction,
une longueur de la deuxième partie électroluminescente (II) dans la première direction est sensiblement supérieure à une largeur de la deuxième partie électroluminescente (II) dans la seconde direction, et
une longueur de la troisième partie électroluminescente (III) dans la première direction est sensiblement supérieure à une largeur de la troisième partie électroluminescente (III) dans la seconde direction.

10. Procédé selon l'une quelconque des revendications précédentes, dans lequel le dispositif d'affichage électroluminescent peut être plié autour d'un axe s'étendant dans la seconde direction.

FIG. 1

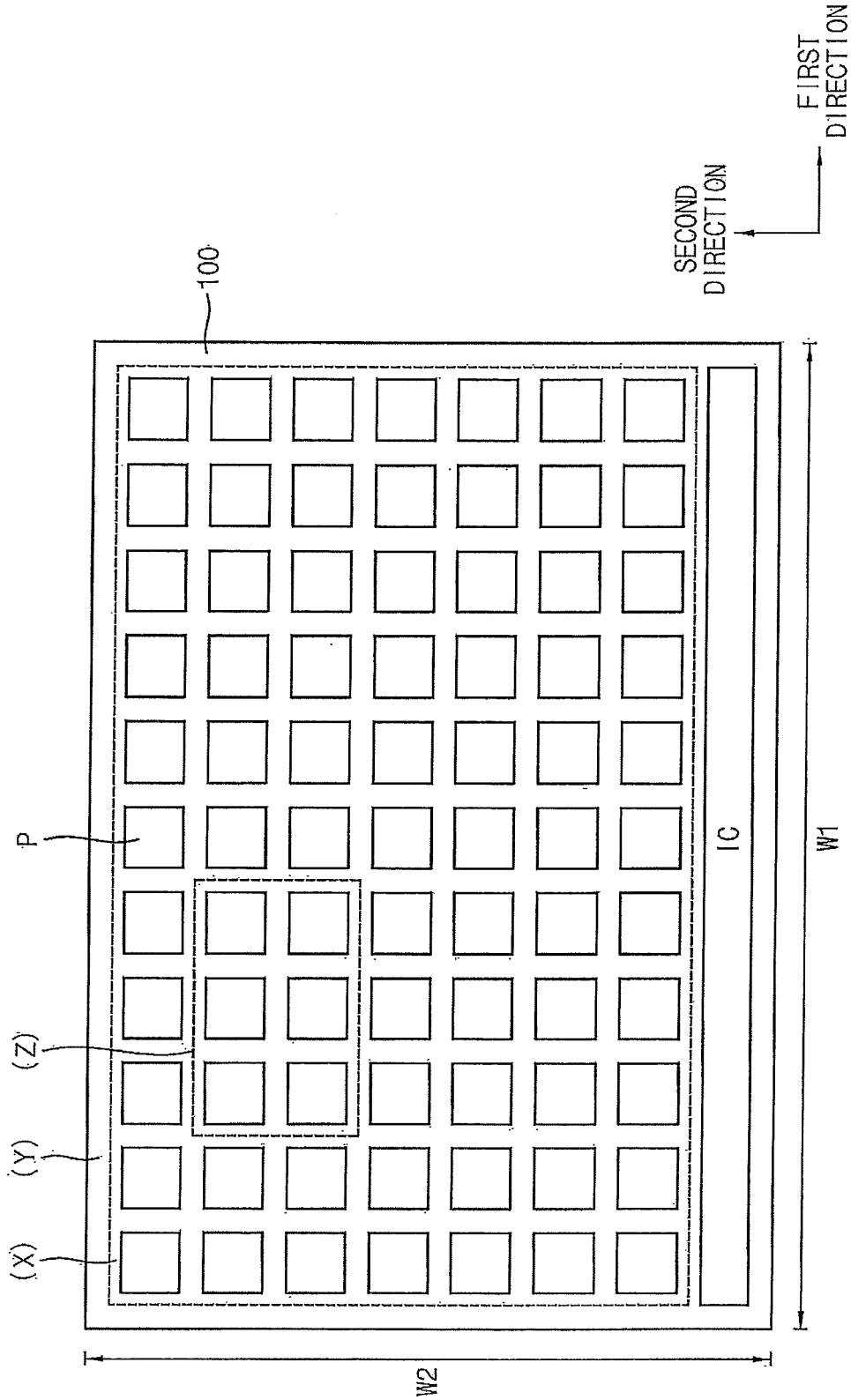


FIG. 2

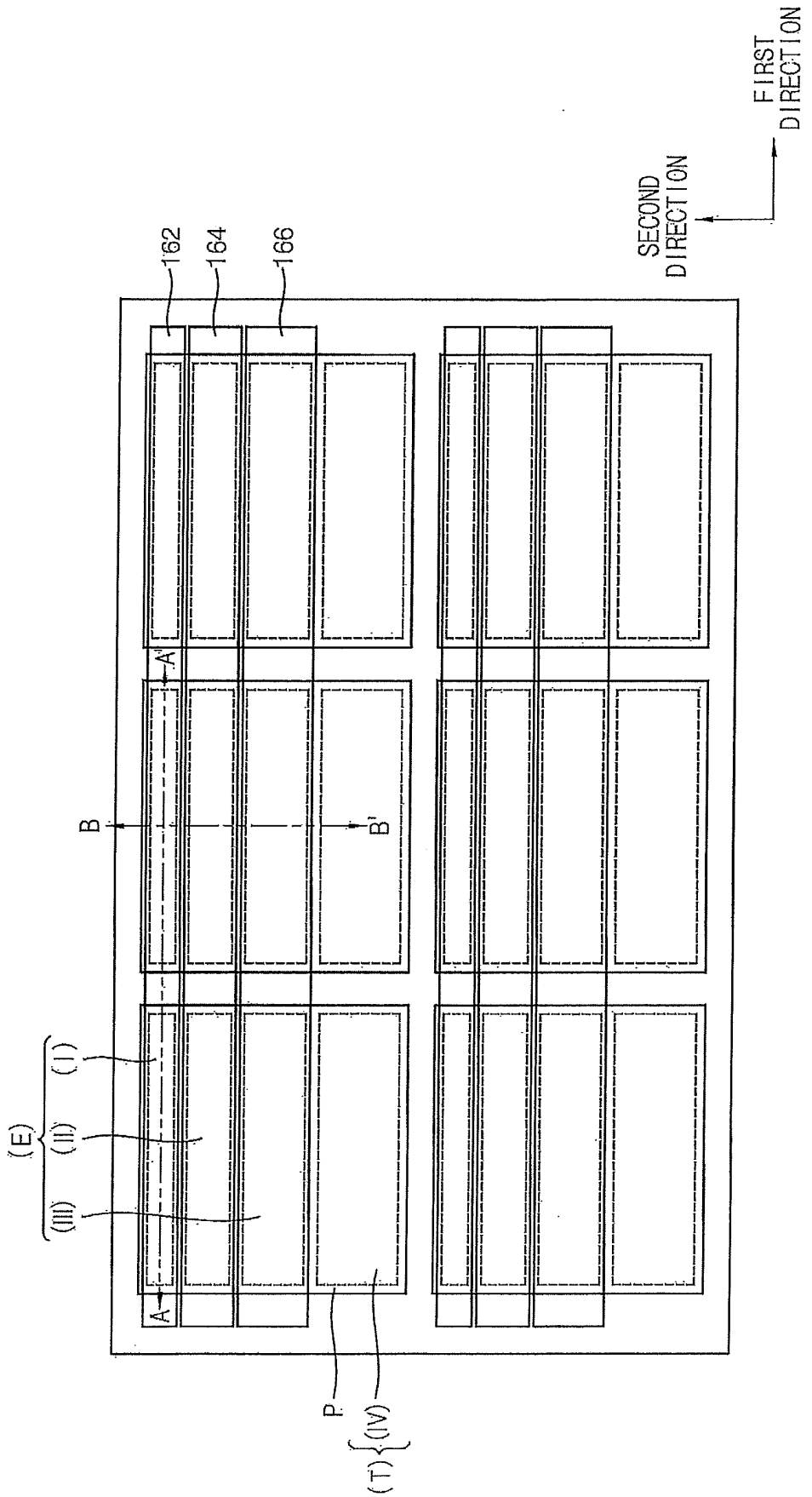

FIRST DIRECTION
SECOND DIRECTION
162
164
166
A
A'
B
B'
(E)
(I)
(II)
(III)
P
(T)
(IV)

FIG. 3

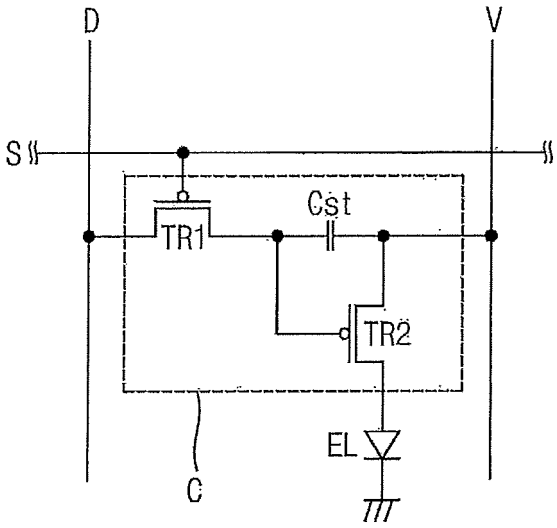


FIG. 4

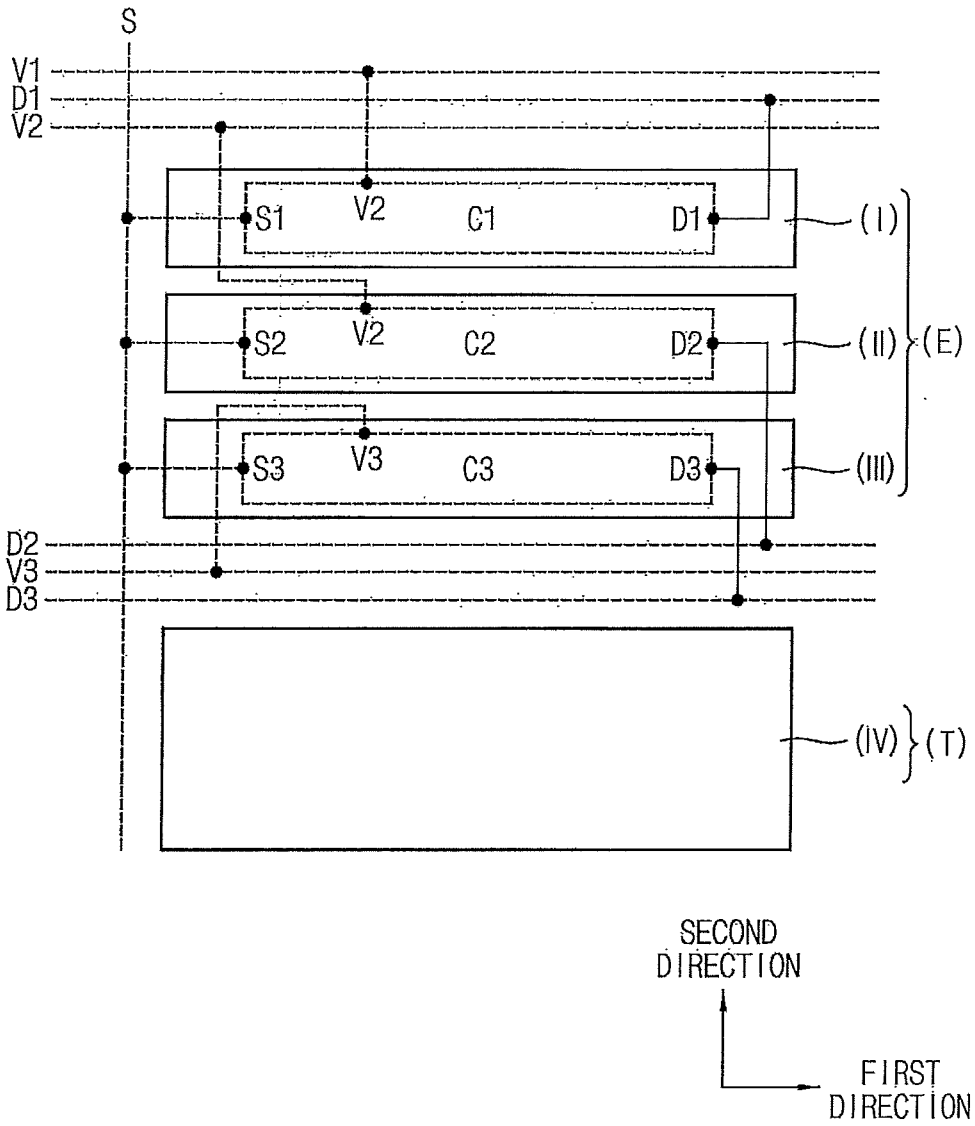

S
V1
D1
V2
S1
V2
C1
D1
(I)
S2
V2
C2
D2
(II)
(E)
S3
V3
C3
D3
(III)
D2
V3
D3
(IV)
(T)
SECOND DIRECTION
FIRST DIRECTION

FIG. 5

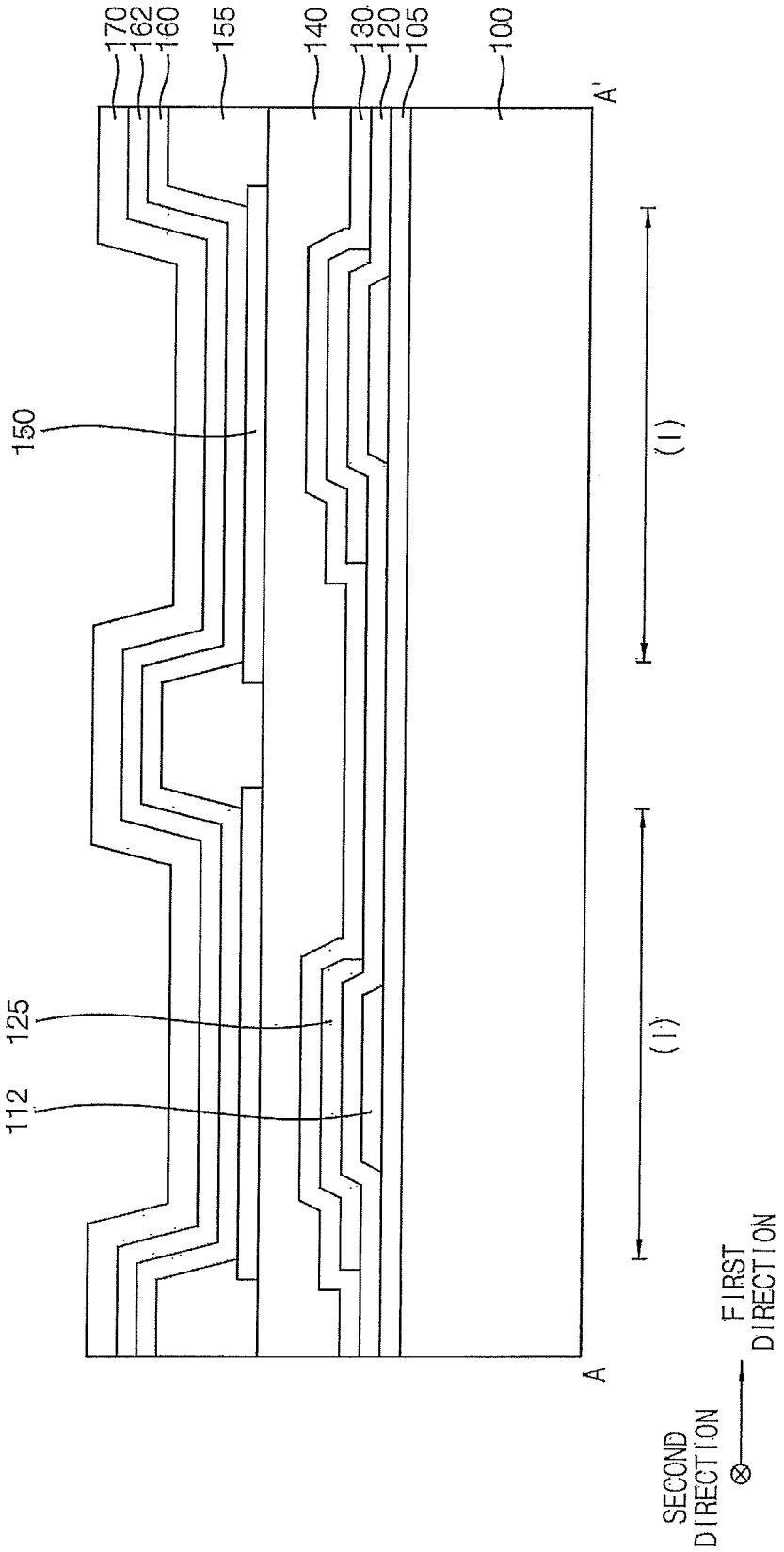

170
162
160
155
140
130
120
105
100
A'
150
125
112
(I)
(I')
A
SECOND DIRECTION
FIRST DIRECTION

FIG. 6

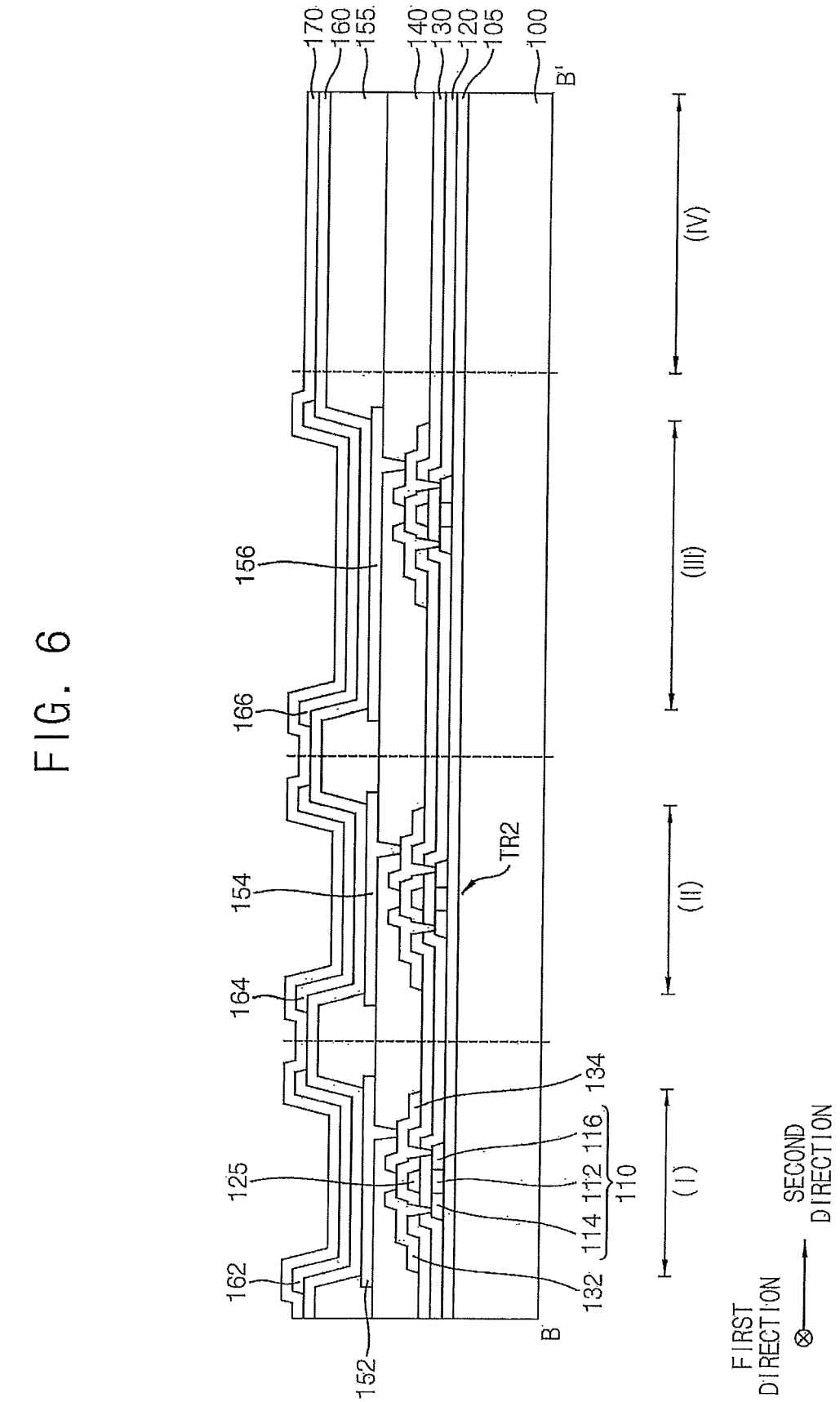

170
160
155
140
130
120
105
100
B'
156
166
154
164
TR2
125
162
152
134
116
112
114
110
132
B
(I)
(II)
(III)
(IV)
FIRST DIRECTION
SECOND DIRECTION

FIG. 7

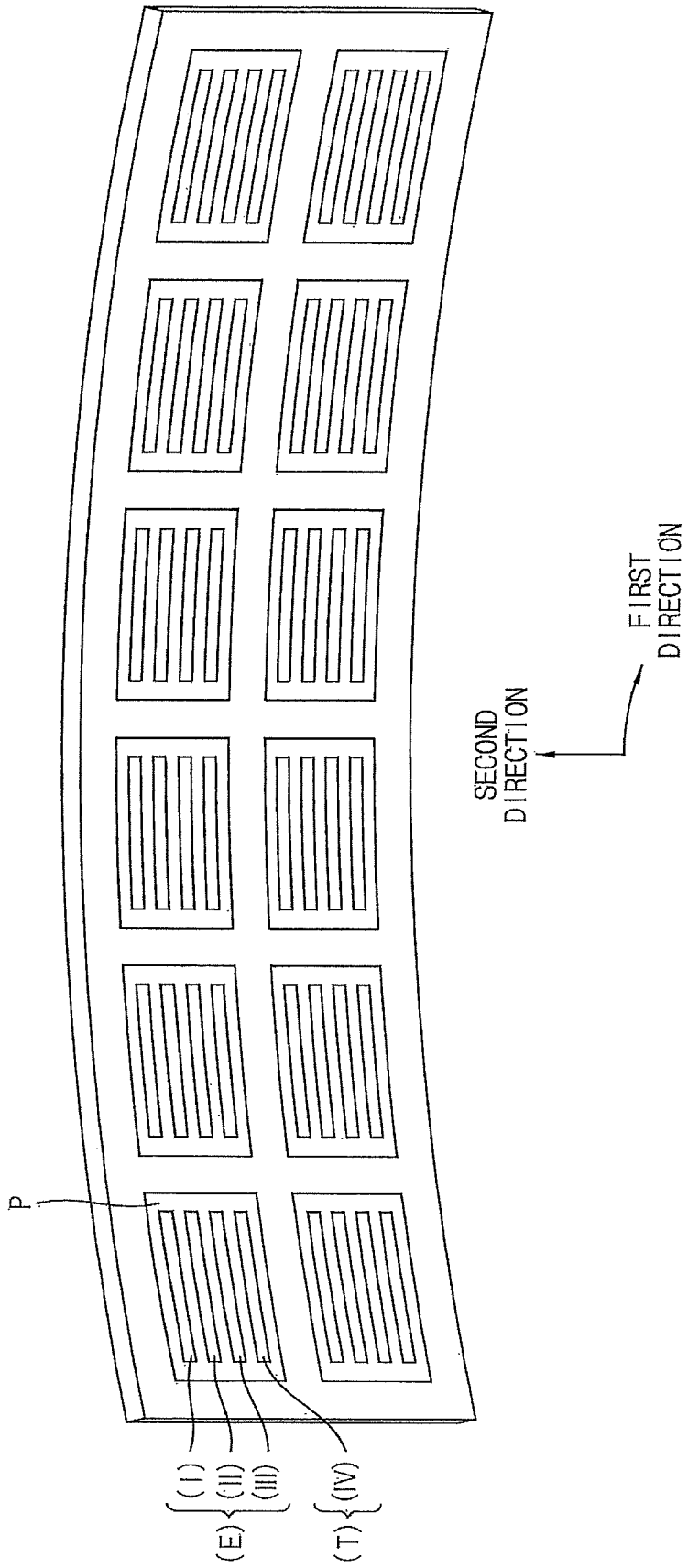


FIG. 8

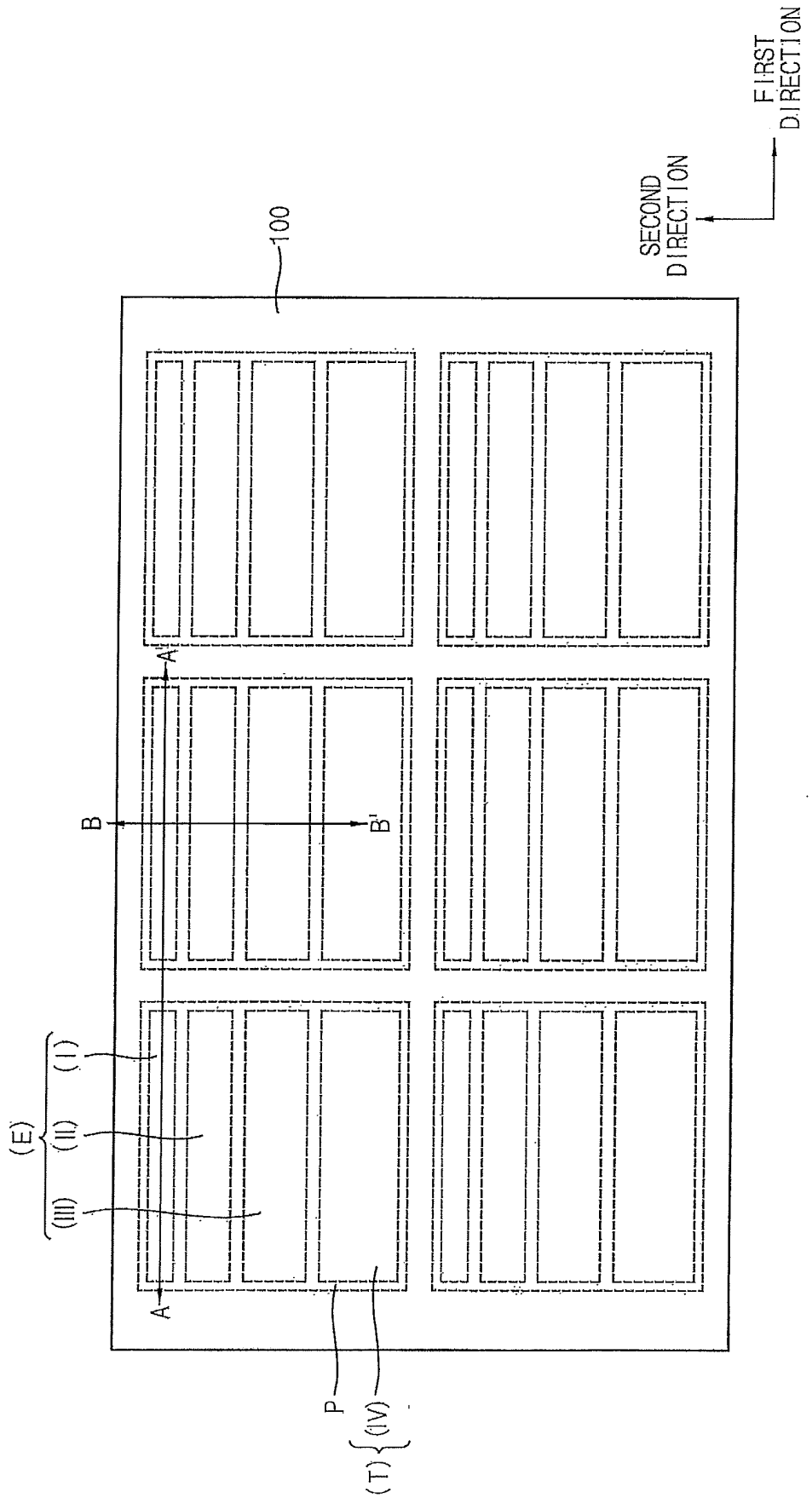


FIG. 9

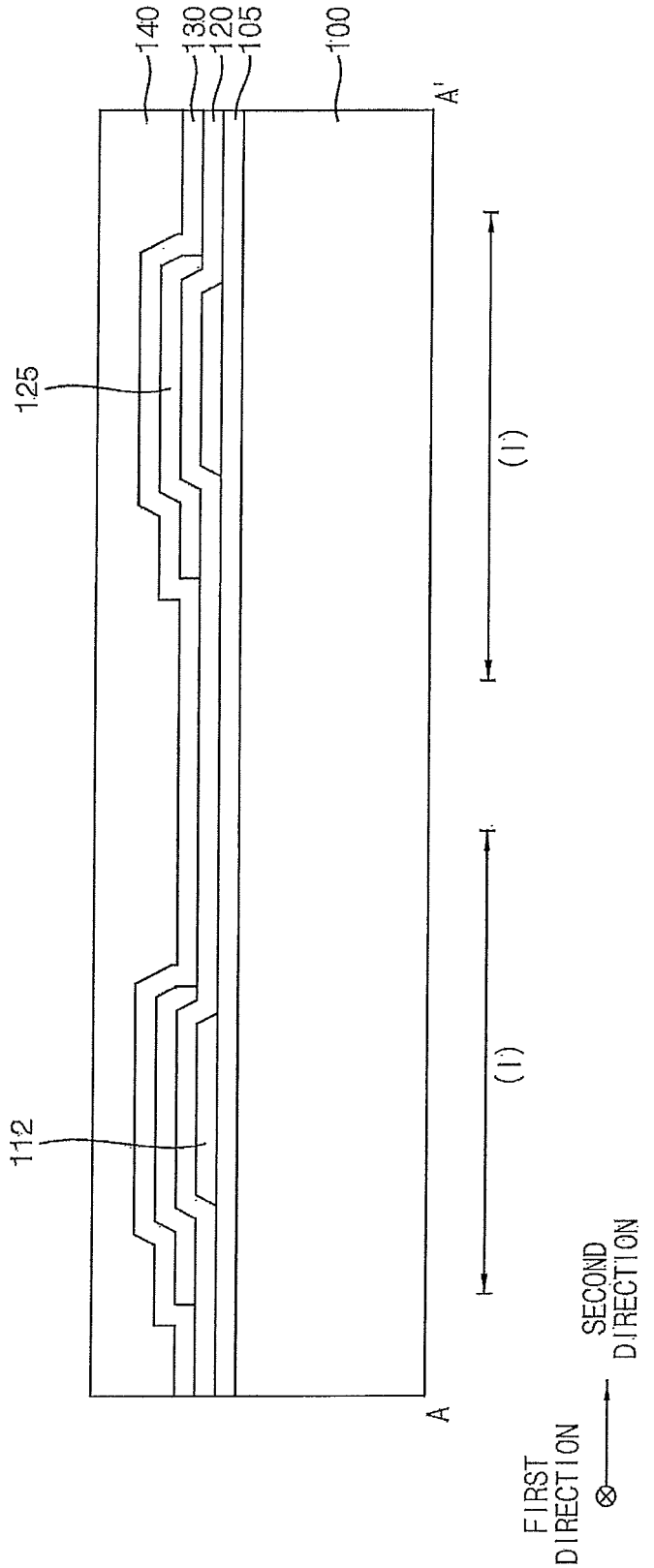

140
130
120
105
100
A'
125
(I')
(I)
112
A
FIRST DIRECTION
SECOND DIRECTION

FIG. 10

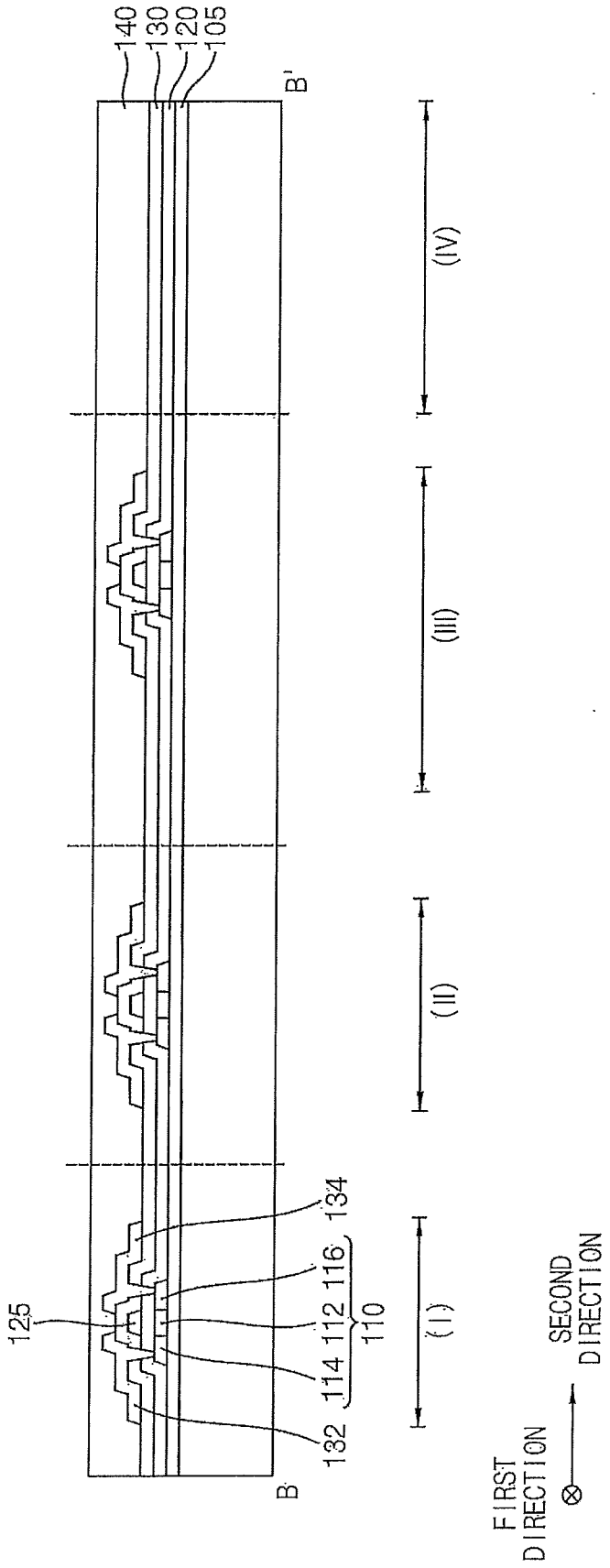

140
130
120
105
B'
B
125
134
116
112
114
110
132
(I)
(II)
(III)
(IV)
FIRST DIRECTION
SECOND DIRECTION

FIG. 11

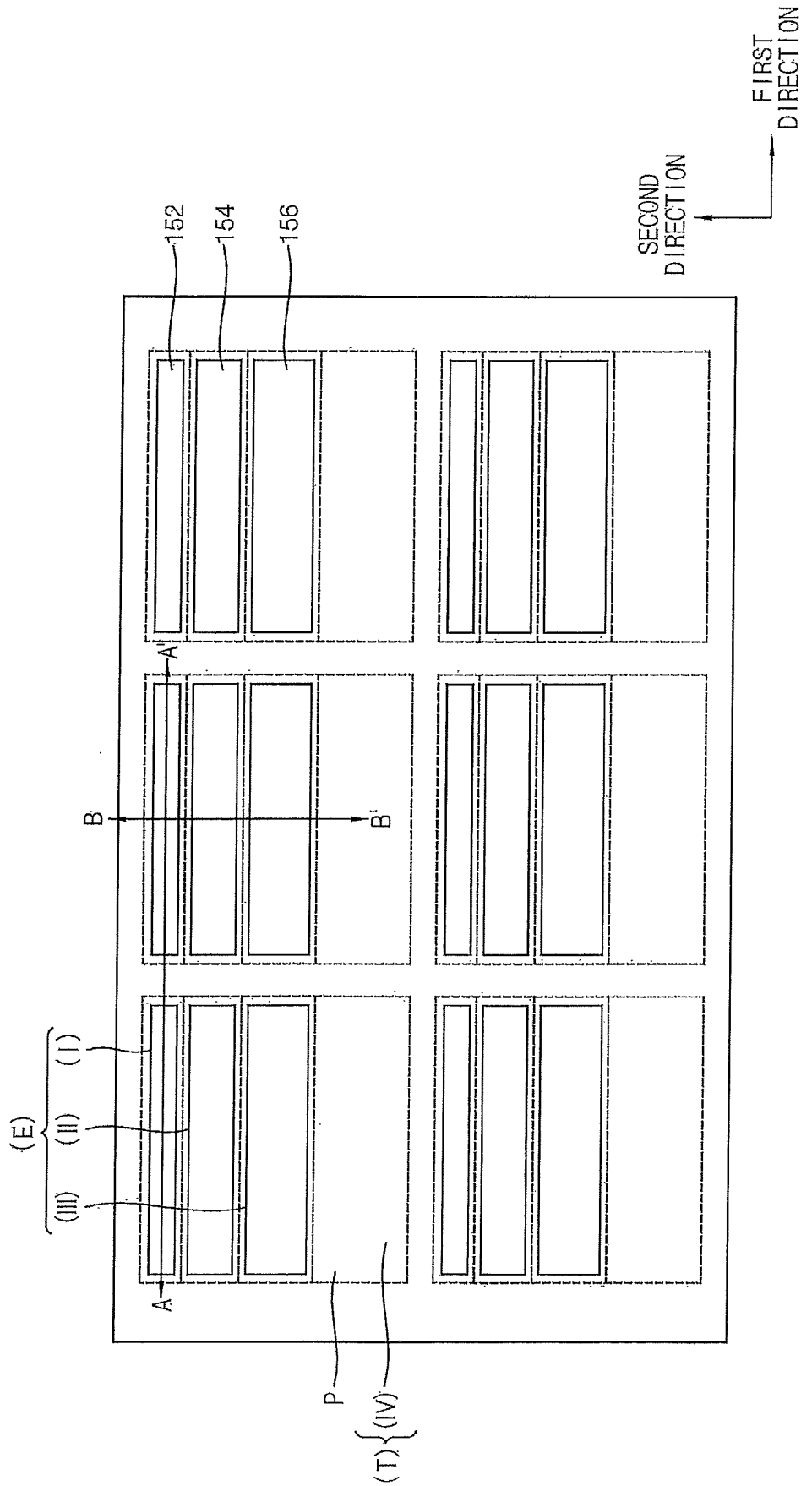

FIRST DIRECTION
SECOND DIRECTION
152
154
156
A
A'
B
B'
(E)
(I)
(II)
(III)
P
(T)
(IV)

FIG. 12

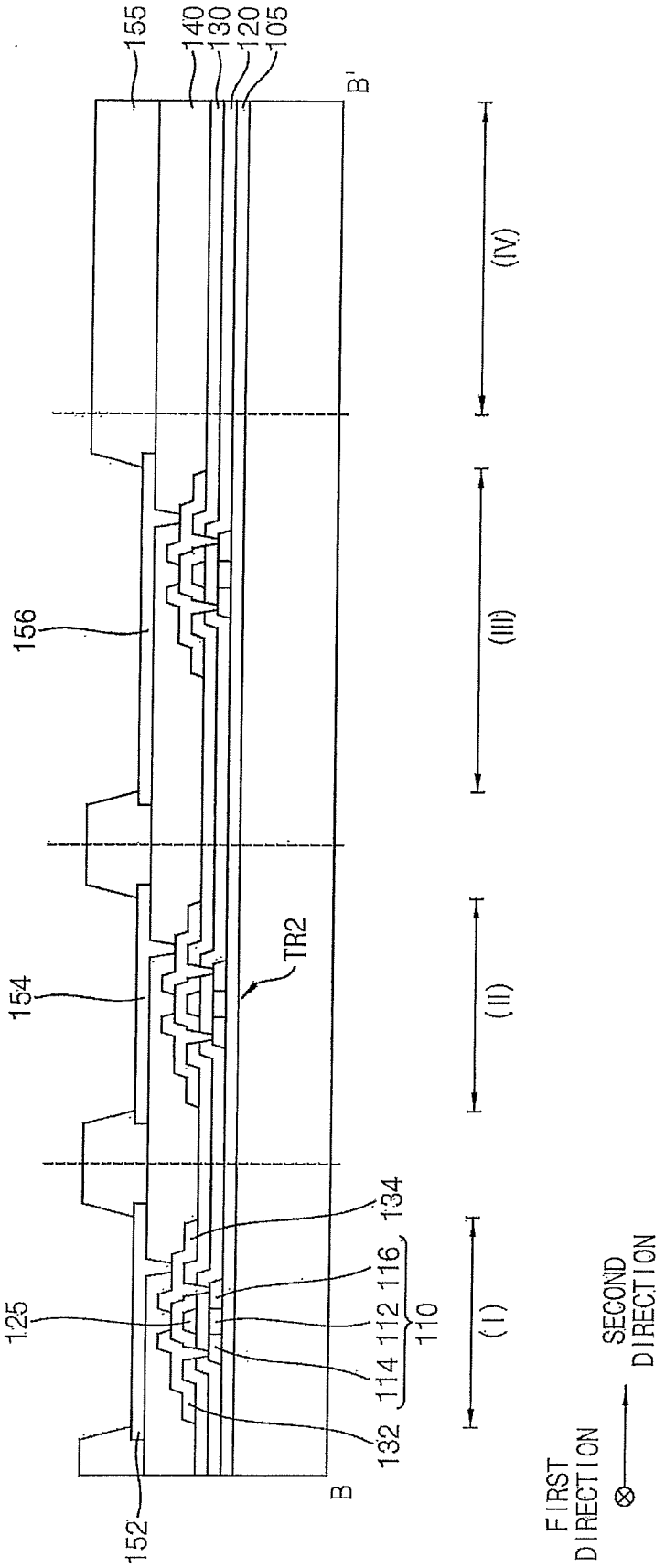

155
140
130
120
105
B'
156
154
TR2
125
134
116
112
114
110
132
152
B
(I)
(II)
(III)
(IV)
FIRST DIRECTION
SECOND DIRECTION

FIG. 13

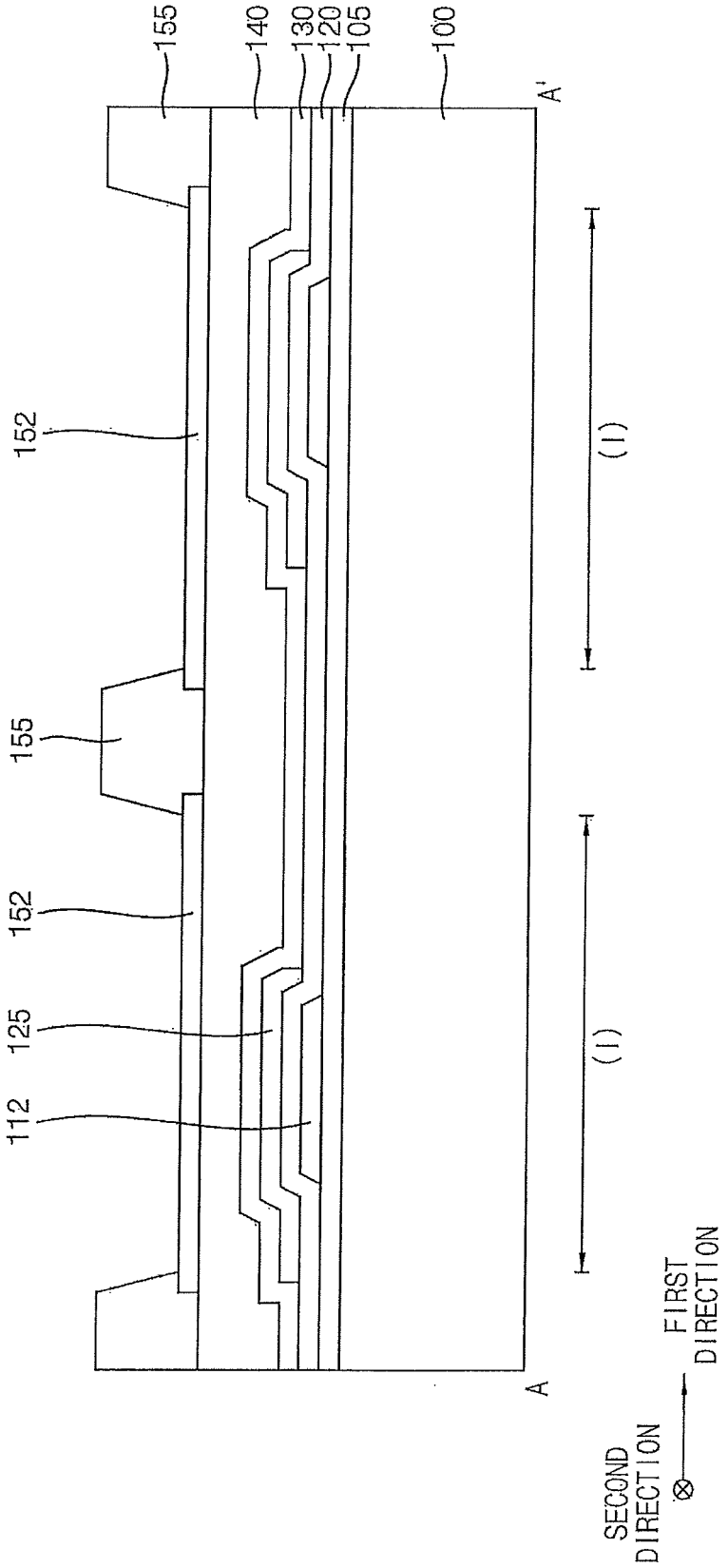

155
140
130
120
105
100
A'
152
155
152
125
112
(I)
(I)
A
SECOND DIRECTION
FIRST DIRECTION

FIG. 14

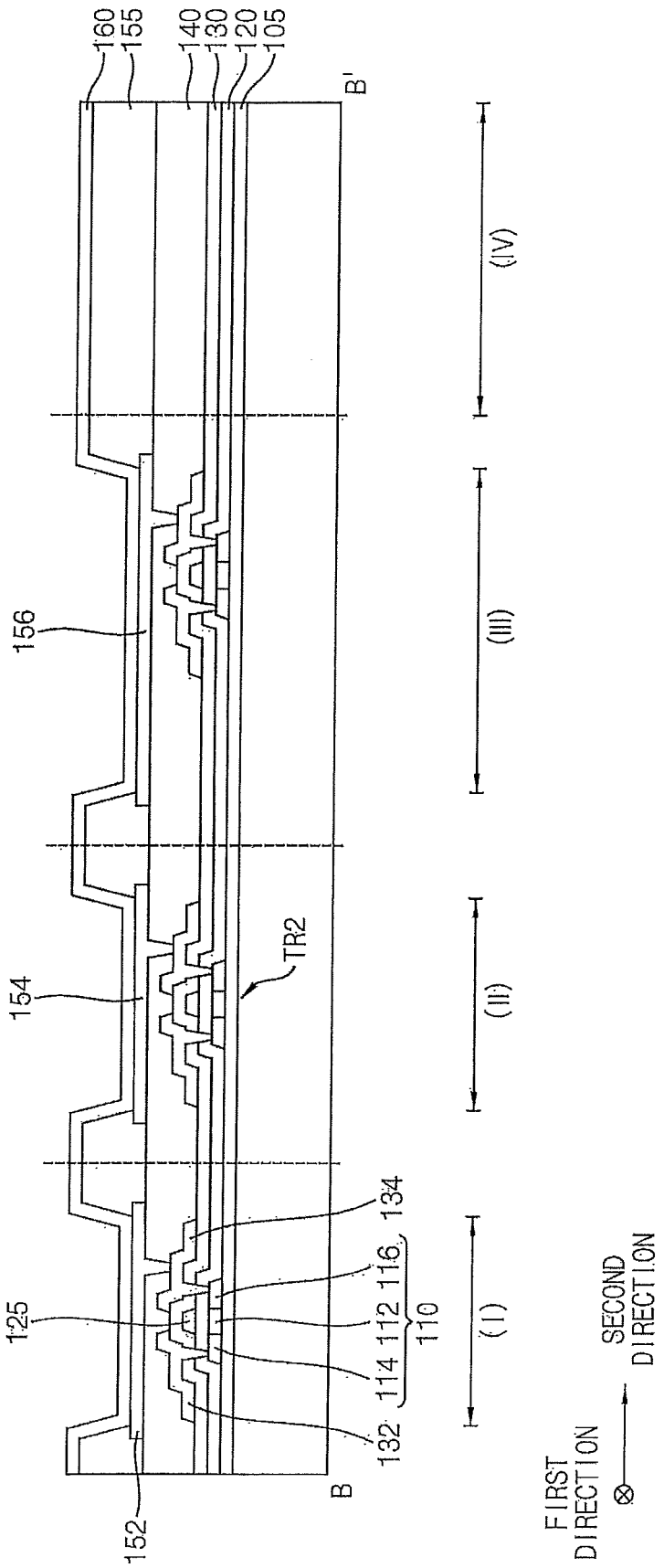

160
155
140
130
120
105
B'
156
154
TR2
125
134
116
112
114
110
132
152
B
(I)
(II)
(III)
(IV)
FIRST DIRECTION
SECOND DIRECTION

FIG. 15

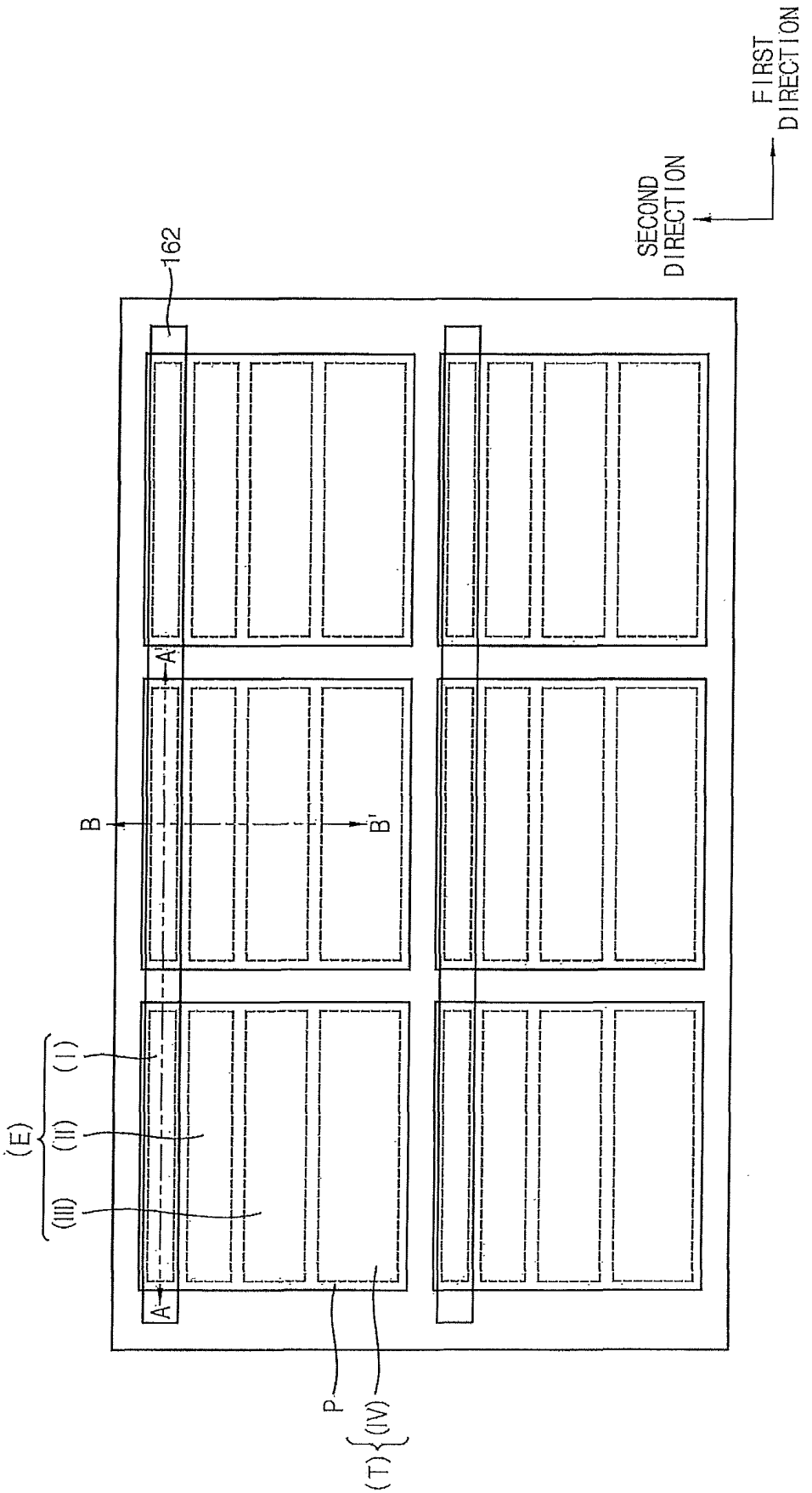


FIG. 16

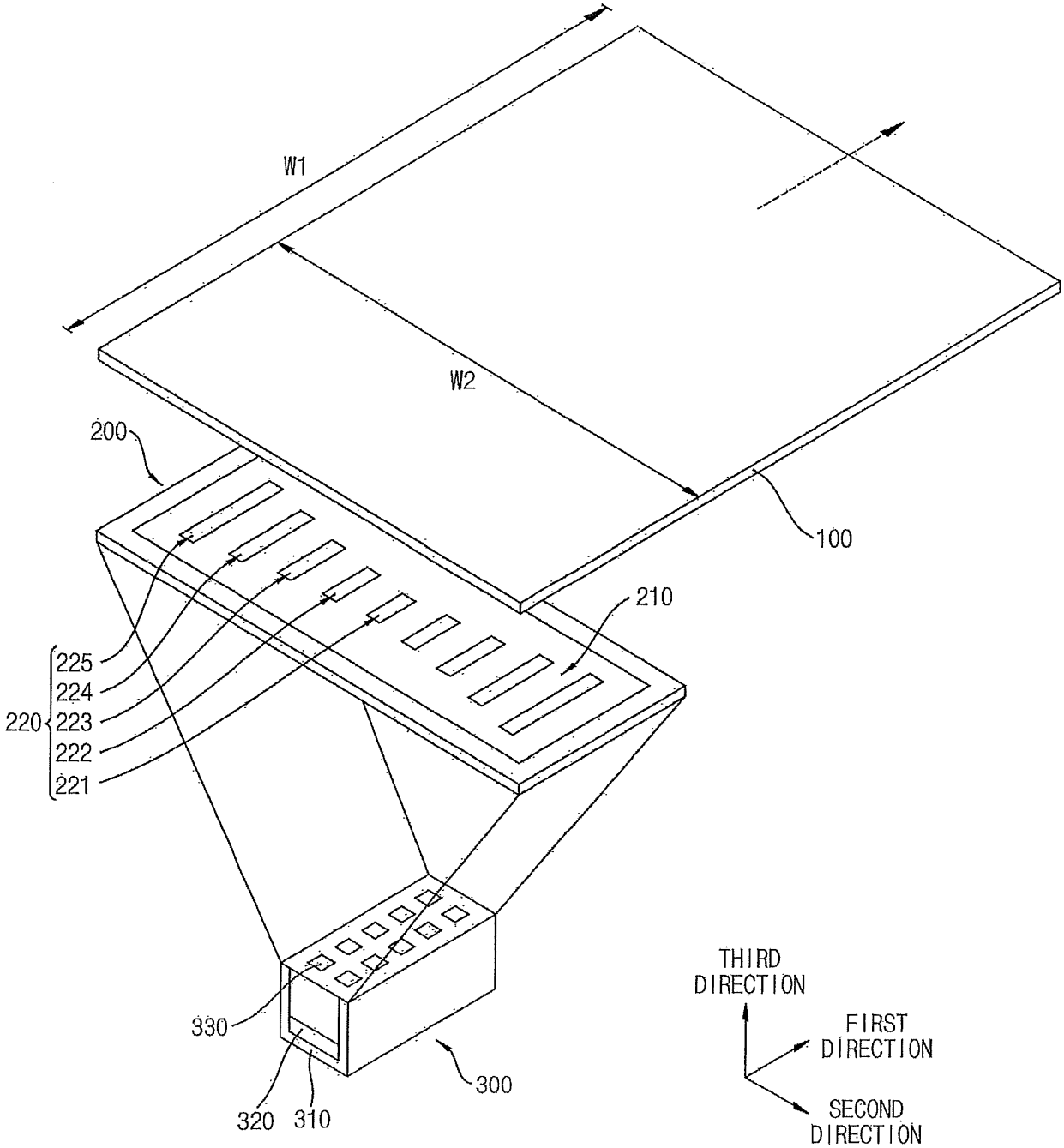

W1
W2
200
100
210
220
225
224
223
222
221
330
320
310
300
THIRD DIRECTION
FIRST DIRECTION
SECOND DIRECTION

FIG. 17

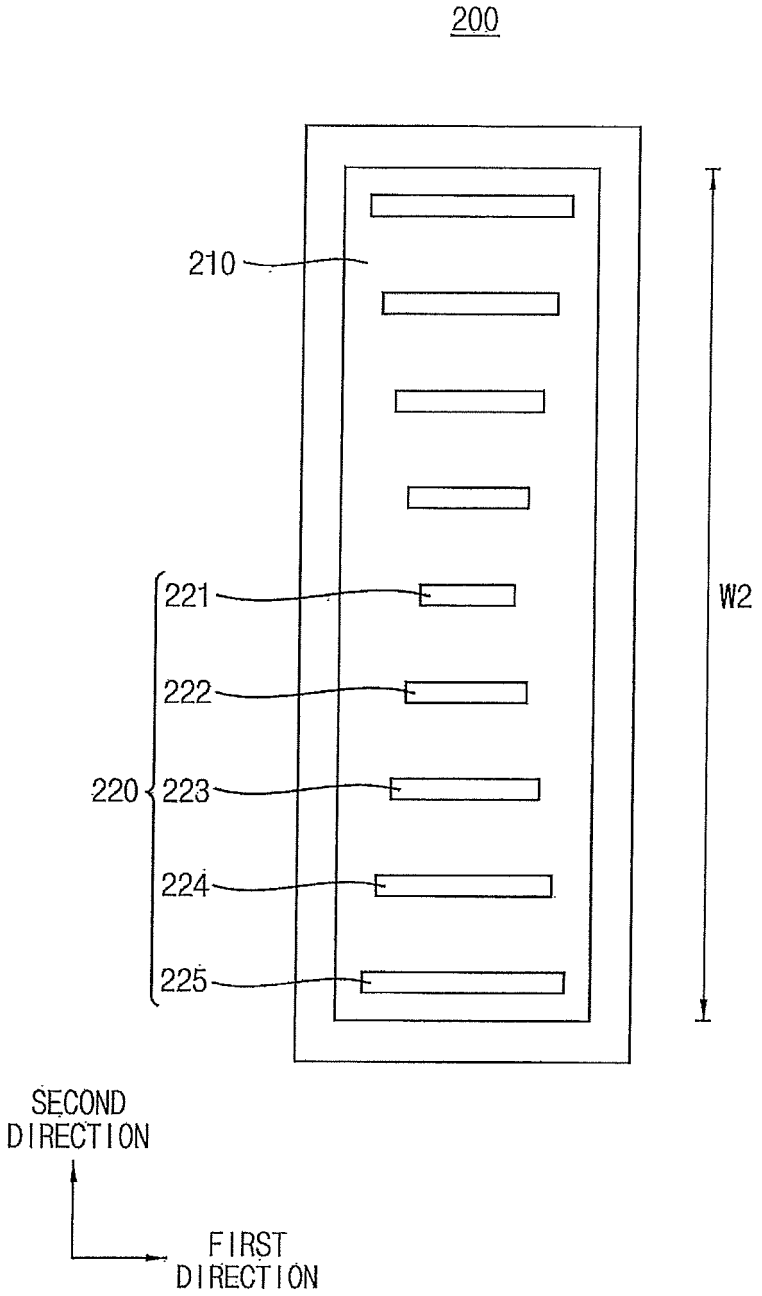

200
210
221
222
220
223
224
225
W2
SECOND DIRECTION
FIRST DIRECTION

FIG. 18

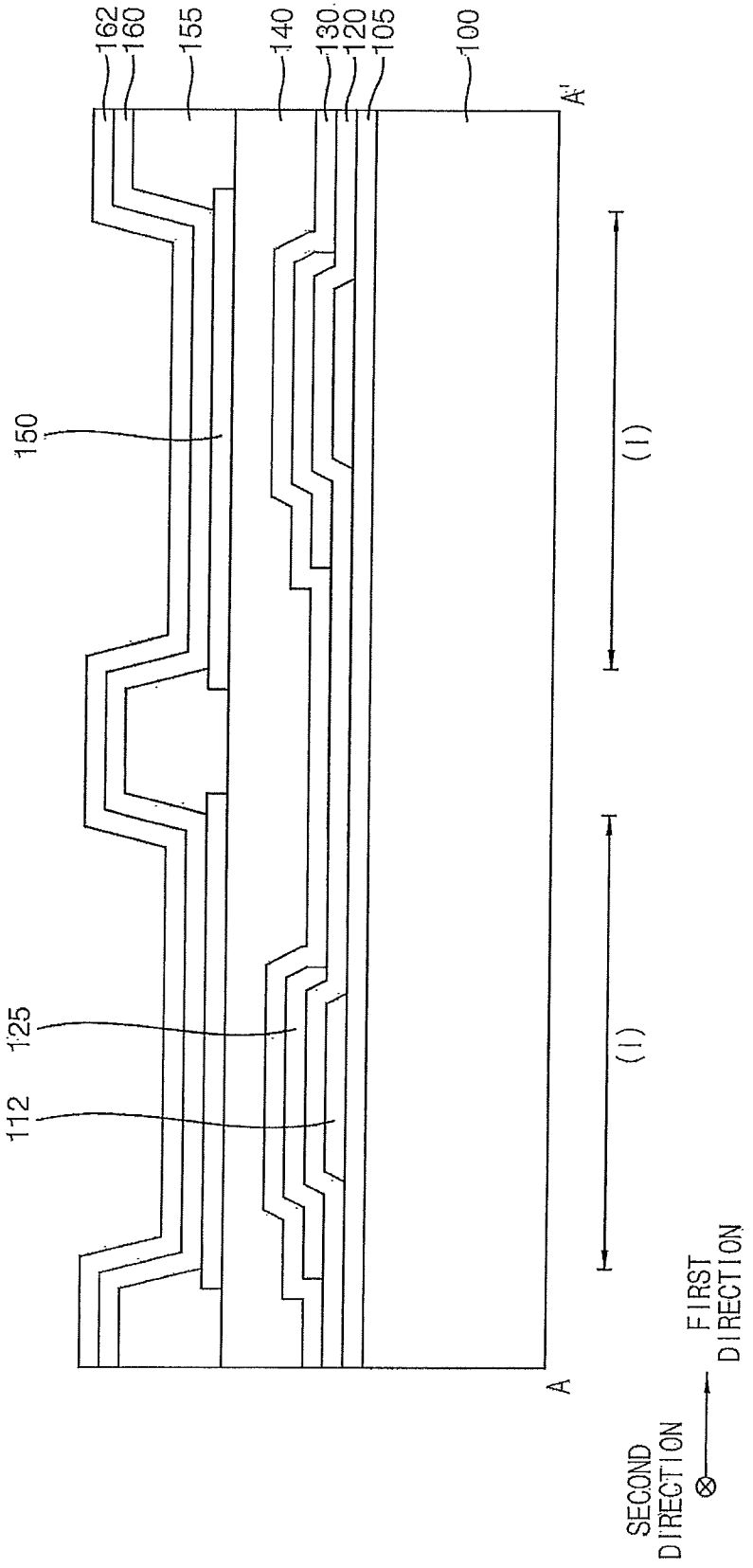

162
160
155
140
130
120
105
100
A'
150
125
112
(I)
(I)
A
SECOND DIRECTION
FIRST DIRECTION

FIG. 19

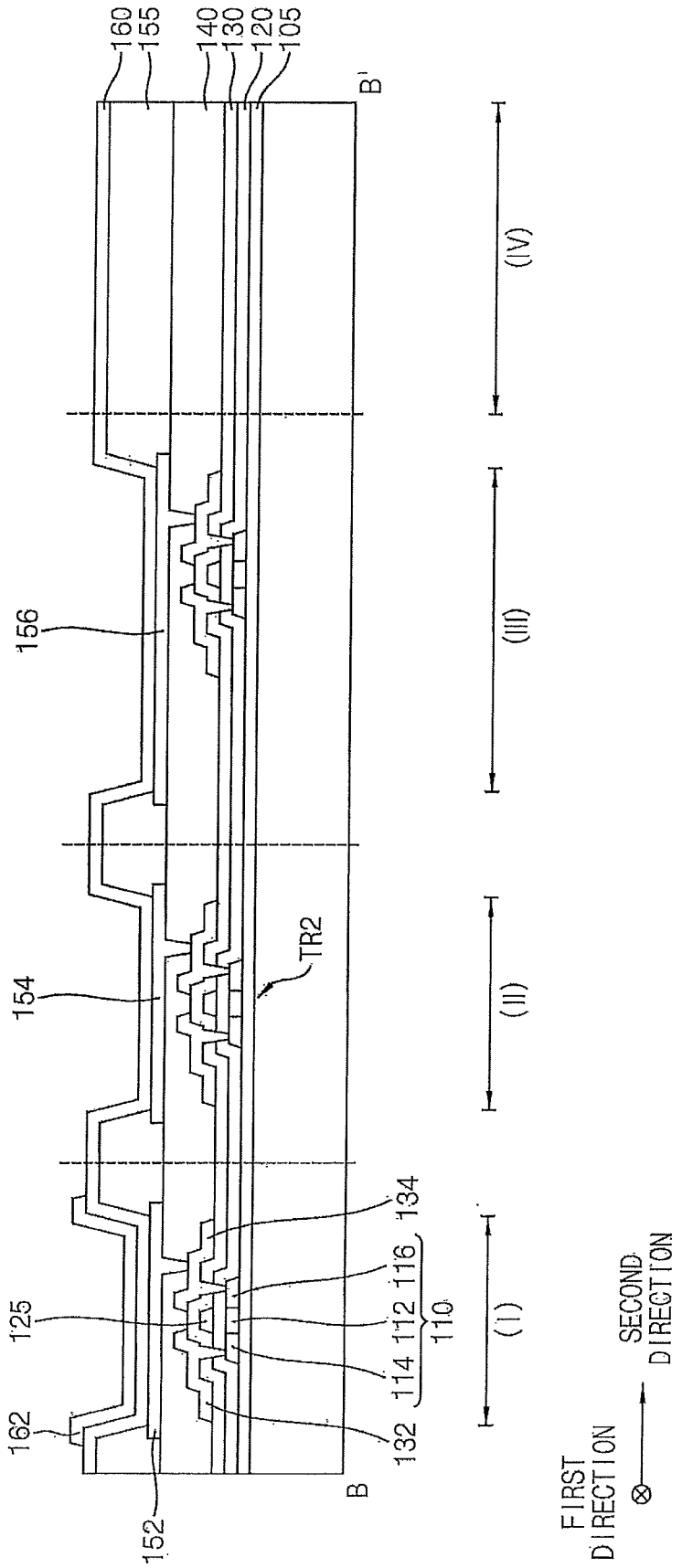

160
155
140
130
120
105
B'
156
154
TR2
125
162
152
B
134
116
112
114
110
132
(I)
(II)
(III)
(IV)
FIRST DIRECTION
SECOND DIRECTION

FIG. 20

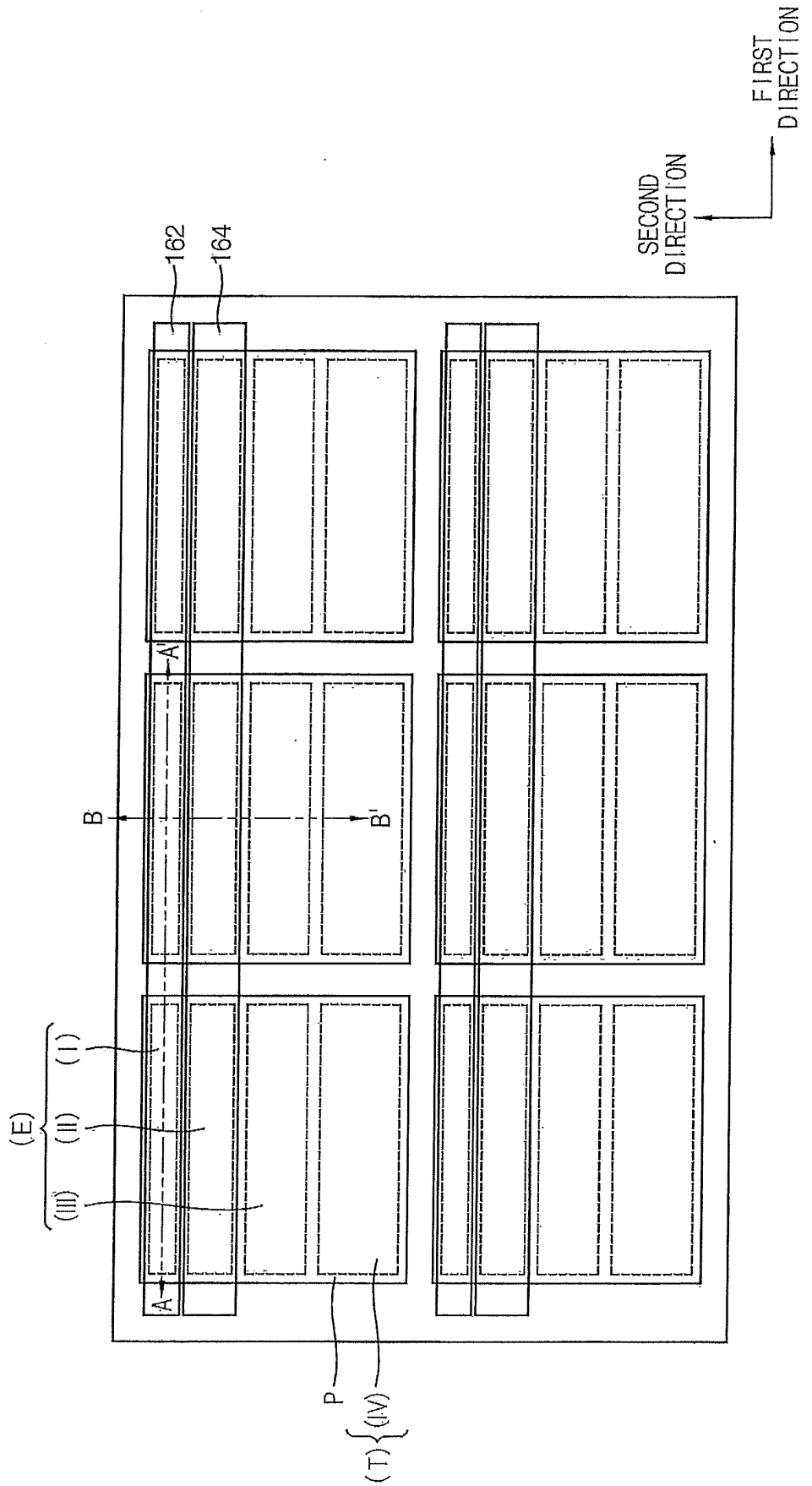

FIRST DIRECTION
SECOND DIRECTION
162
164
A
A'
B
B'
(E)
(I)
(II)
(III)
P
(T)
(IV)

FIG. 21

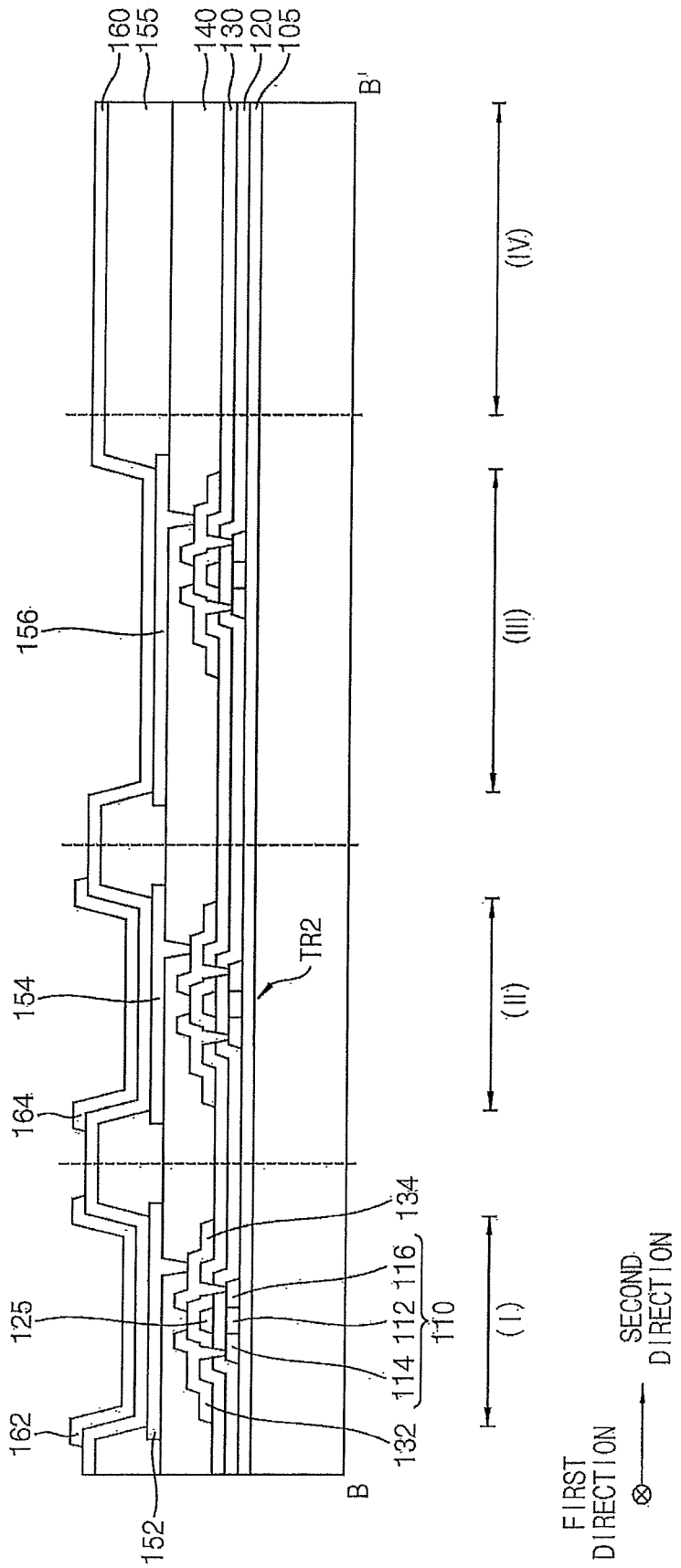

160
155
140
130
120
105
B'
156
154
164
125
162
152
TR2
134
116
112
114
110
132
B
(I)
(II)
(III)
(IV)
FIRST DIRECTION
SECOND DIRECTION

FIG. 22

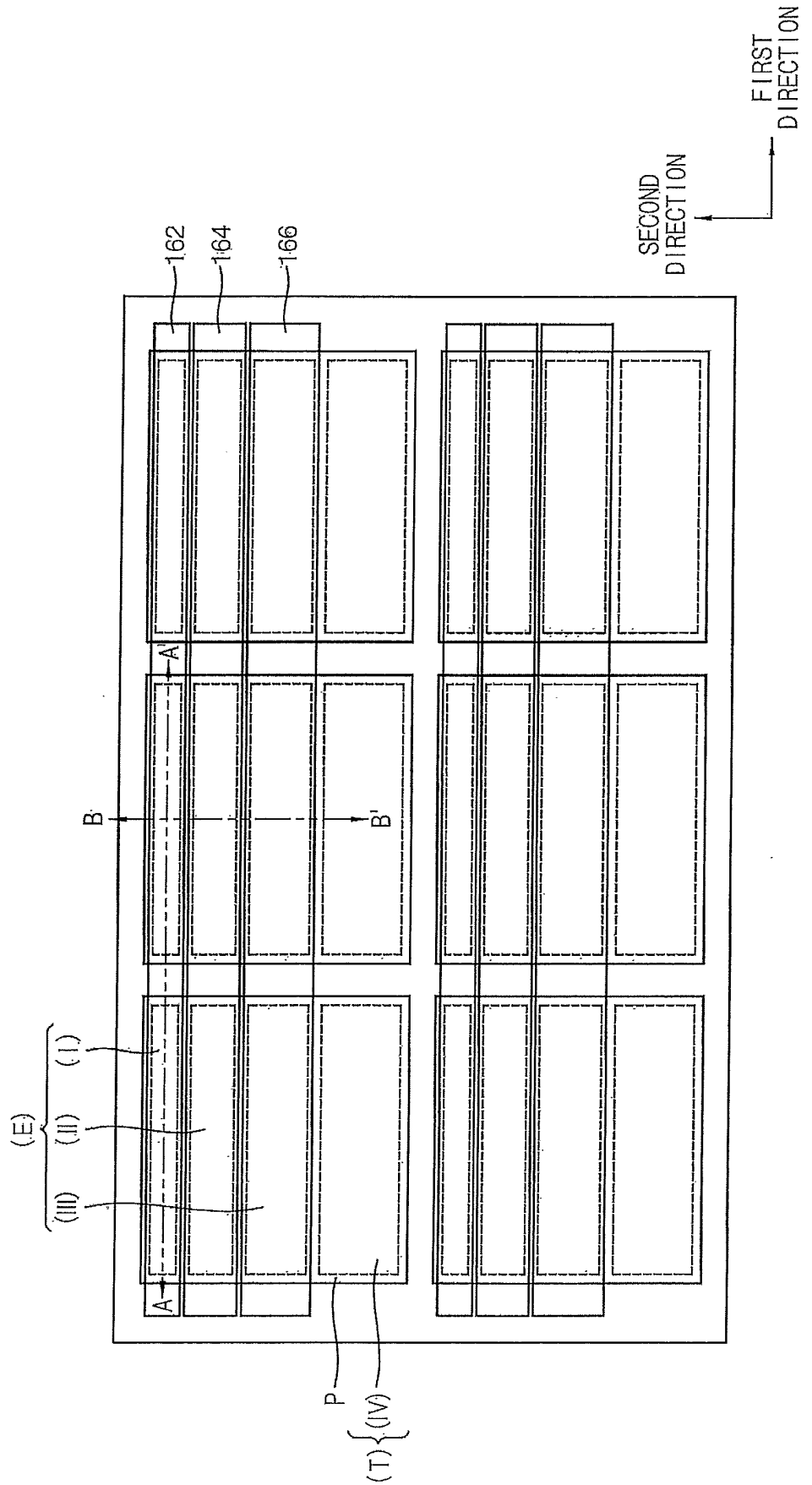

FIRST DIRECTION
SECOND DIRECTION
162
164
166
A
A'
B
B'
(E)
(I)
(II)
(III)
P
(T)
(IV)

FIG. 23

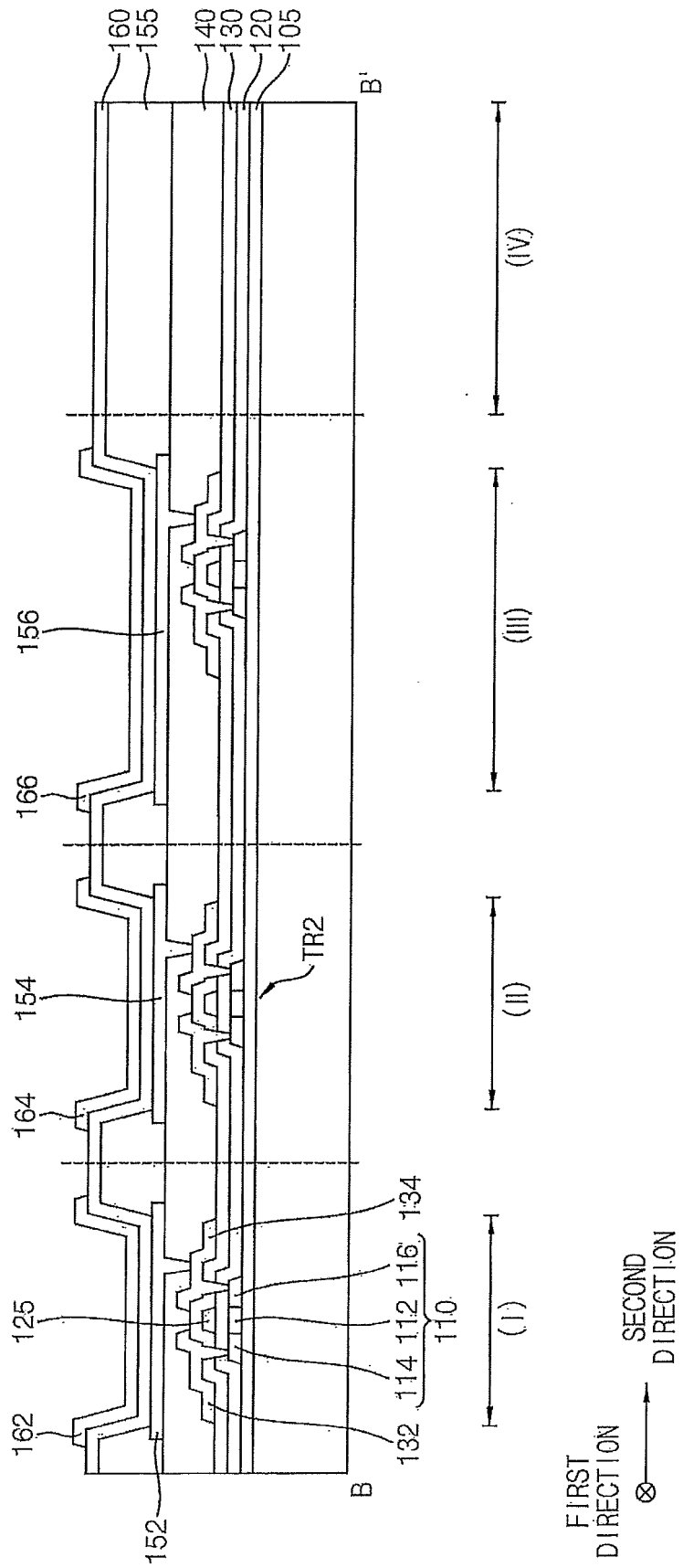

160
155
140
130
120
105
B'
156
166
154
164
125
162
152
TR2
134
116'
112
110
114
132
B
(IV)
(III)
(II)
(I)
FIRST DIRECTION
SECOND DIRECTION

FIG. 24

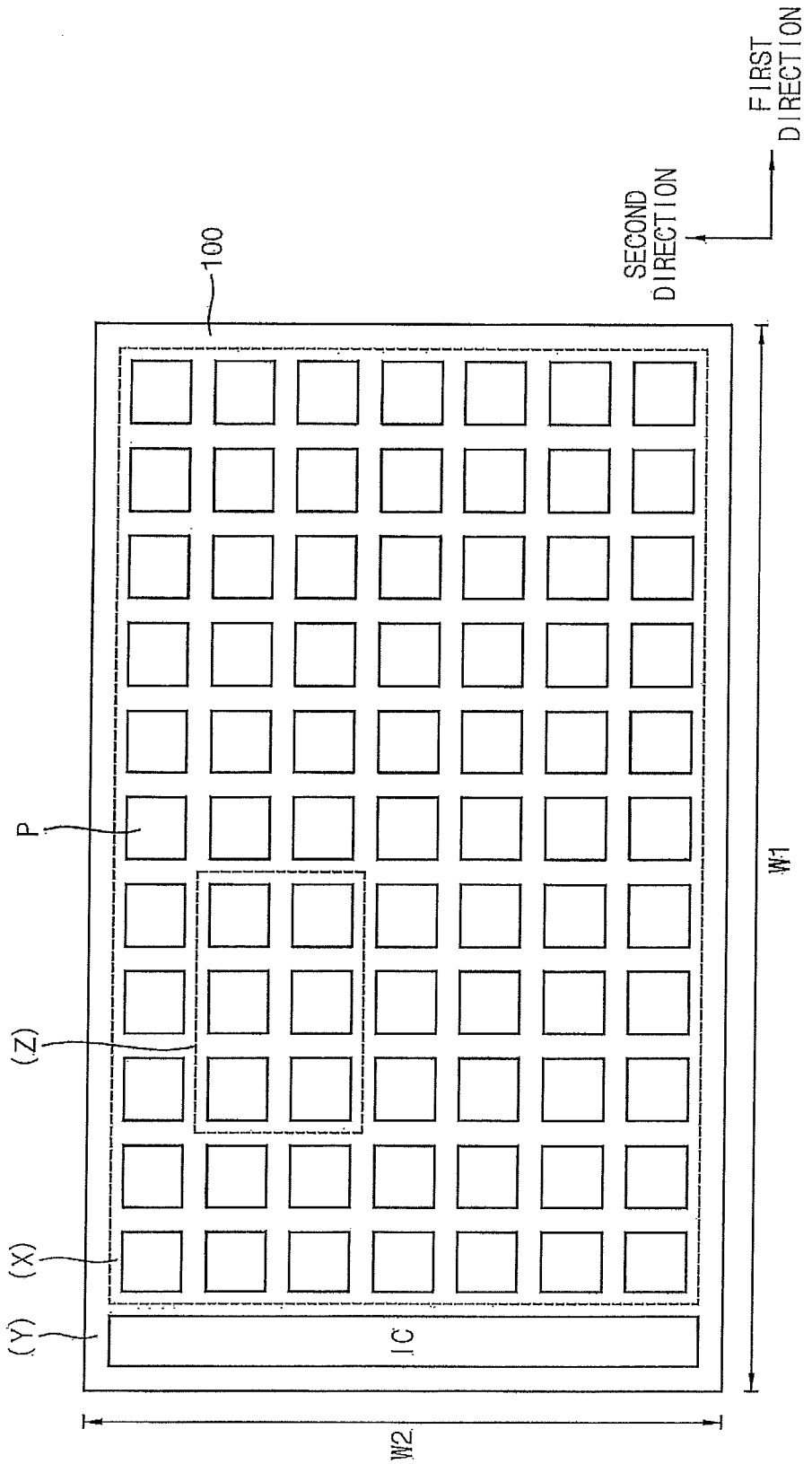


FIG. 25

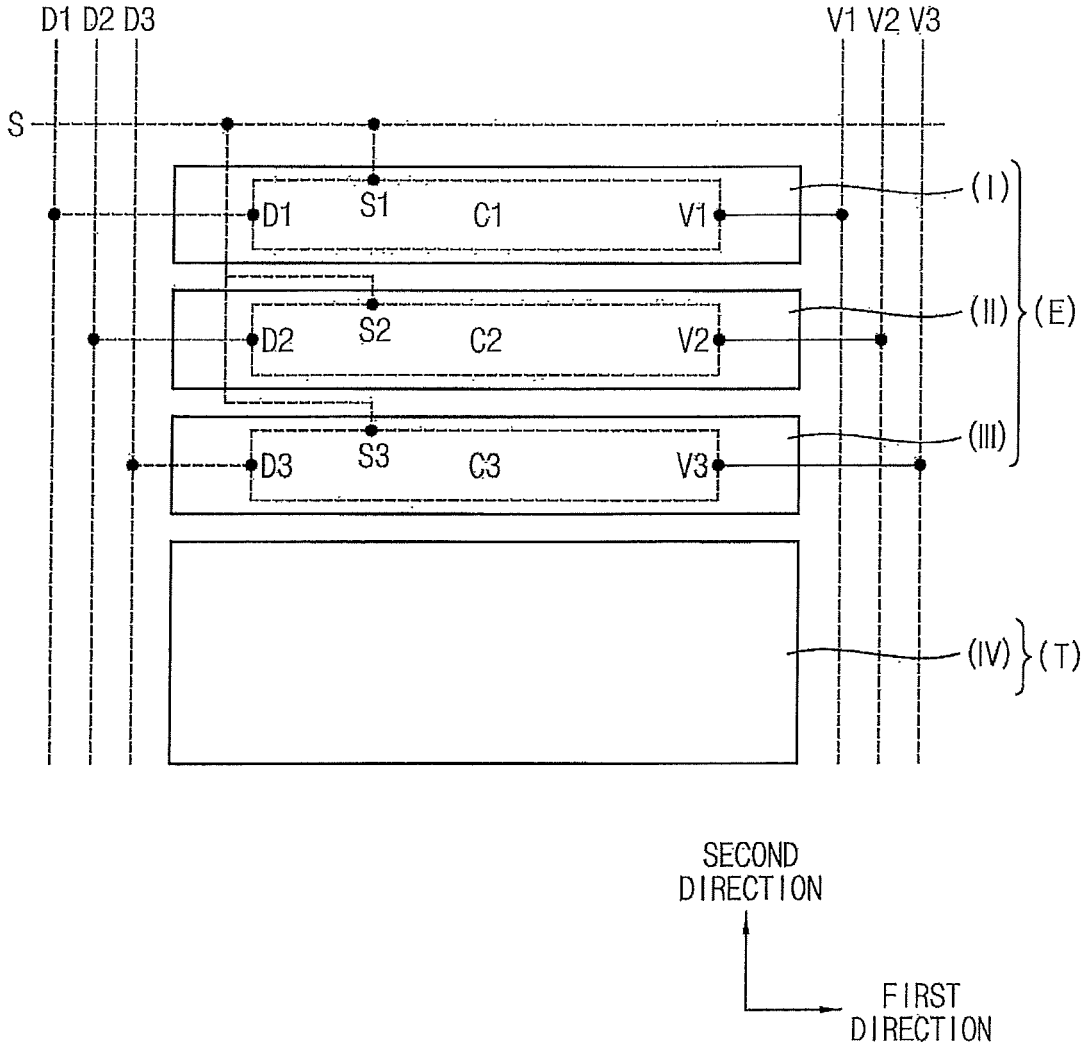

D1 D2 D3
V1 V2 V3
S
D1
S1
C1
V1
(I)
D2
S2
C2
V2
(II)
(E)
D3
S3
C3
V3
(III)
(IV)
(T)
SECOND DIRECTION
FIRST DIRECTION

FIG. 26

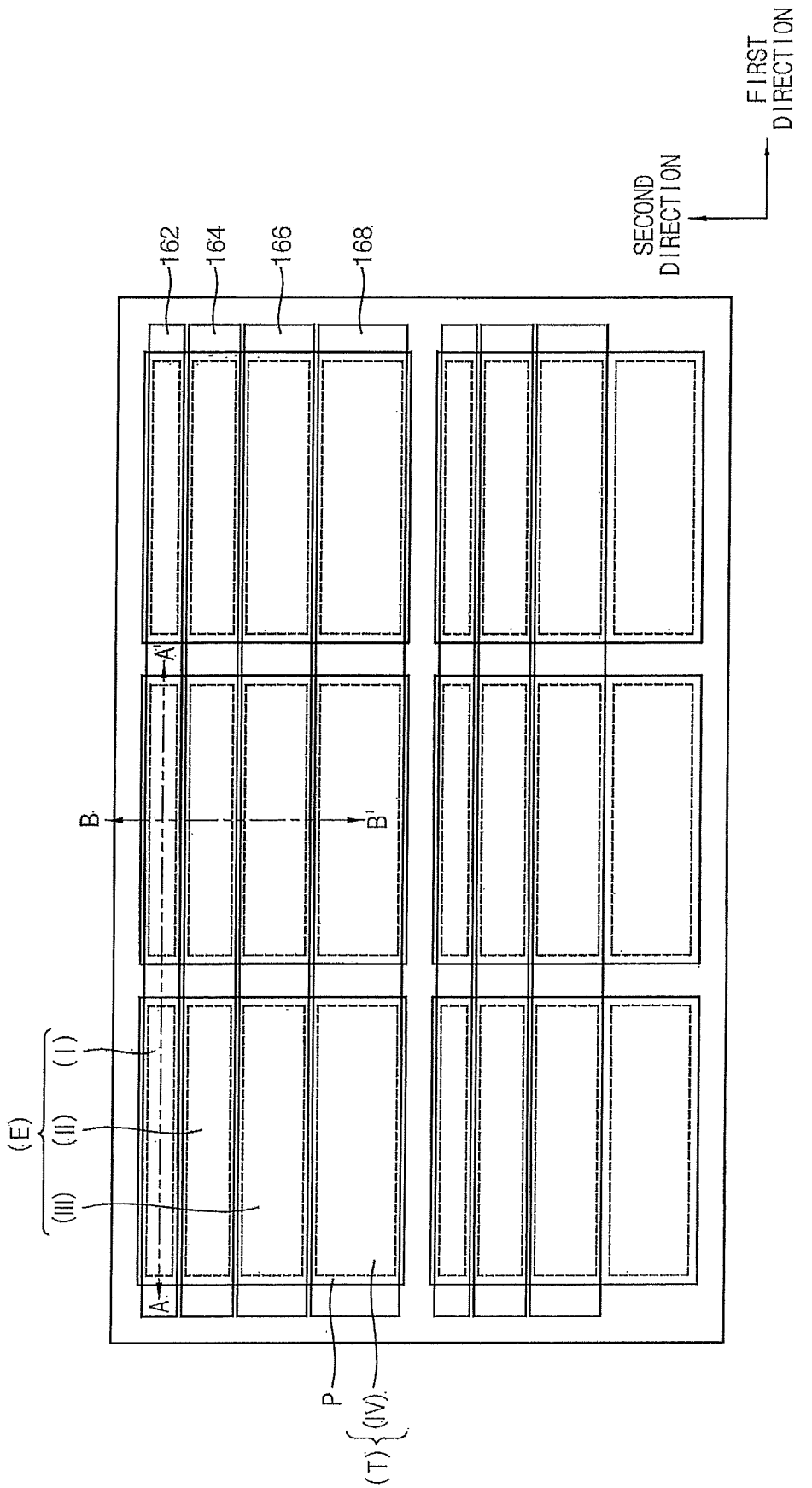

FIRST DIRECTION
SECOND DIRECTION
162
164
166
168
A
A'
B
B'
(E)
(I)
(II)
(III)
P
(T)
(IV)

FIG. 27

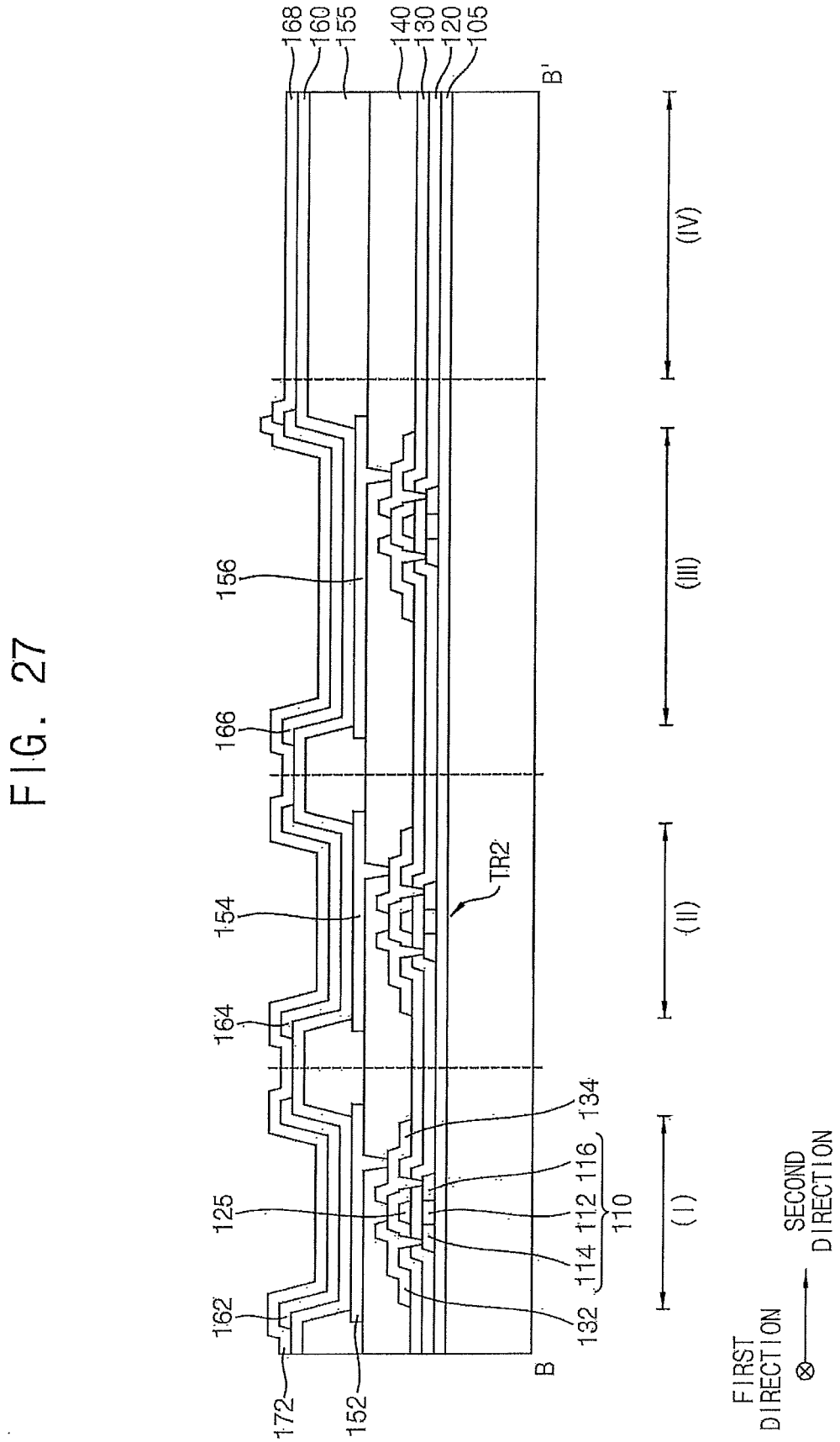

168
160
155
140
130
120
105
B'
156
166
154
164
125
162
172
152
TR2
134
116
112
114
110
132
B
(IV)
(III)
(II)
(I)
FIRST DIRECTION
SECOND DIRECTION

FIG. 28

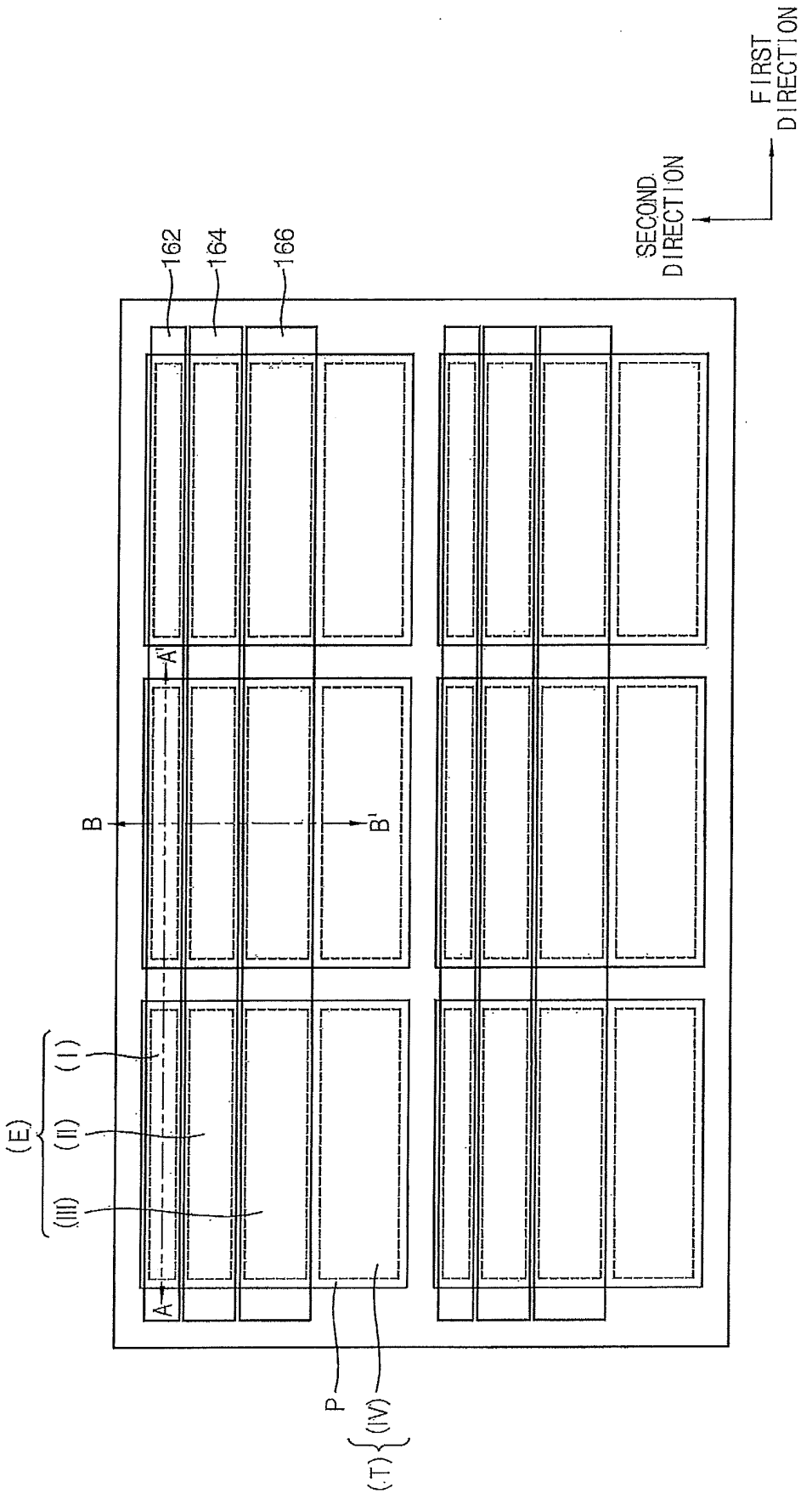

FIRST DIRECTION
SECOND DIRECTION
162
164
166
A
A'
B
B'
(E)
(I)
(II)
(III)
P
(T)
(IV)

FIG. 29

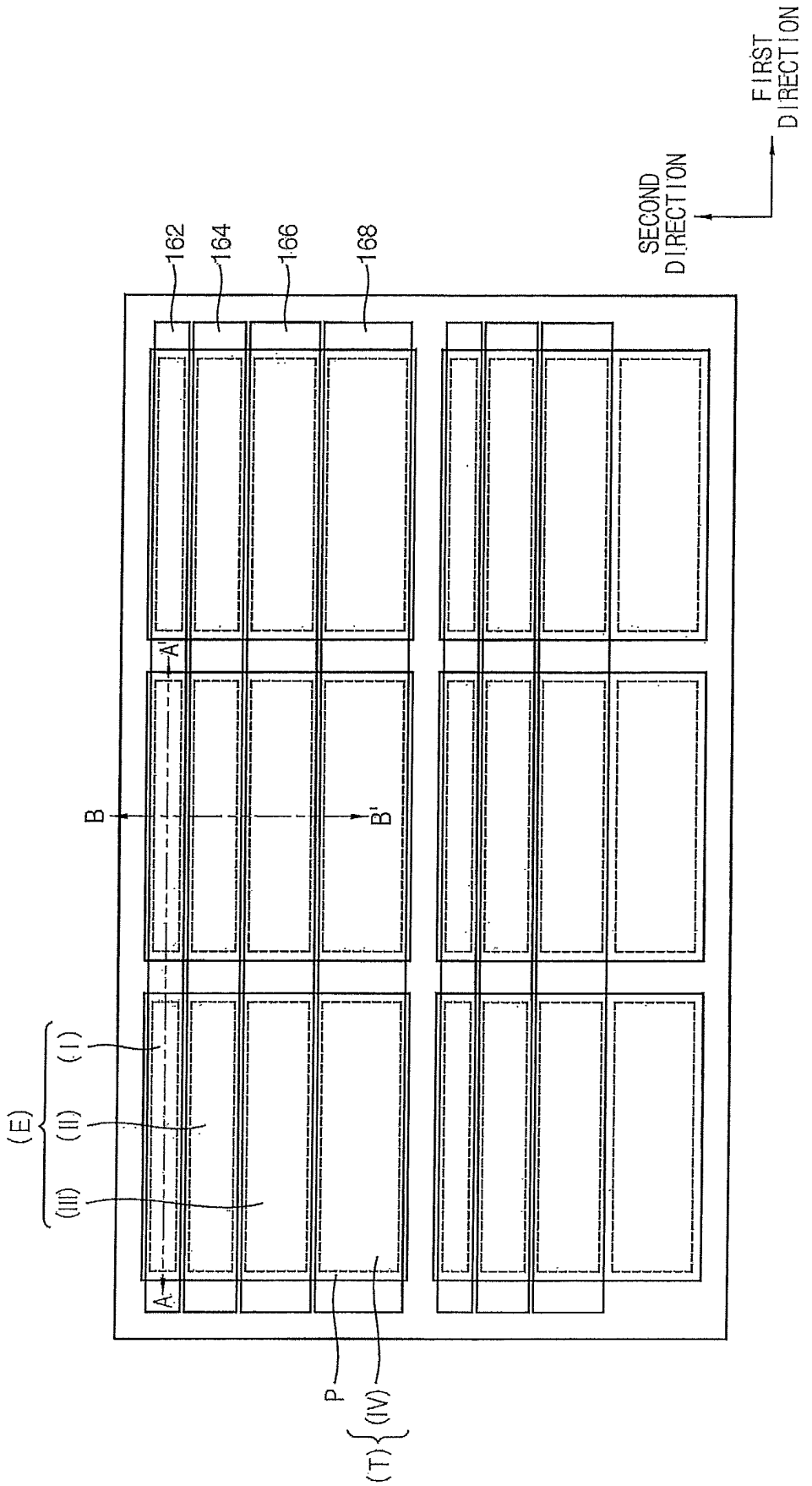

FIRST DIRECTION
SECOND DIRECTION
162
164
166
168
A
A'
B
B'
(E)
(I)
(II)
(III)
P
(T)
(IV)

FIG. 30

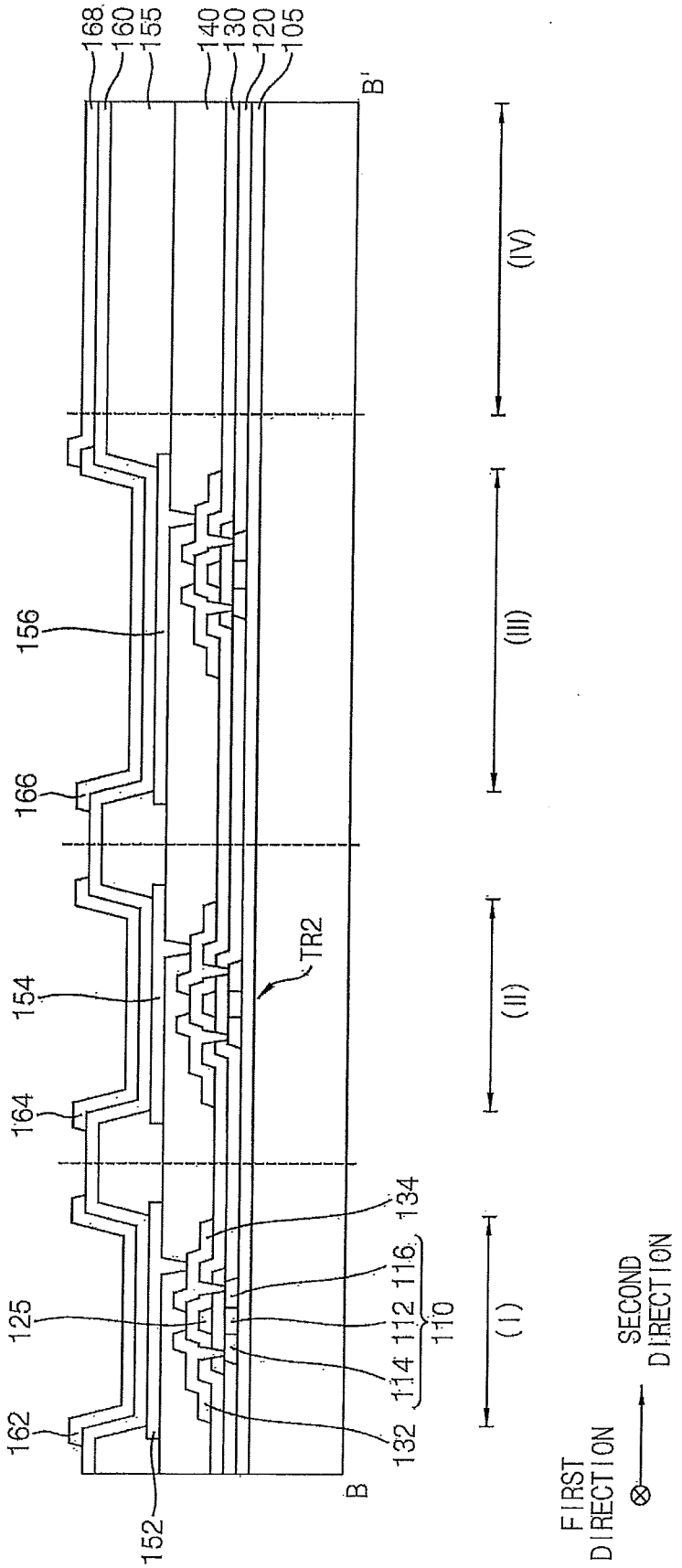

168
160
155
140
130
120
105
B'
156
166
154
164
125
162
152
TR2
134
116
112
114
110
132
B
(I)
(II)
(III)
(IV)
FIRST DIRECTION
SECOND DIRECTION

FIG. 31

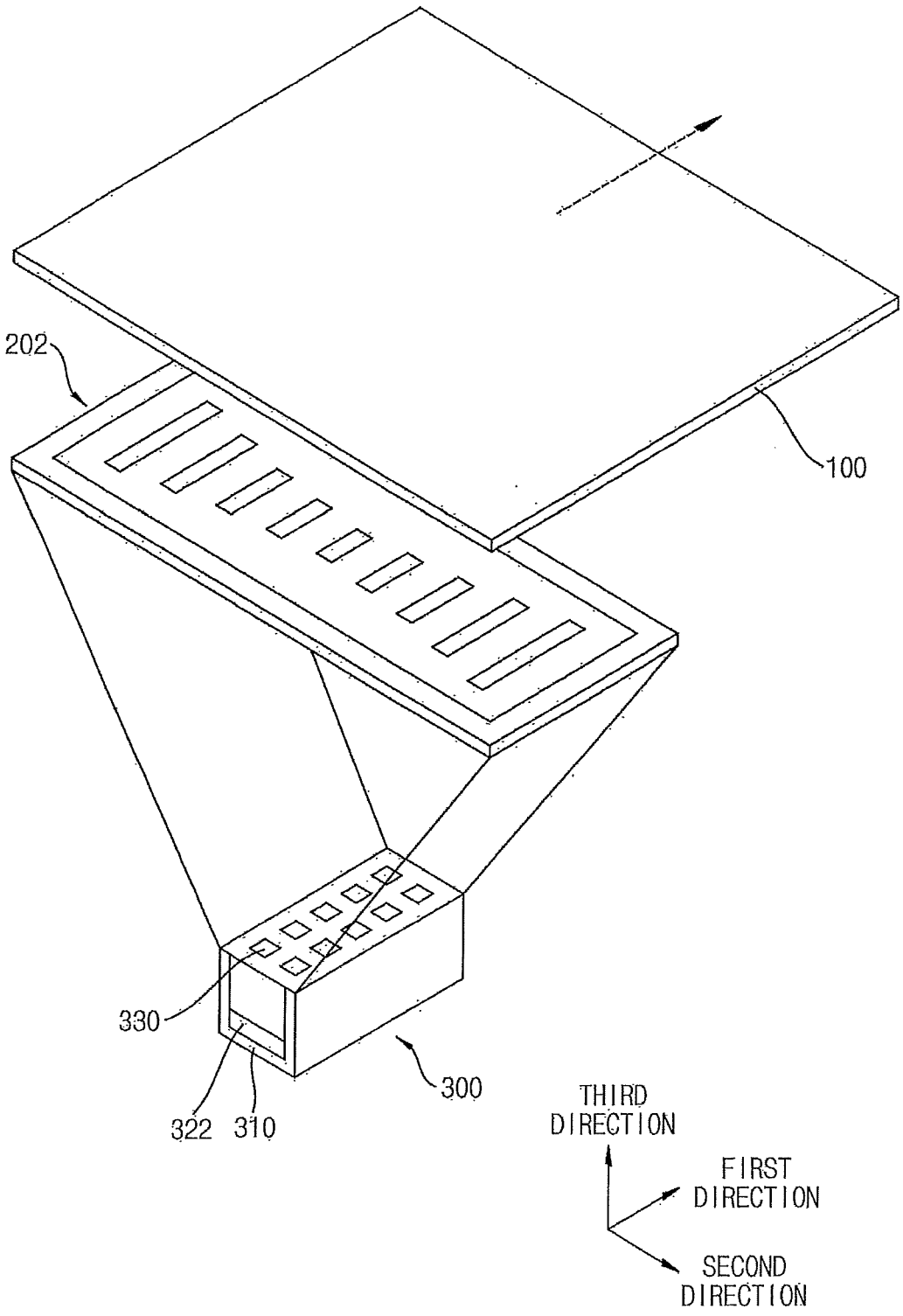

202
100
330
322
310
300
THIRD DIRECTION
FIRST DIRECTION
SECOND DIRECTION

FIG. 32

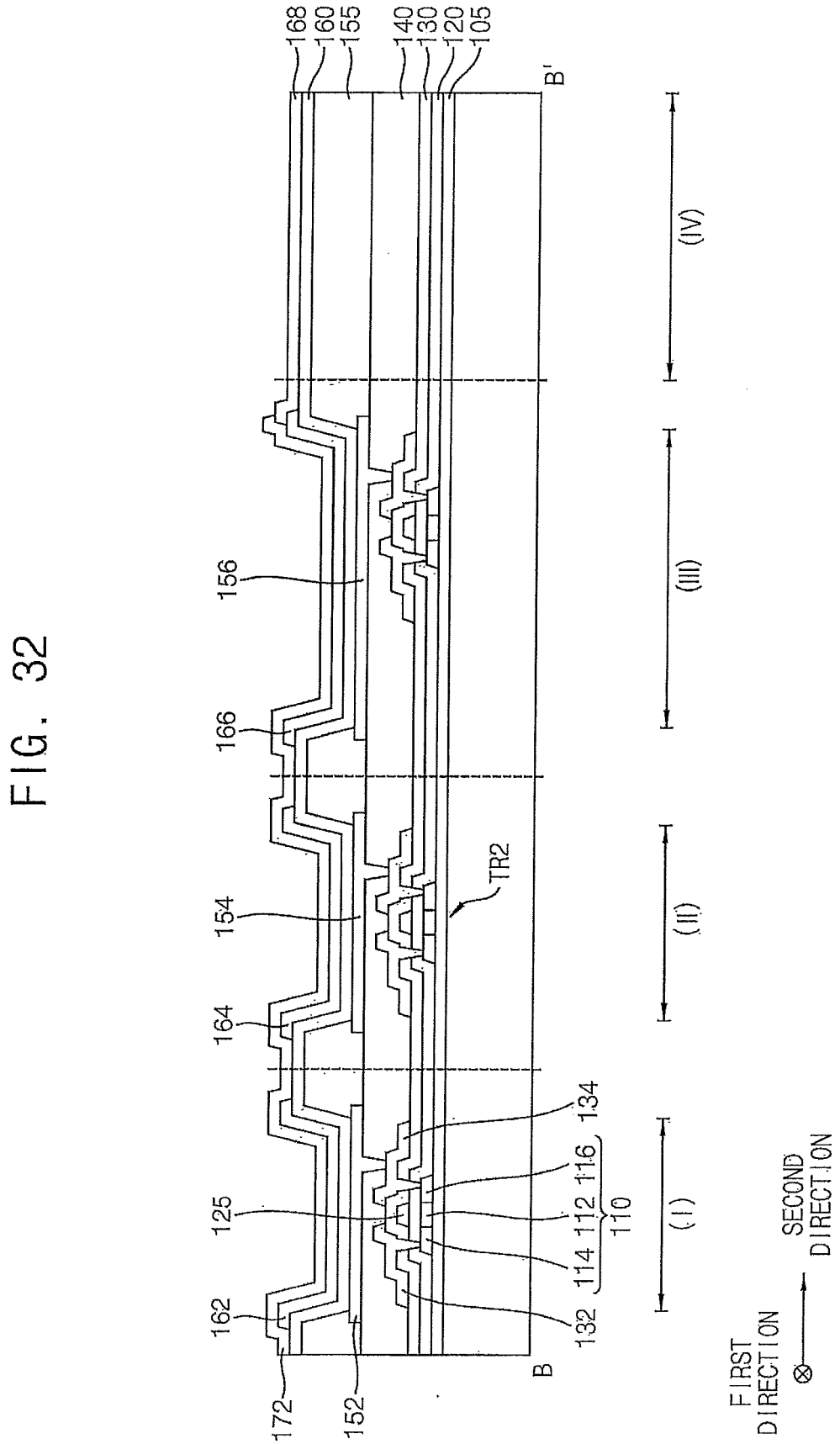

168
160
155
140
130
120
105
B'
156
166
154
164
125
162
172
152
TR2
134
116
112
114
110
132
B
(I)
(II)
(III)
(IV)
FIRST DIRECTION
SECOND DIRECTION

FIG. 33

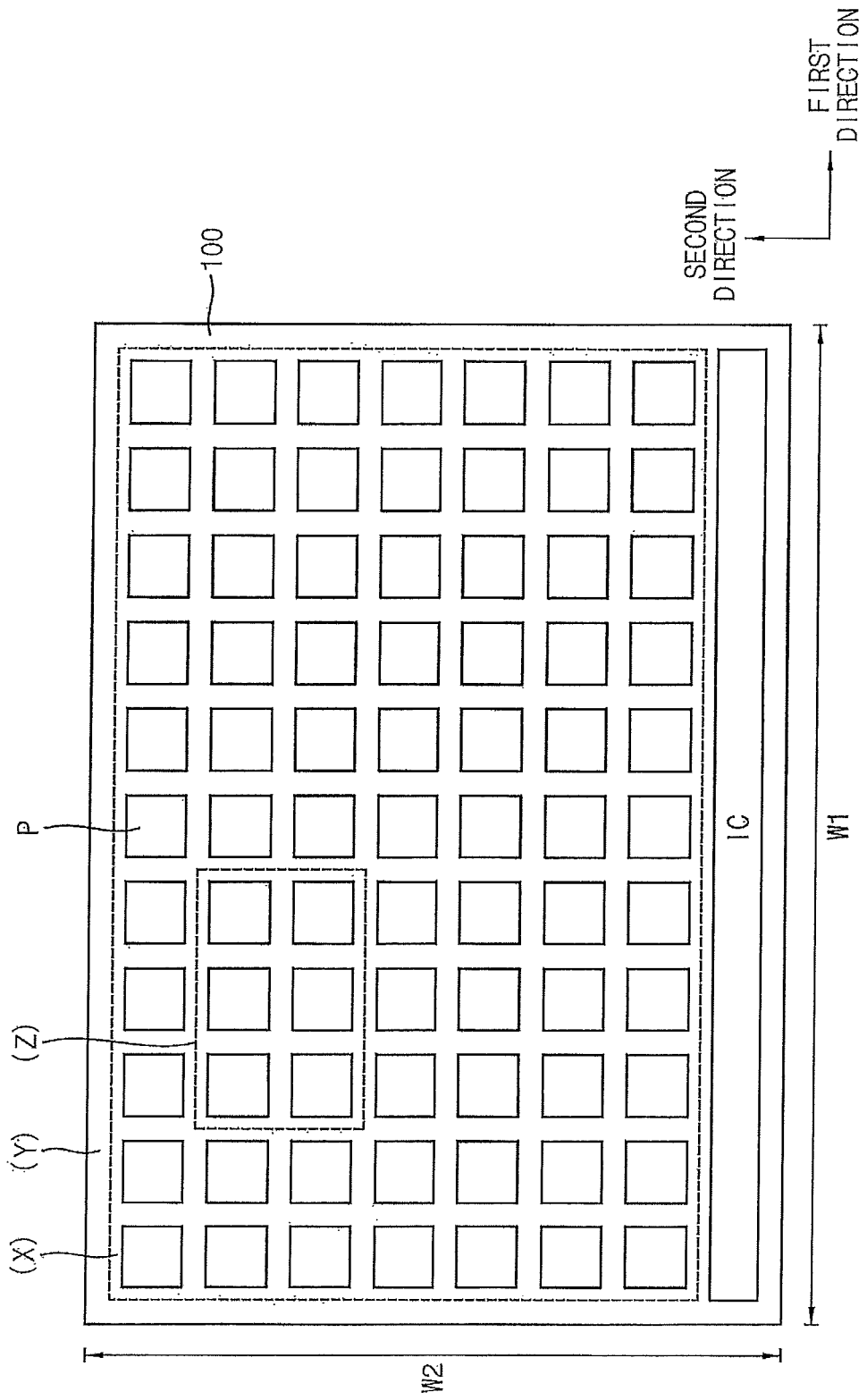


FIG. 34

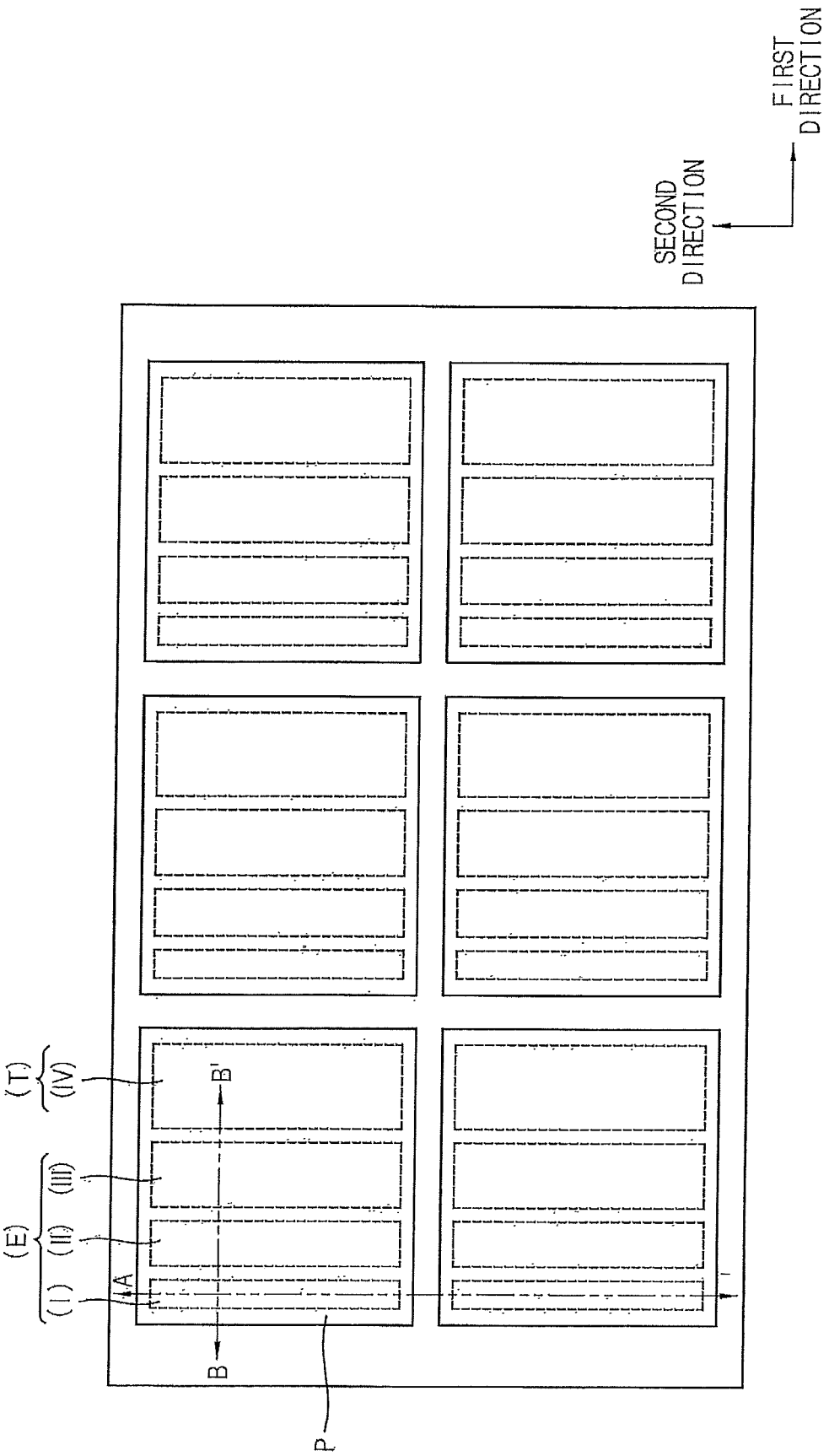


FIG. 35

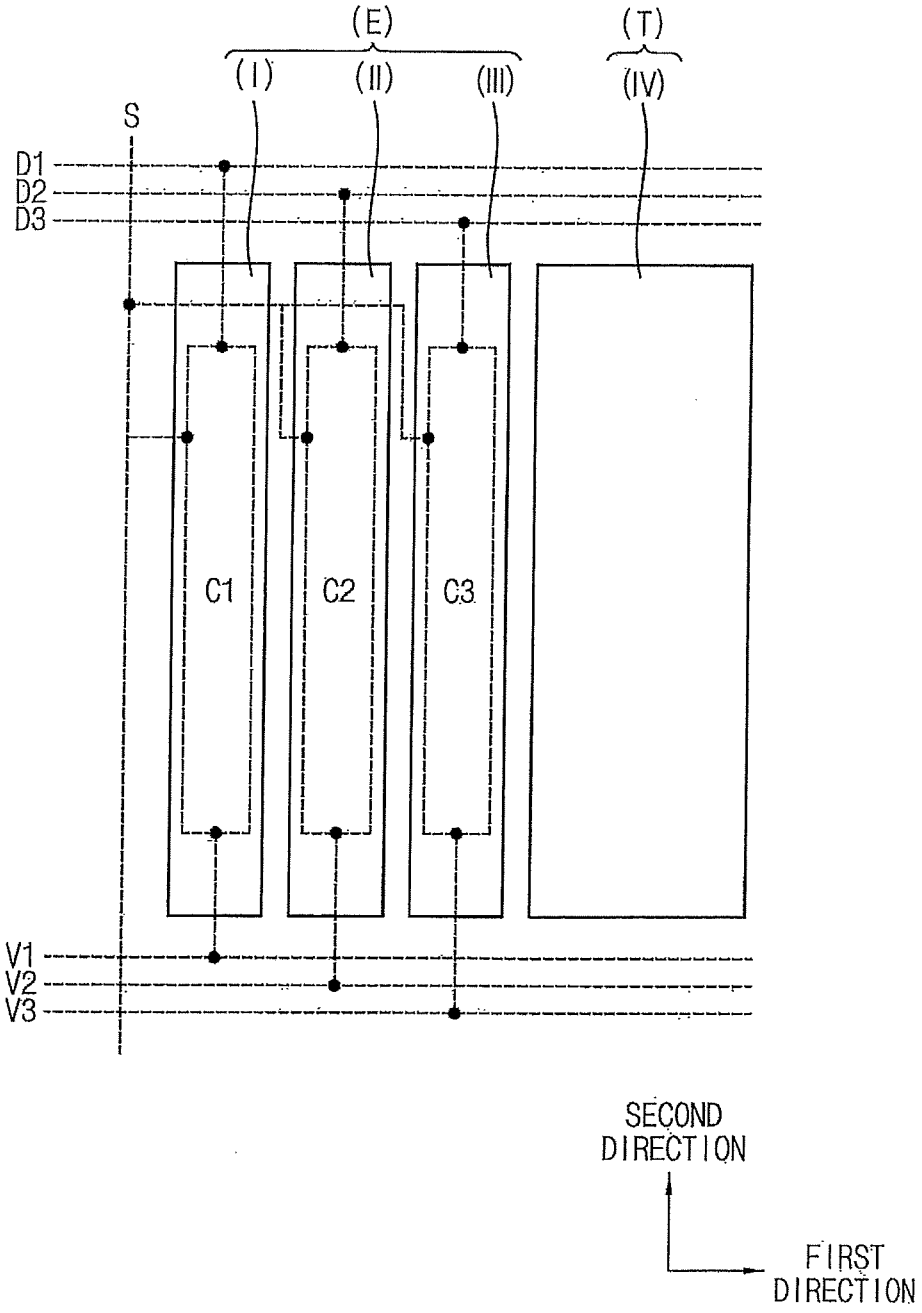

(E)
(T)
(I)
(II)
(III)
(IV)
S
D1
D2
D3
C1
C2
C3
V1
V2
V3
SECOND DIRECTION
FIRST DIRECTION

FIG. 36

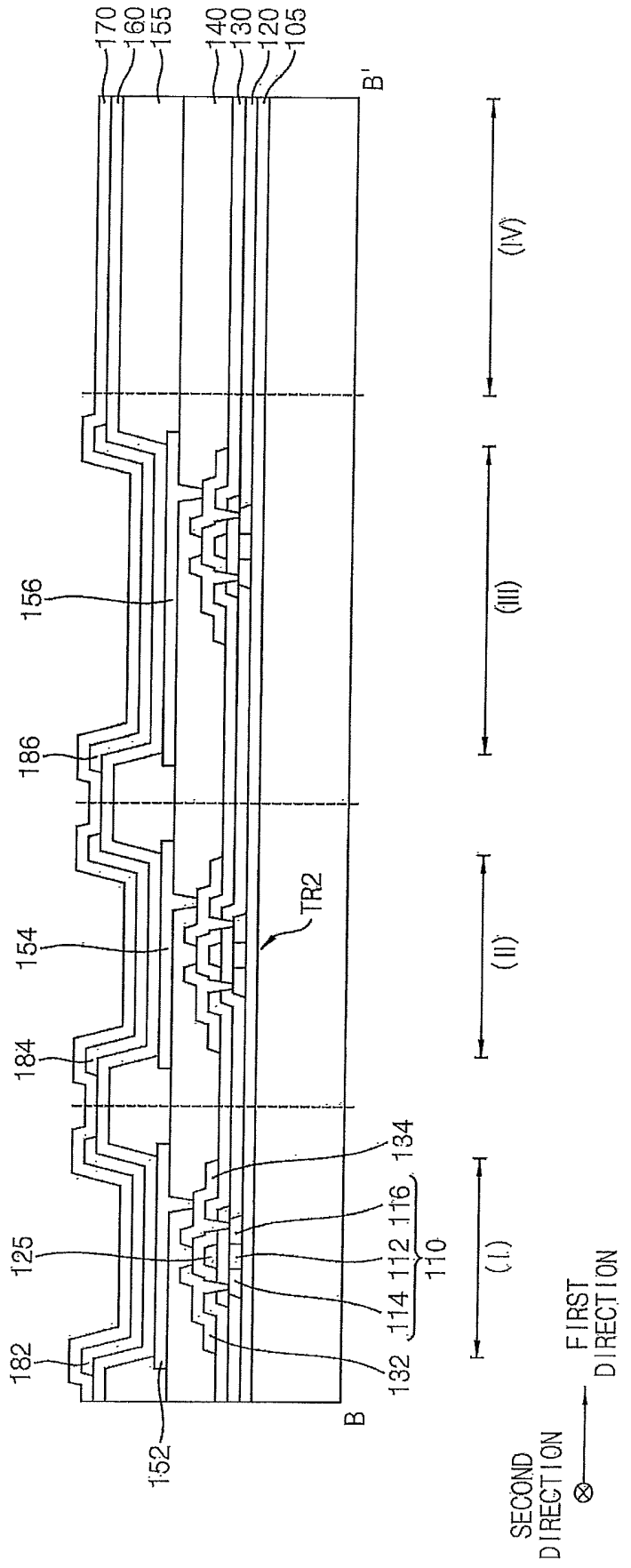
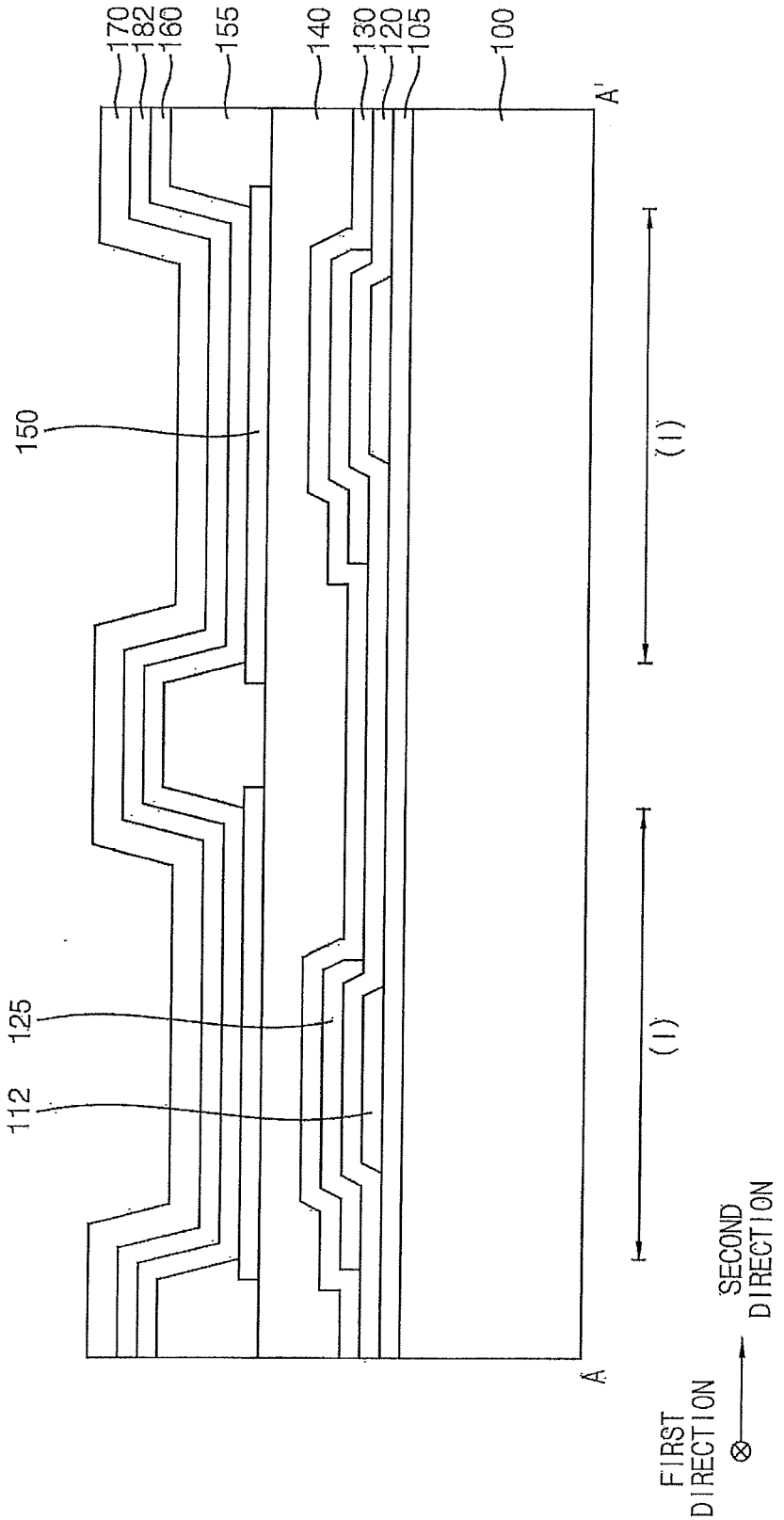

170
160
155
140
130
120
105
B'
156
186
154
184
125
182
152
TR2
134
116
112
114
110
132
B
(IV)
(III)
(II)
(I)
FIRST DIRECTION
SECOND DIRECTION

FIG. 37


170
182
160
155
140
130
120
105
100
A'
150
125
112
(I)
(I)
A
FIRST DIRECTION
SECOND DIRECTION

REFERENCES CITED IN THE DESCRIPTION

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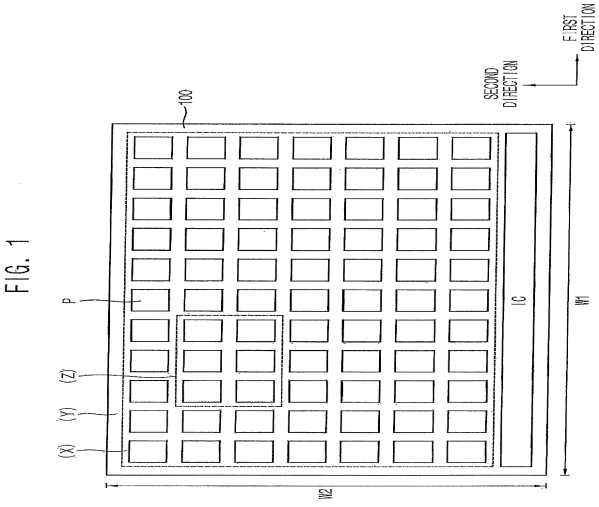
Patent documents cited in the description

- US 2014077186 A1 **[0003]**
- US 2012301986 A1 **[0004]**

专利名称(译)	生产有机发光显示装置的方法		
公开(公告)号	EP3002790B1	公开(公告)日	2019-11-27
申请号	EP2015188253	申请日	2015-10-02
[标]申请(专利权)人(译)	三星显示有限公司		
申请(专利权)人(译)	三星DISPLAY CO.，LTD.		
当前申请(专利权)人(译)	三星DISPLAY CO.，LTD.		
[标]发明人	JEONG JIN WOOK JO HAN GGOCH NU RI KIM SANG YEOL		
发明人	JEONG, JIN-WOOK JO, HAN-GGOCH-NU-RI KIM, SANG-YEOL		
IPC分类号	H01L27/32 H01L51/56		
CPC分类号	H01L27/3213 H01L27/3216 H01L27/326 H01L51/0011 H01L51/0097 H01L51/56 H01L2251/5338 H01L27/3218 H01L27/3248 H01L27/3276 H01L51/0013 H01L51/0077 H01L51/5012 H01L51/5221 H01L2227/323 H01L2251/301		
优先权	1020140133150 2014-10-02 KR		
其他公开文献	EP3002790A1		
外部链接	Espacenet		

摘要(译)

有机发光显示装置包括：基板，在第一方向上具有第一宽度，在第二方向上具有第二宽度，第二宽度垂直于并且小于第一宽度；以及基板上的像素区域，每个像素沿第一方向延伸的区域包括第一发光部分，第二发光部分，第三发光部分和沿第二方向布置的透射部分，第一至第三发光部分均在第一方向上延伸。