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(54) **LIQUID CRYSTAL DISPLAY**

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(57) **ABSTRACT**

A liquid crystal display includes: a first substrate and a second substrate facing each other; a liquid crystal layer between the first substrate and the second substrate; a lower pixel electrode positioned on the first substrate; a first passivation layer positioned on the lower pixel electrode; an upper pixel electrode positioned on the first passivation layer; and an opposing electrode positioned on the second substrate, wherein the upper pixel electrode comprises a stem and a plurality of minute branches extending outwardly from the stem, and the lower pixel electrode comprises a main body overlapping the plurality of minute branches and at least one bar-shaped portion extending along an edge of the main body maintaining a predetermined gap with the edge of the main body.

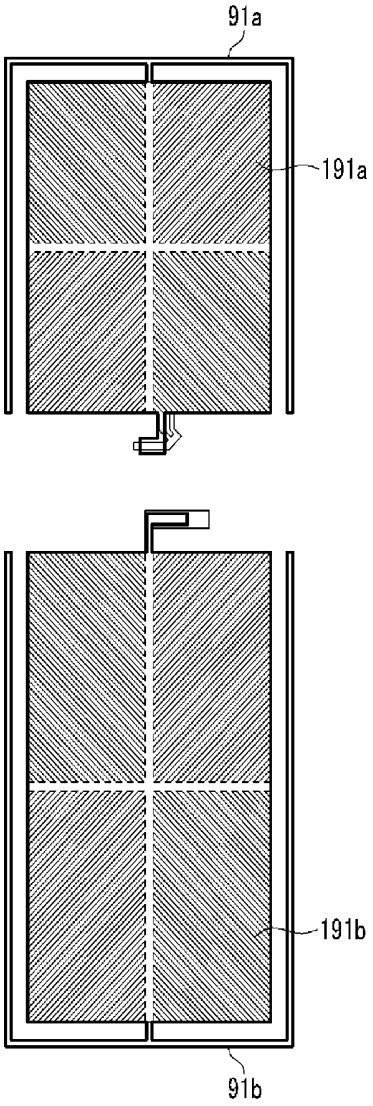


FIG.1

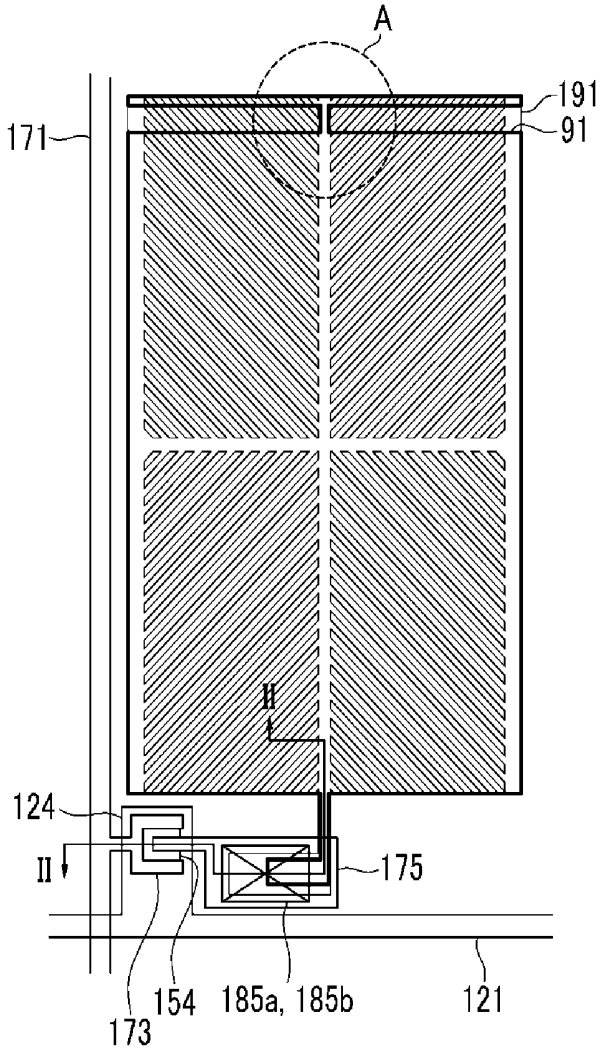


FIG.2

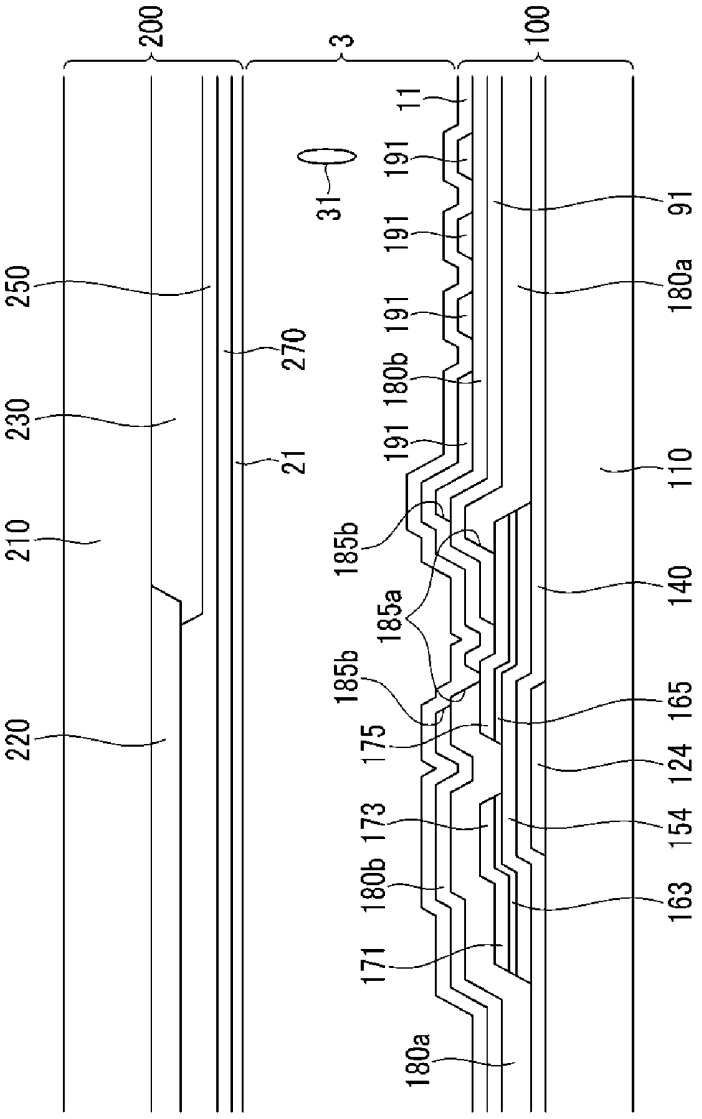

200
3
100
250
230
210
220
270
21
31
11
191
191
191
191
180b
191
185b
185a
185b
175
173
180b
171
180a
91
180a
110
140
165
124
154
163

FIG.3

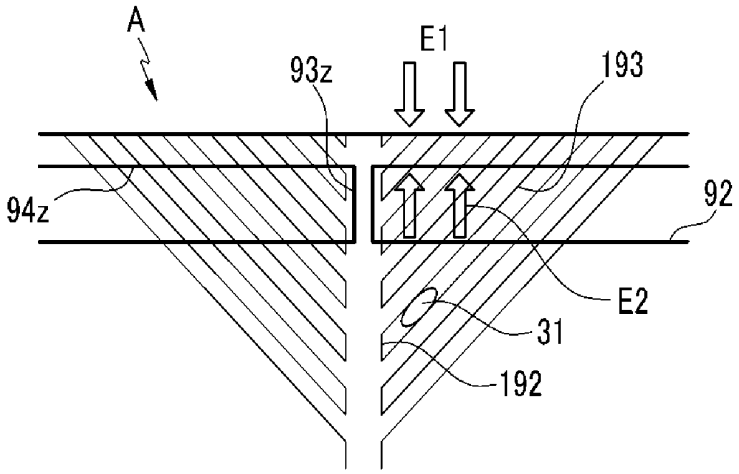


FIG.4

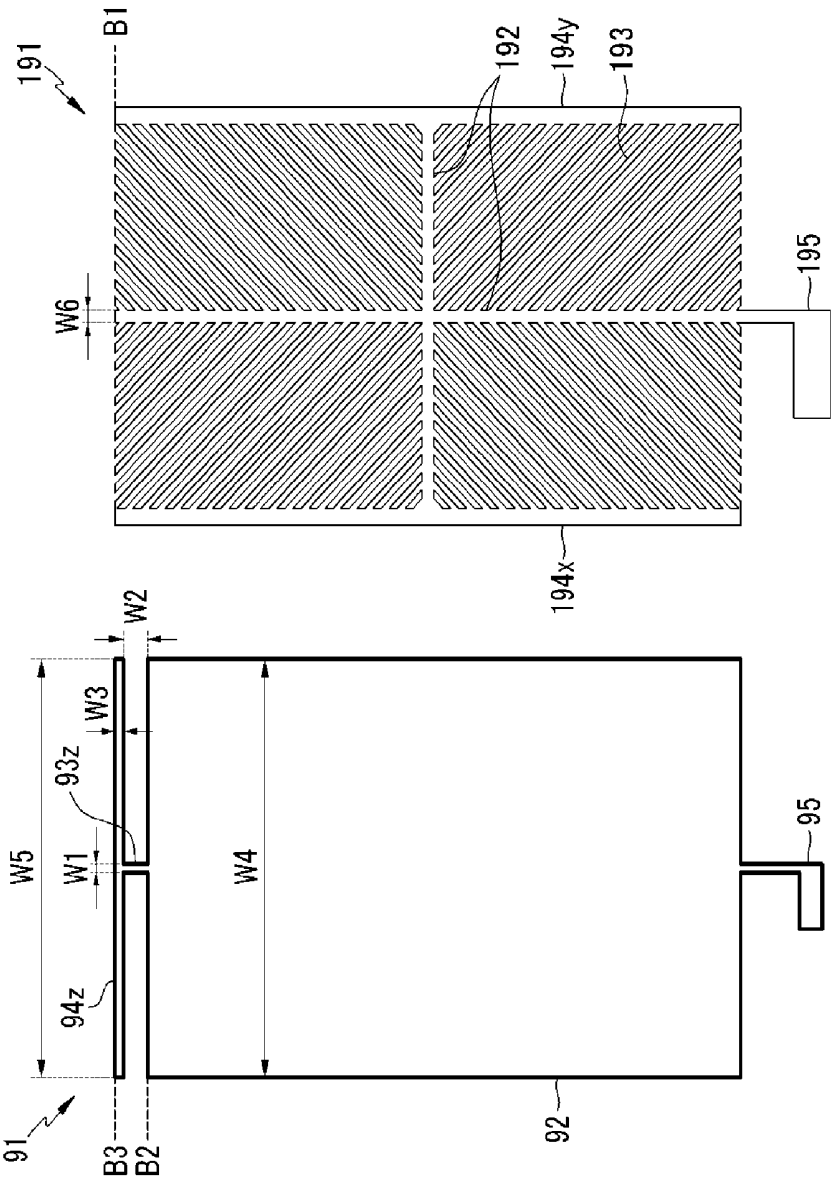

191
B1
192
194y
193
195
W6
194x
W2
W3
93z
W5
W1
W4
95
94z
91
B3
B2
92

FIG.5

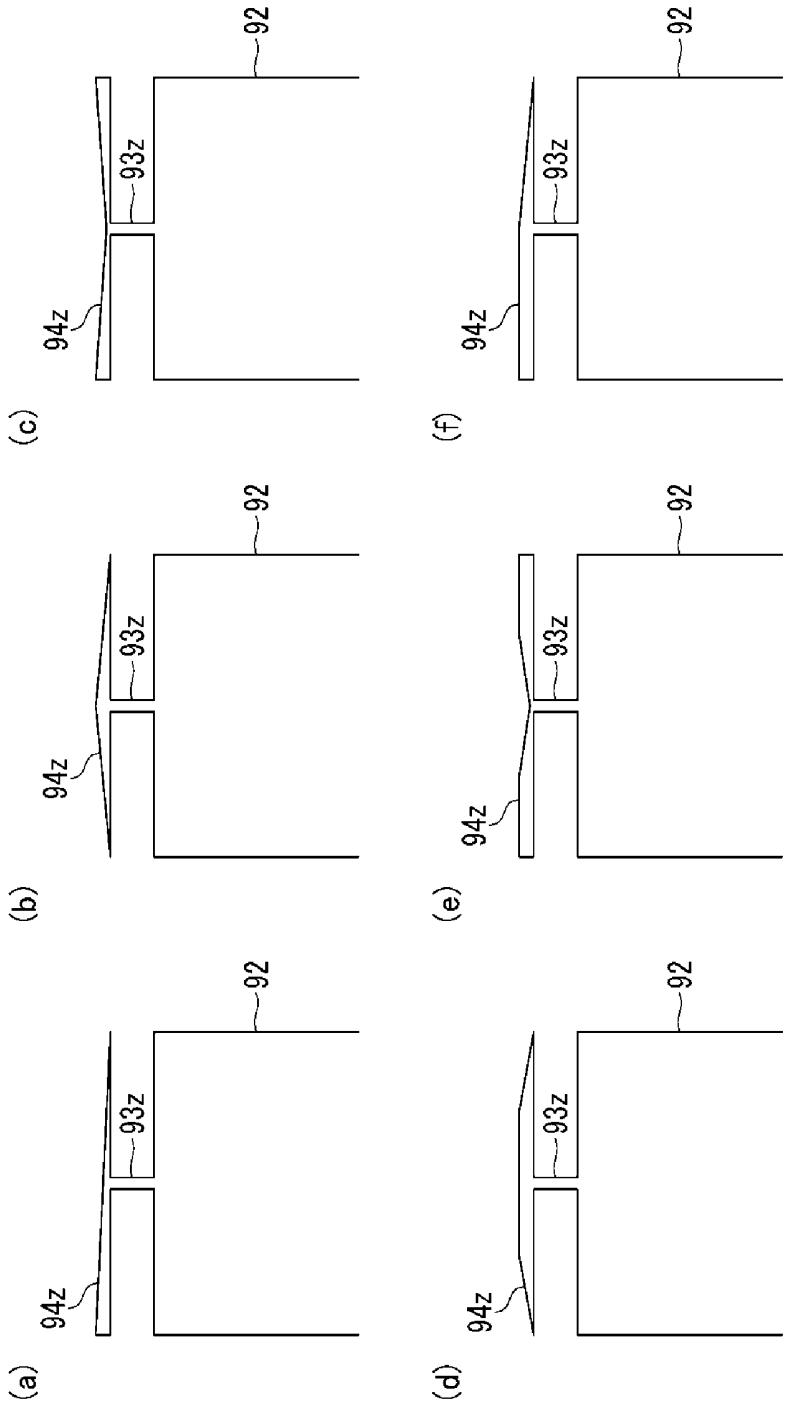


FIG.6

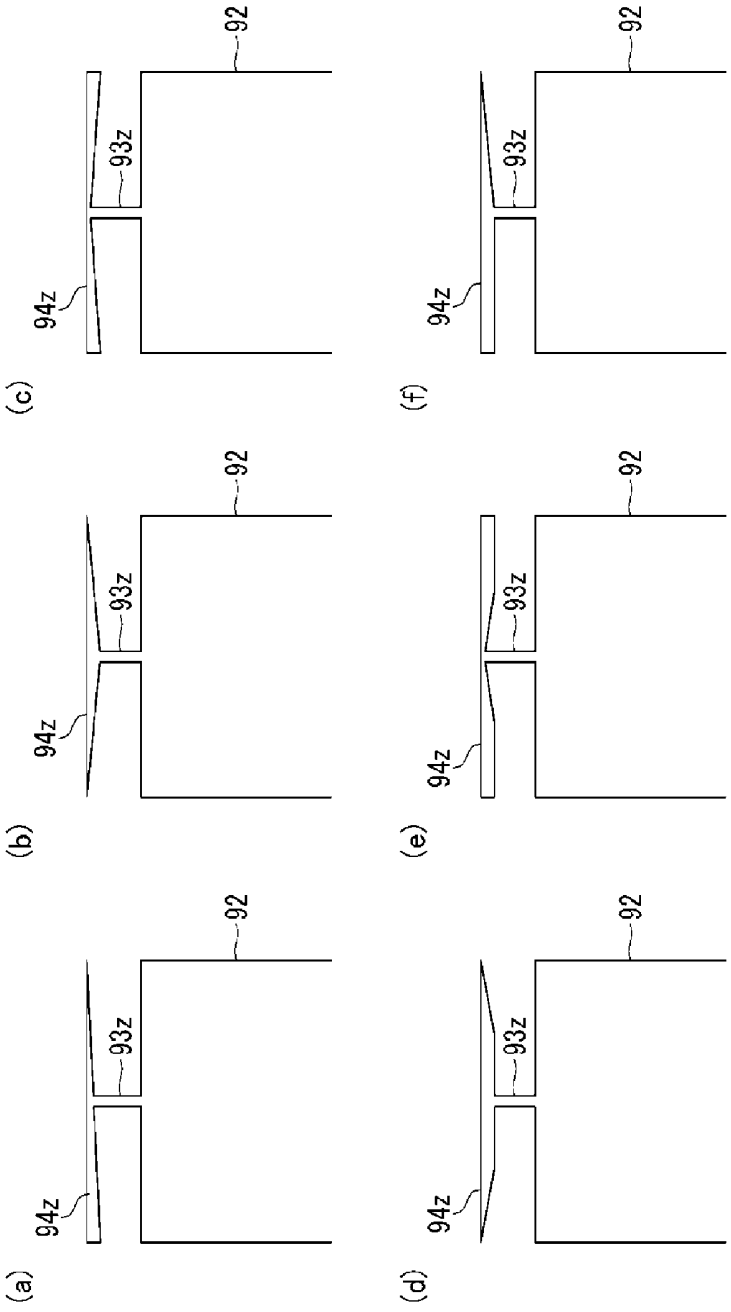


FIG.7

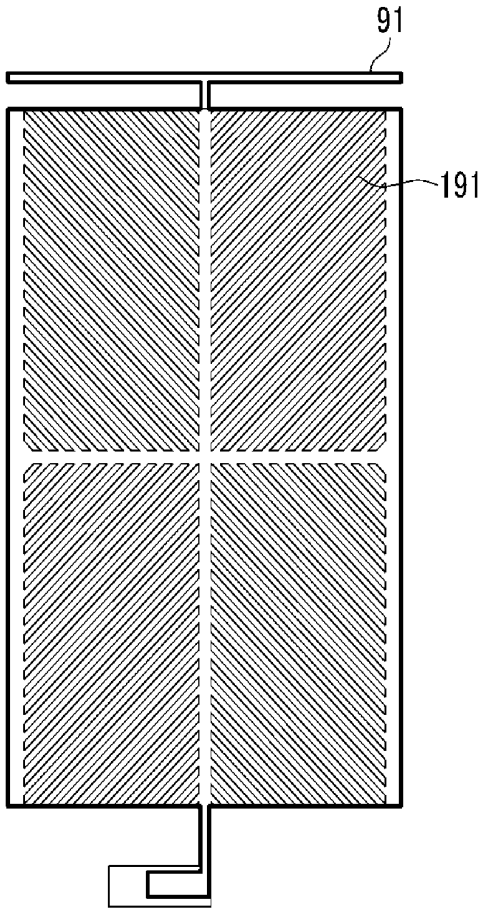


FIG.8

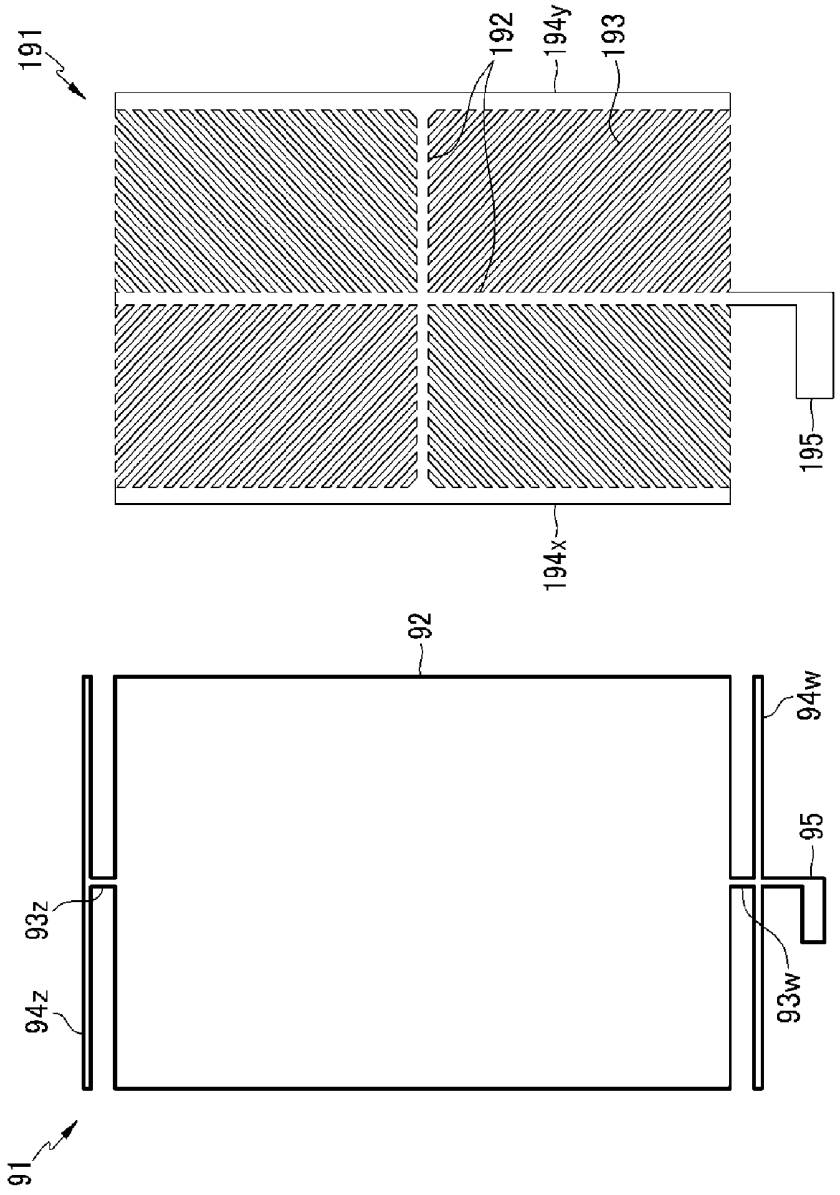
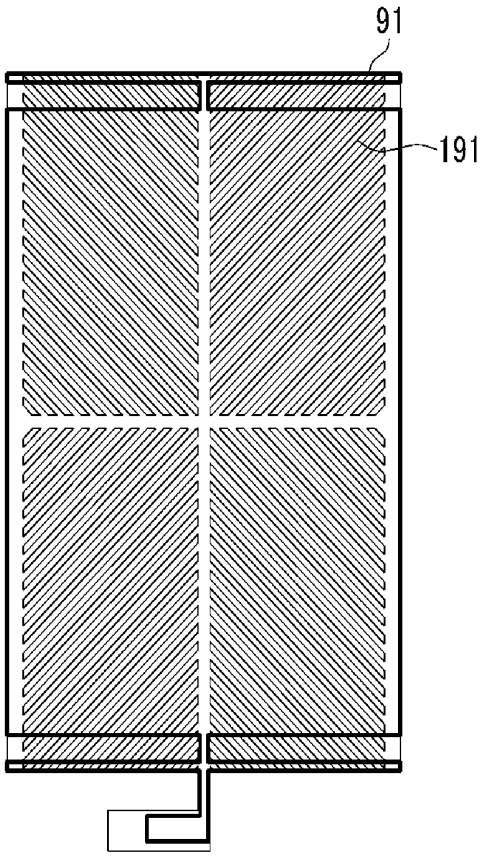


FIG.9



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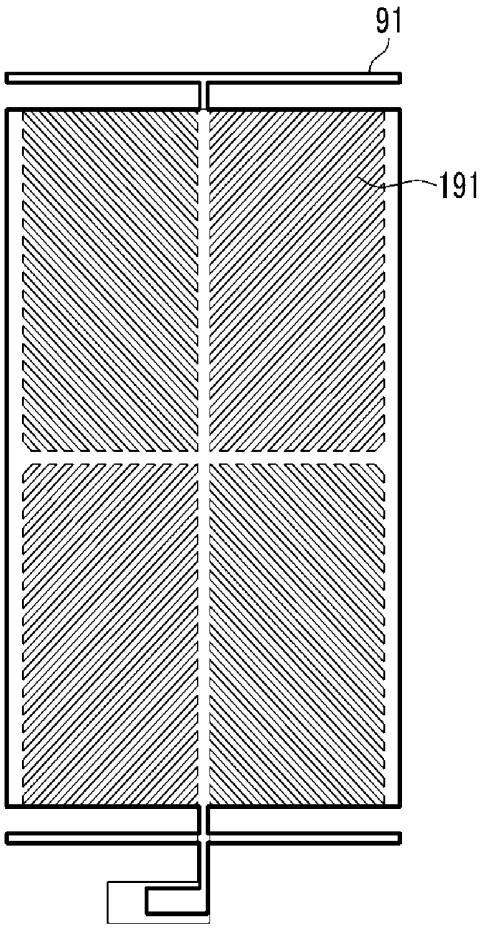


FIG. 11

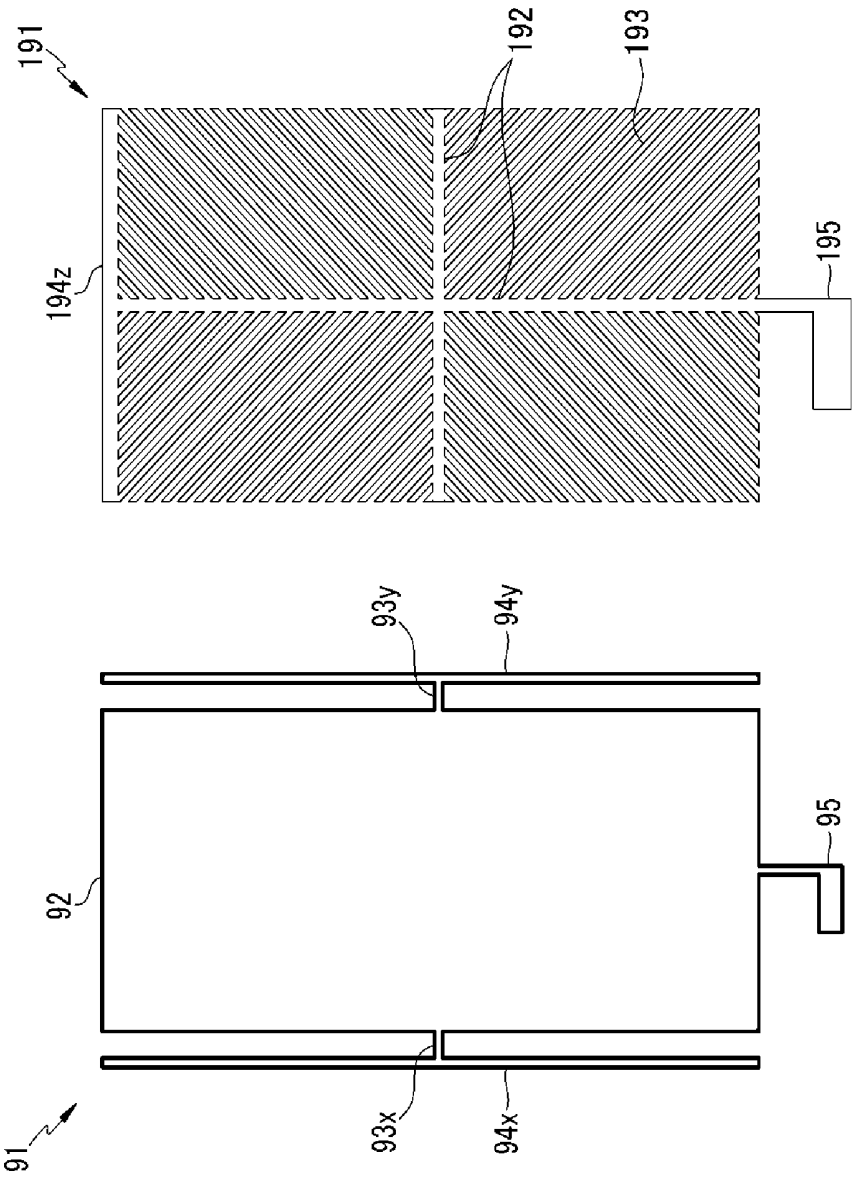


FIG.12

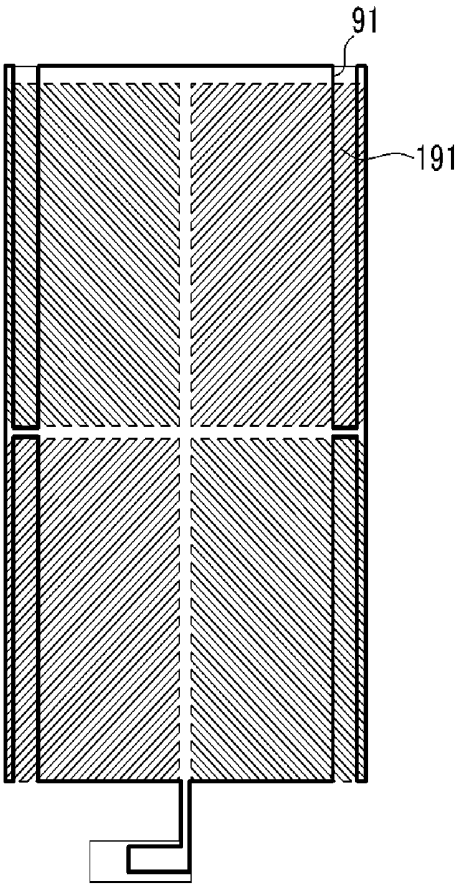


FIG.13

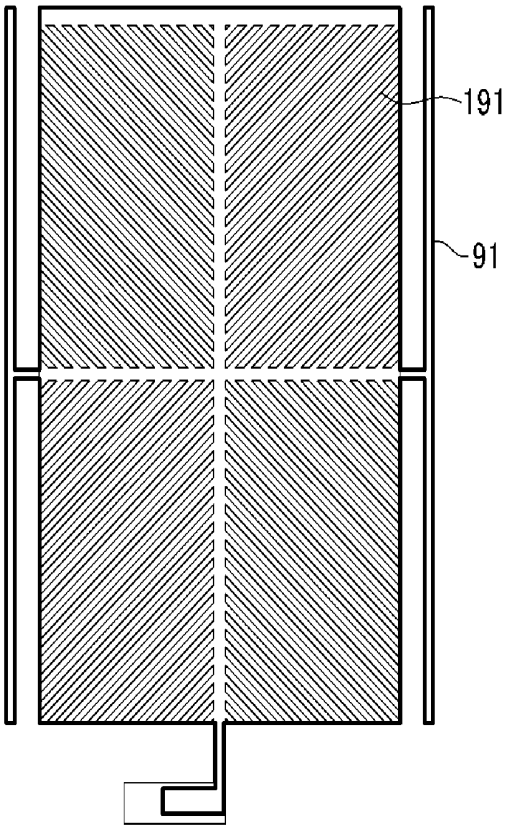


FIG.14

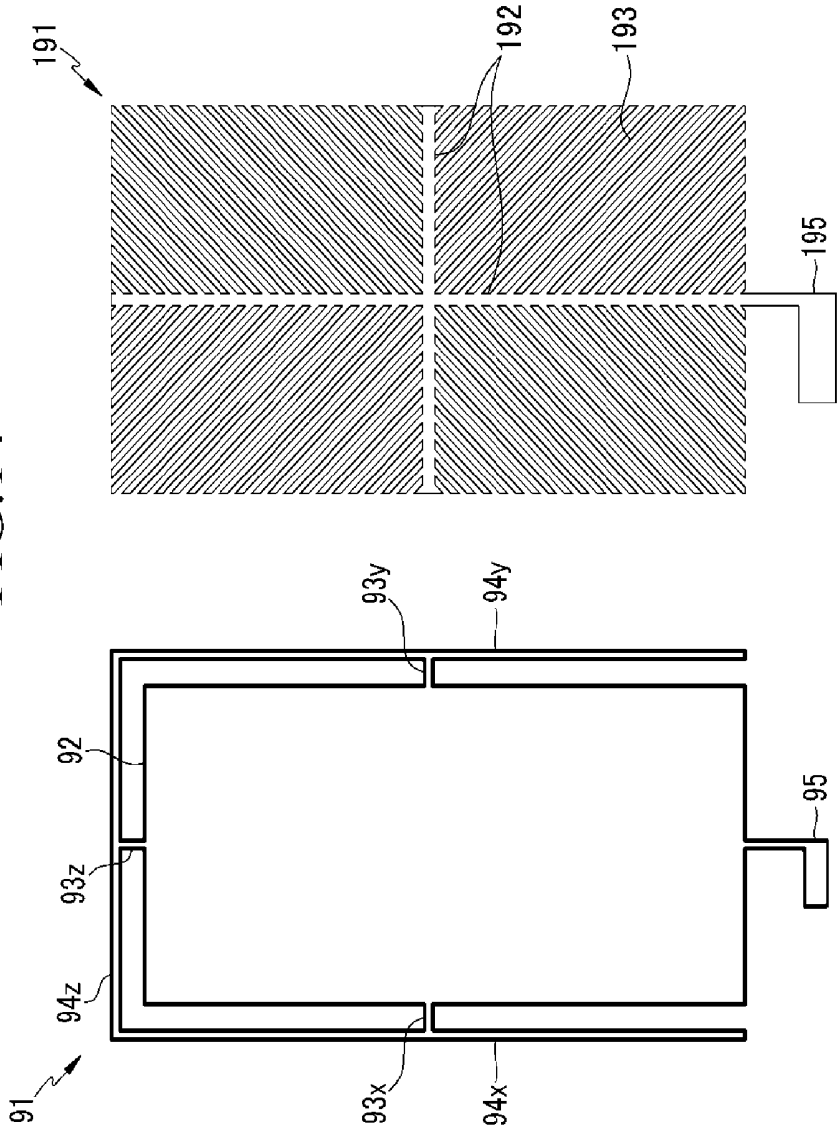


FIG.15

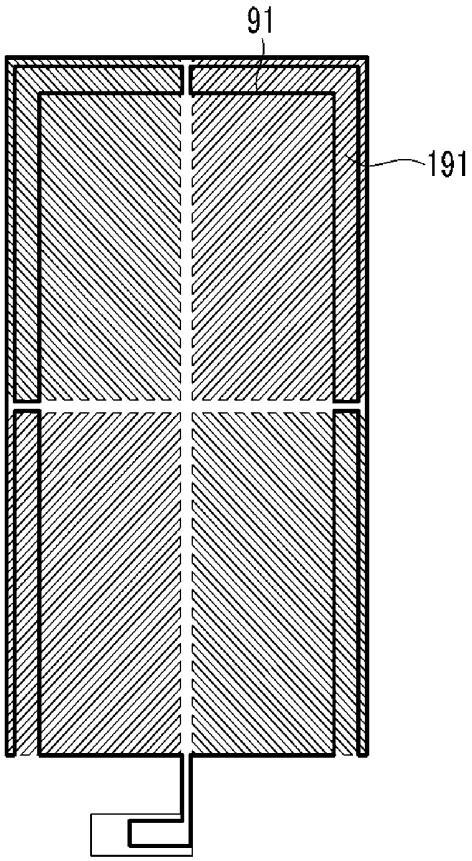


FIG.16

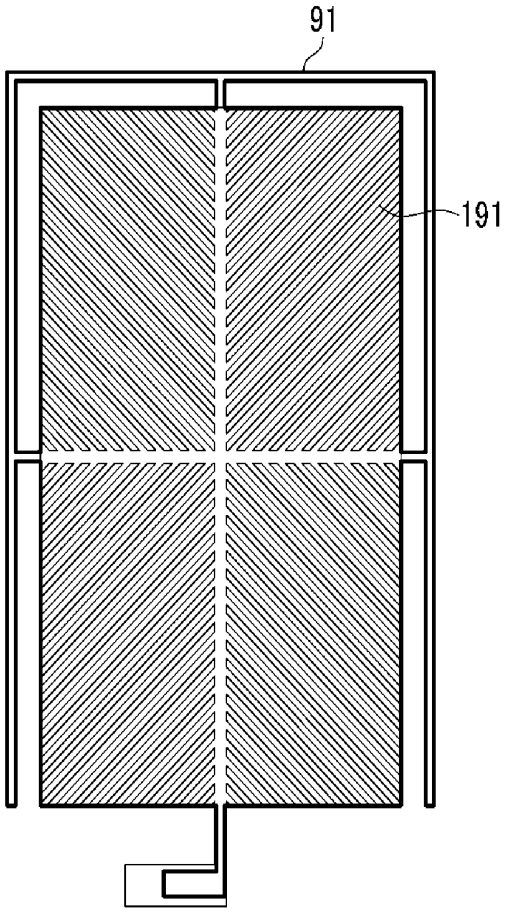


FIG.17

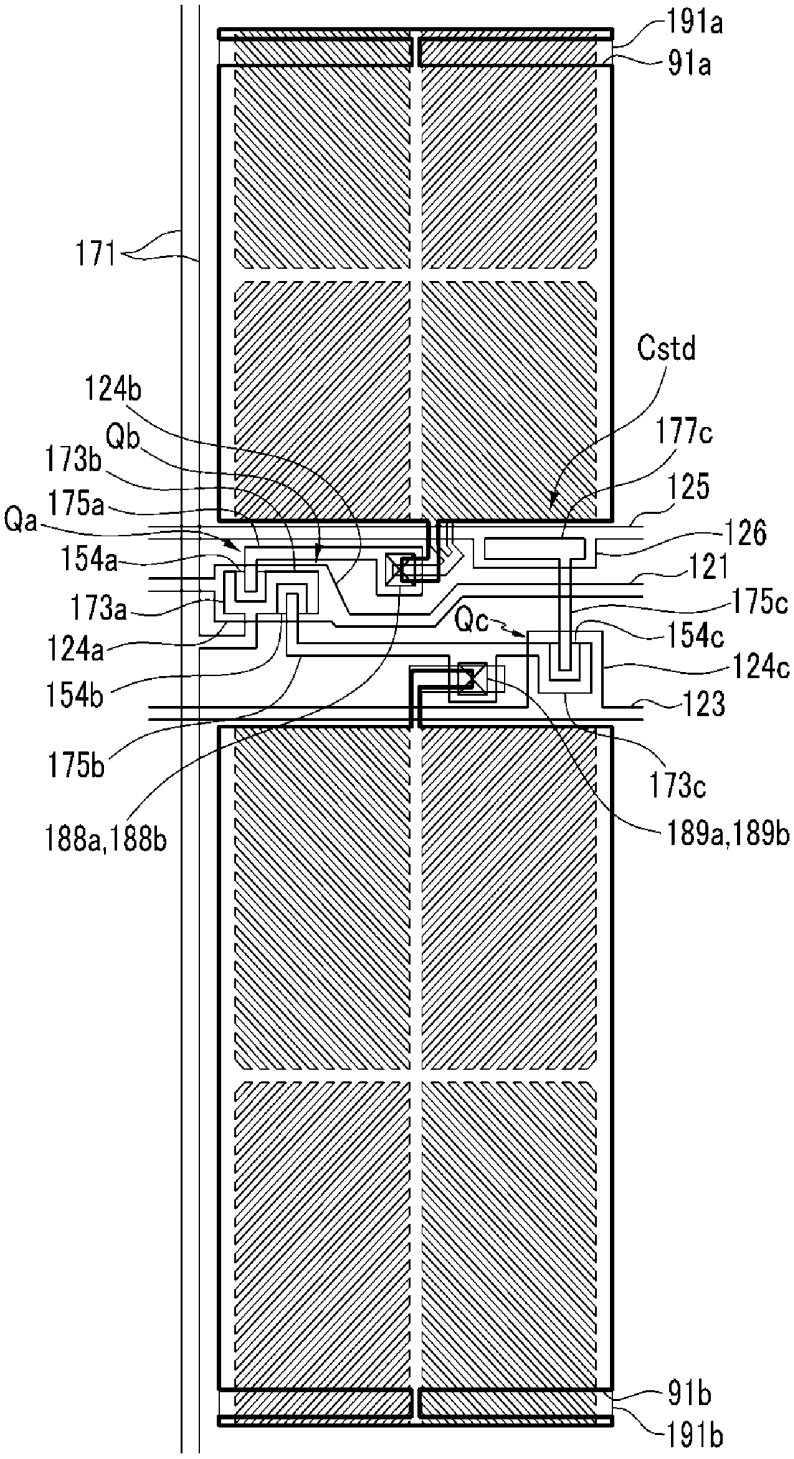
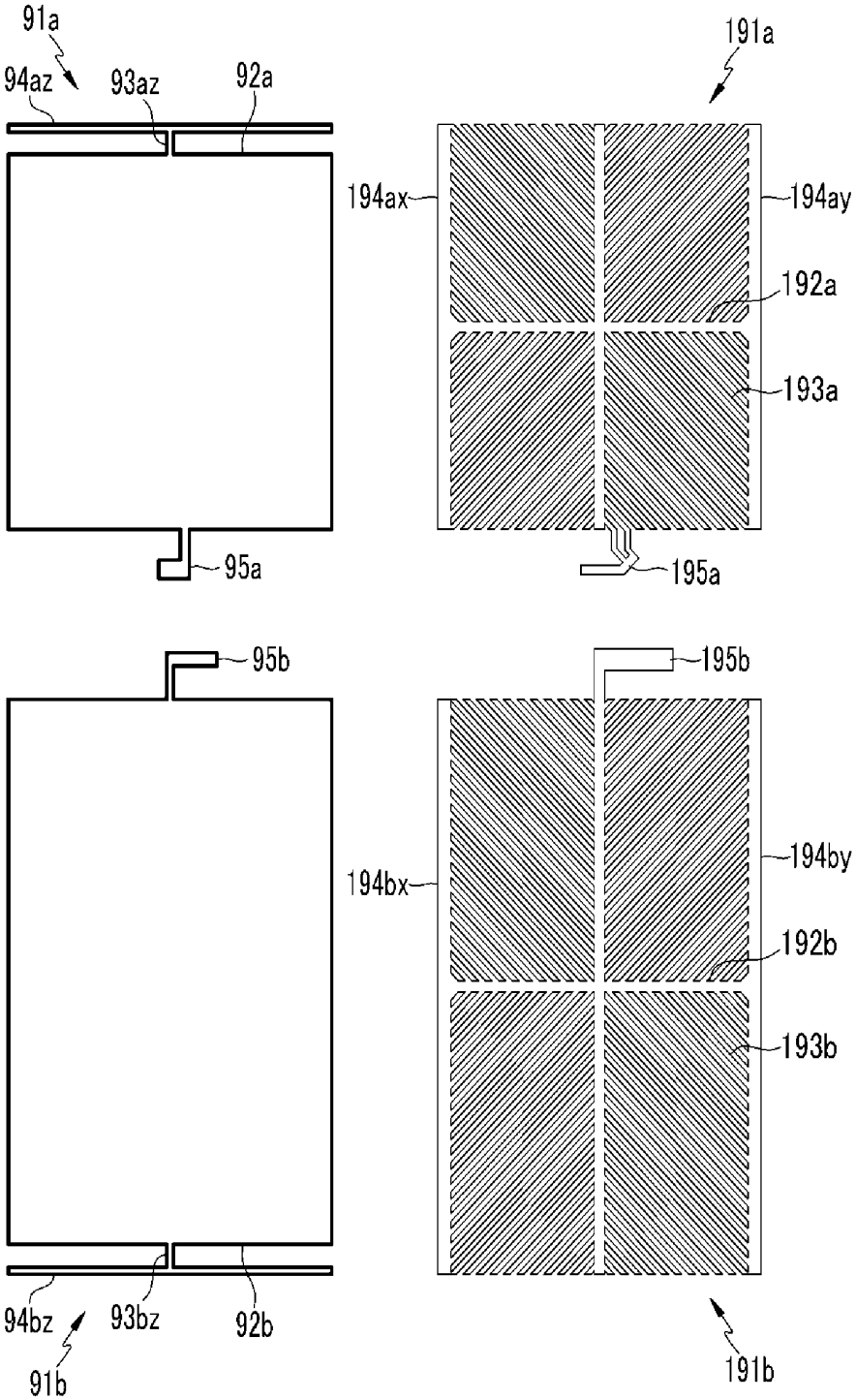

191a
91a
171
Cstd
124b
Qb
177c
173b
125
175a
Qa
126
154a
121
173a
175c
Qc
154c
124a
124c
154b
123
175b
173c
188a,188b
189a,189b
91b
191b

FIG.18


91a
94az
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92a
95a
191a
194ax
194ay
192a
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94bz
93bz
92b
91b
191b

FIG.19

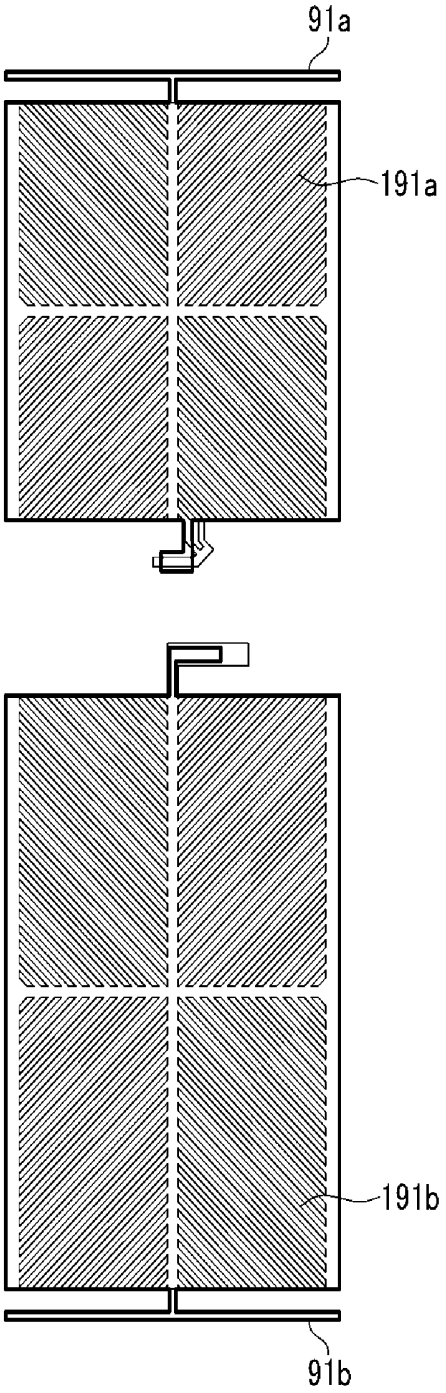
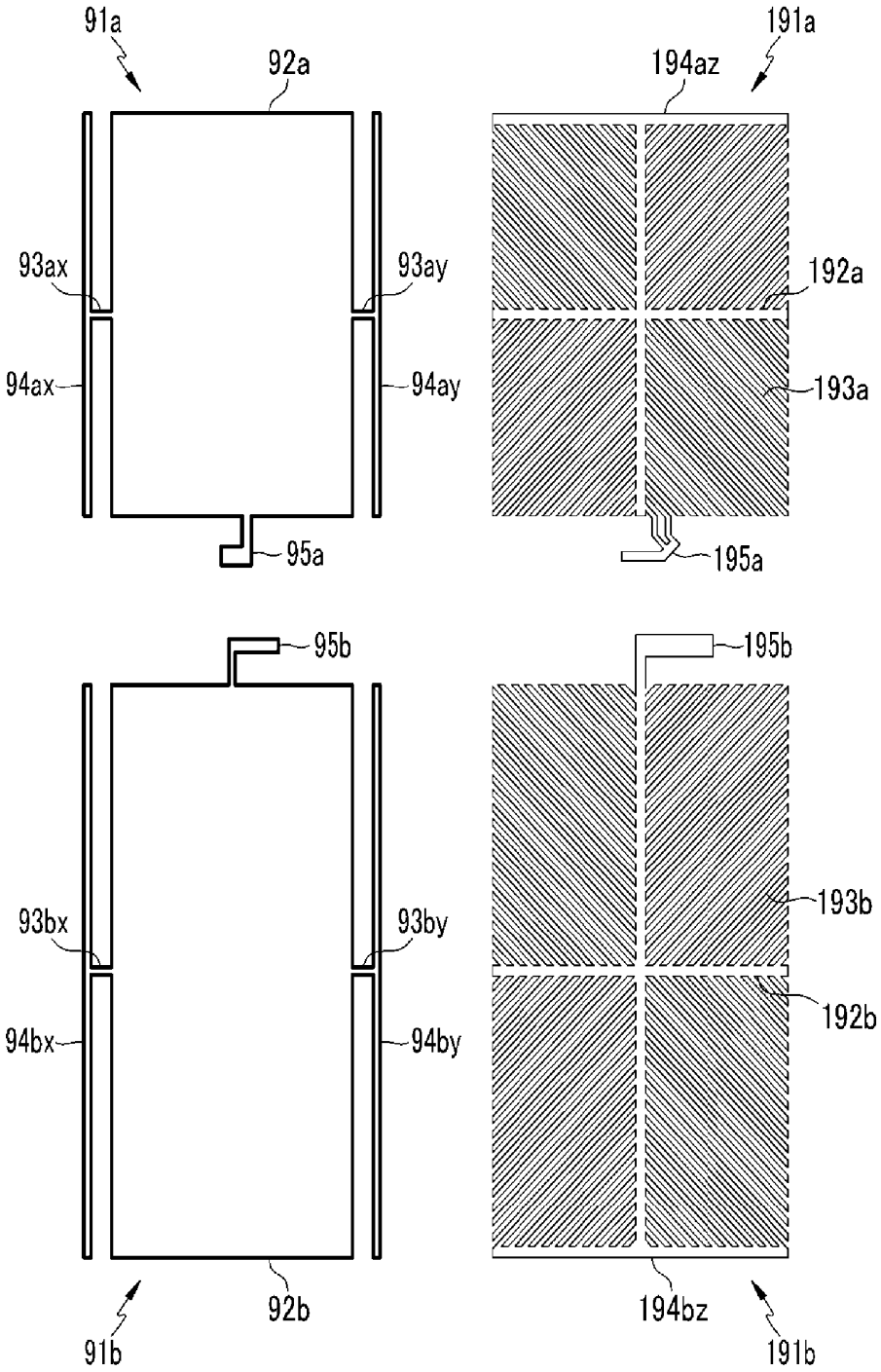


FIG.20


91a
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93ay
94ax
94ay
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191a
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194bz
191b

FIG.21

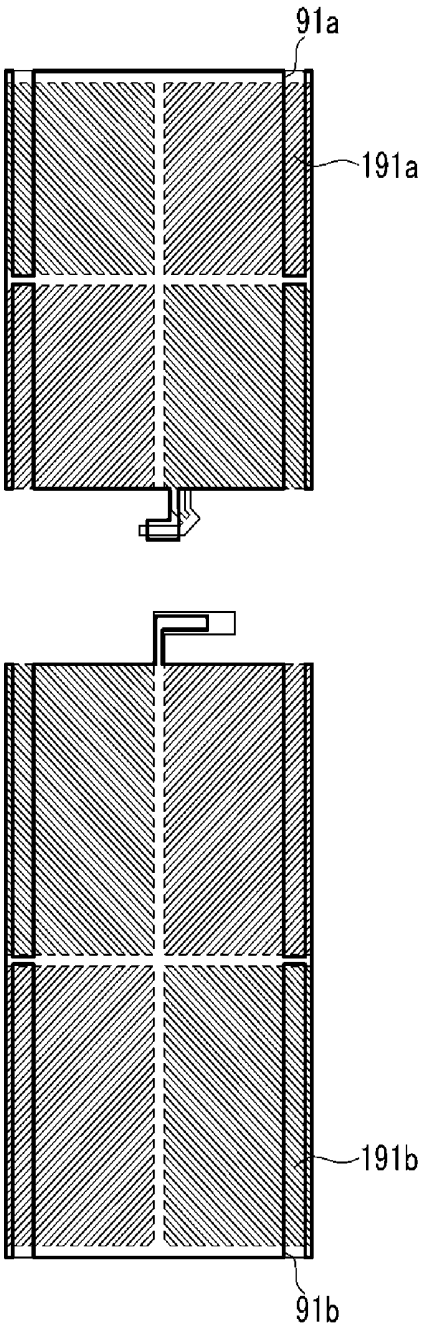

FIG.22

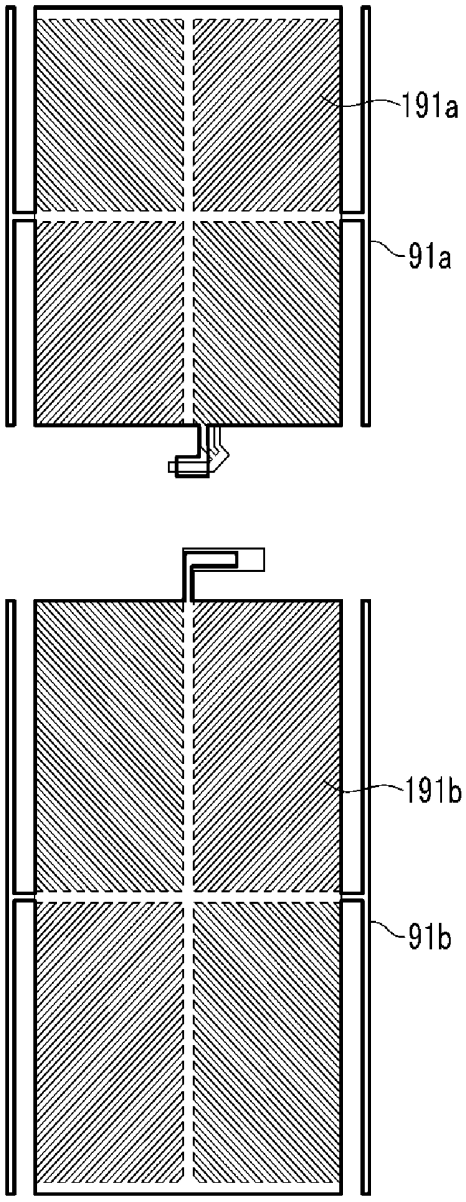

FIG.23

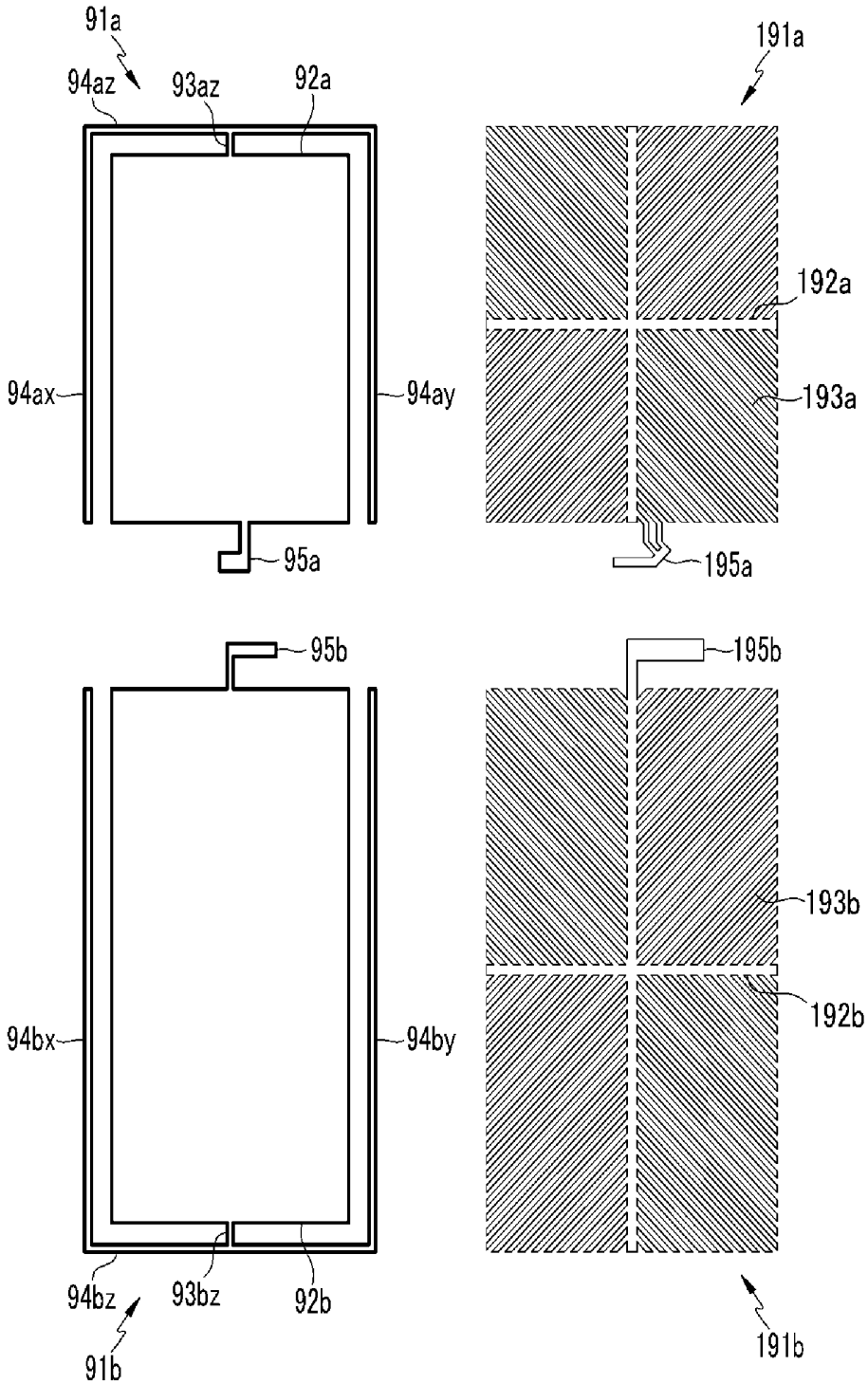
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FIG.24

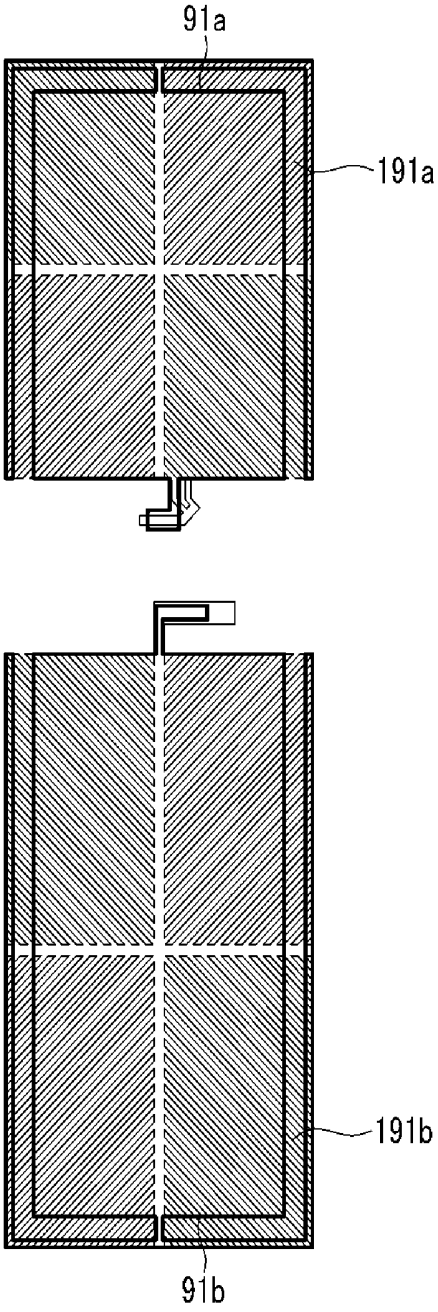
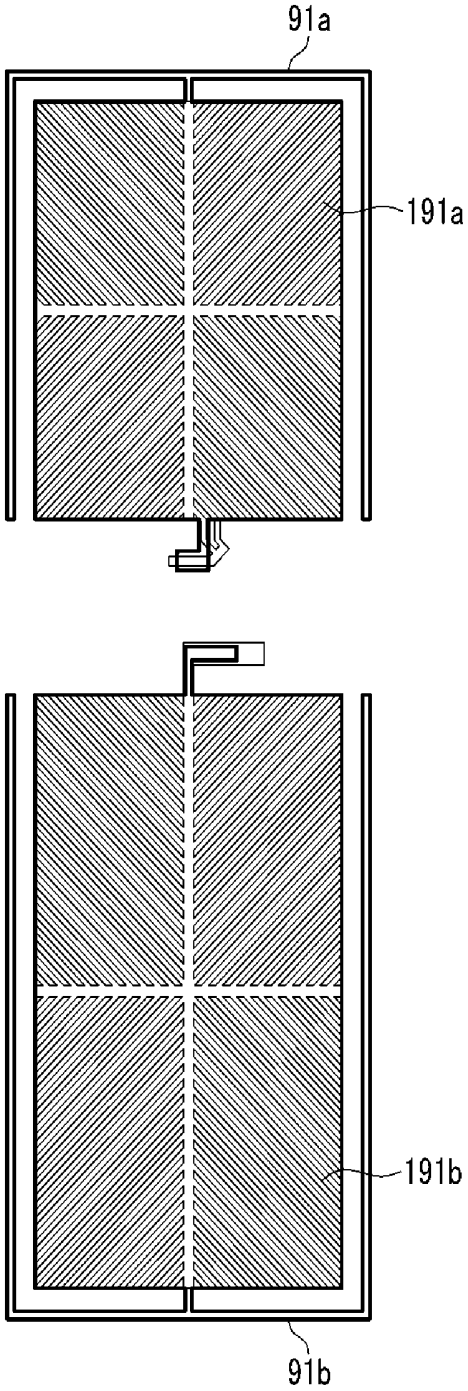


FIG.25



LIQUID CRYSTAL DISPLAY

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to and the benefit of Korean Patent Application No. 10-2012-0022386 filed in the Korean Intellectual Property Office on Mar. 5, 2012, the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] (a) Field of the Invention

[0003] The present invention relates to a liquid crystal display.

[0004] (b) Description of the Related Art

[0005] As one of the most widely used types flat panel displays, a liquid crystal displays (LCD) includes two panels provided with field generating electrodes, such as pixel electrodes and a common electrode, and a liquid crystal (LC) layer interposed between the two panels. LCDs display images by applying voltages to the field-generating electrodes to generate an electric field in the LC layer that determines the orientation of LC molecules therein to adjust polarization of incident light.

[0006] Among the LCDs, a vertical alignment (VA) mode LCD, which aligns LC molecules such that their long axes are perpendicular to the panels in the absence of an electric field, has a high contrast ratio and wide reference viewing angle.

[0007] In a vertical alignment (VA) mode LCD, the wide reference viewing angle can be realized by forming, in one pixel, a plurality of domains that include liquid crystals having different alignment directions.

[0008] in one example for forming such a plurality of domains in a single pixel, cutouts of minute slits are formed in the field generating electrodes. In this method, the plurality of domains may be formed by aligning the liquid crystal molecules vertically with respect to a fringe field generated between the edges of the cutouts and the field generating electrodes facing the edges.

[0009] The above information disclosed in this Background section is only for enhancement of understanding and therefore it may contain information that does not form the prior art that is already known to a person of ordinary skill in the art.

SUMMARY OF THE INVENTION

[0010] A liquid crystal display provides improved transmittance by controlling a fringe field on an edge portion of a pixel electrode.

[0011] In one aspect, a liquid crystal display includes: a first substrate and a second substrate facing each other; a liquid crystal layer between the first substrate and the second substrate; a lower pixel electrode positioned on the first substrate; a first passivation layer positioned on the lower pixel electrode; an upper pixel electrode positioned on the first passivation layer; and an opposing electrode positioned on the second substrate, wherein the upper pixel electrode comprises a stem and a plurality of minute branches extending outwardly from the stem, and the lower pixel electrode comprises a main body overlapping the plurality of minute branches and at least one bar-shaped portion extending along an edge of the main body maintaining a gap with the edge of the main body.

[0012] A position of an edge of the upper pixel electrode may be arranged in one of: alignment with an outer edge of the bar-shaped portion of the lower pixel electrode, alignment with the edge of the main body facing the bar-shaped portion, and between the outer edge of the bar-shaped portion of the lower pixel electrode and the edge of the main body facing the bar-shaped portion.

[0013] The lower pixel electrode and the upper pixel electrode may be electrically connected to each other.

[0014] At least one connector connecting the bar-shaped portion and the main body may be further included.

[0015] Ends of the minute branch electrodes of the upper pixel electrode facing the bar-shaped portion may be separated from each other.

[0016] The upper pixel electrode may further include a connection branch connecting the ends of the minute branch electrodes of the upper pixel electrode that do not face the bar-shaped portion.

[0017] A length of the bar-shaped portion may be equal to or more than ½ of a length of the edge of the main body facing the bar-shaped portion.

[0018] A width of the connector may be larger than 0 and less than a sum of a width of the stem of the upper pixel electrode and 1 μm.

[0019] A width of the bar-shaped portion may be more than 0 and less than 10 μm.

[0020] A length of the connector may be larger than 0.

[0021] The lower pixel electrode may comprise a first lower sub-pixel electrode and a second lower sub-pixel electrode that are supplied with different voltages obtained from a same image information, and the upper pixel electrode may comprise a first upper sub-pixel electrode and a second upper sub-pixel electrode that are supplied with different voltages obtained from the same image information.

[0022] In a liquid crystal display, transmittance may be improved in the edge portion of the pixel electrode.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] FIG. **1** is a layout view of one pixel of a liquid crystal display according to an exemplary embodiment,

[0024] FIG. **2** is a cross-sectional view of the liquid crystal display of FIG. **1** taken along the line II-II,

[0025] FIG. **3** is an enlarged view of the portion A of FIG. **1**,

[0026] FIG. **4** is a top plan view respectively showing a lower pixel electrode and an upper pixel electrode of the liquid crystal display of FIG. **1**,

[0027] FIG. **5** is a view of various shapes of a lower pixel electrode of a liquid crystal display according to an exemplary embodiment,

[0028] FIG. **6** is a view of various shapes of a lower pixel electrode of a liquid crystal display according to an exemplary embodiment,

[0029] FIG. **7** is a layout view showing the lower pixel electrode and the upper pixel electrode of FIG. **4** together,

[0030] FIG. **8** is a top plan view respectively showing a lower pixel electrode and an upper pixel electrode according to an exemplary embodiment,

[0031] FIG. **9** and FIG. **10** are layout views showing the lower pixel electrode and the upper pixel electrode of FIG. **8** together,

[0032] FIG. **11** is a top plan view respectively showing a lower pixel electrode and an upper pixel electrode according to an exemplary embodiment,

[0033] FIG. **12** and FIG. **13** are layout views showing the lower pixel electrode and the upper pixel electrode of FIG. **11** together,

[0034] FIG. **14** is a top plan view respectively showing a lower pixel electrode and an upper pixel electrode according to an exemplary embodiment,

[0035] FIG. **15** and FIG. **16** are layout views showing the lower pixel electrode and the upper pixel electrode of FIG. **14** together,

[0036] FIG. **17** is a layout view of one pixel of a liquid crystal display according to an exemplary embodiment,

[0037] FIG. **18** is a top plan view of a lower pixel electrode and an upper pixel electrode of the liquid crystal display of FIG. **16**,

[0038] FIG. **19** is a layout view showing the lower pixel electrode and the upper pixel electrode of FIG. **18** together,

[0039] FIG. **20** is a top plan view of a lower pixel electrode and an upper pixel electrode according to an exemplary embodiment,

[0040] FIG. **21** and FIG. **22** are layout views showing the lower pixel electrode and the upper pixel electrode of FIG. **20** together,

[0041] FIG. **23** is a top plan view of a lower pixel electrode and an upper pixel electrode according to an exemplary embodiment, and

[0042] FIG. **24** and FIG. **25** are layout views showing the lower pixel electrode and the upper pixel electrode of FIG. **23** together.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0043] Exemplary embodiments will be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments are shown. As those skilled in the art would realize, the described embodiments may be modified in various different ways, all without departing from the spirit or scope of the present disclosure.

[0044] In the drawings, the thickness of layers, films, panels, regions, etc., are exaggerated for clarity. Like reference numerals designate like elements throughout the specification. It will be understood that when an element such as a layer, film, region, or substrate is referred to as being "on" another element, it can be directly on the other element, or intervening elements may also be present. In contrast, when an element is referred to as being "directly on" another element, there are no intervening elements present.

[0045] Firstly, a liquid crystal display according to an exemplary embodiment will be described with reference to FIG. **1**, FIG. **2**, FIG. **3**, FIG. **4**, FIG. **5**, FIG. **6**, and FIG. **7**.

[0046] FIG. **1** is a layout view of one pixel of a liquid crystal display according to an exemplary embodiment, FIG. **2** is a cross-sectional view of the liquid crystal display of FIG. **1** taken along the line II-II, FIG. **3** is an enlarged view of the portion A of FIG. **1**, FIG. **4** is a top plan view respectively showing a lower pixel electrode and an upper pixel electrode of the liquid crystal display of FIG. **1**, FIG. **5** is a view of various shapes of a lower pixel electrode of a liquid crystal display according to an exemplary embodiment, FIG. **6** is a view of various shapes of a lower pixel electrode of a liquid crystal display according to an exemplary embodiment, and FIG. **7** is a layout view showing the lower pixel electrode and the upper pixel electrode of FIG. **4** together.

[0047] Referring to FIG. **1** and FIG. **2**, a liquid crystal display according to an exemplary embodiment includes a lower panel **100** and an upper panel **200** facing each other, and a liquid crystal layer **3** interposed between the two display panels **100** and **200**.

[0048] Firstly, the lower panel **100** will be described.

[0049] A plurality of gate lines **121** including gate electrodes **124** are formed on an insulation substrate **110**. The gate lines **121** transmit gate signals and extend in a transverse direction.

[0050] A gate insulating layer **140** is formed on the gate lines **121**, and a plurality of semiconductors **154** made of, for example, hydrogenated amorphous silicon or polysilicon are formed on the gate insulating layer **140**.

[0051] Ohmic contacts **163** and **165** are formed on the semiconductors **154**.

[0052] A plurality of data lines **171** and a plurality of drain electrodes **175** are formed on the ohmic contacts **163** and **165** and the gate insulating layer **140**.

[0053] The data lines **171** transmit data signal and extend in a mainly longitudinal direction thereby intersecting the gate lines **121**. The data lines **171** each include a source electrode **173** extending toward the gate electrode **124**.

[0054] The drain electrode **175** is separated from the data line **171** and includes a portion facing the source electrode **173**.

[0055] The ohmic contacts **163** and **165** are only disposed between the underlying semiconductor **154** and the overlying data line **171** and drain electrode **175**, thereby reducing contact resistance therebetween. The semiconductor **154** includes a portion that is not covered and is exposed by the data line **171** and the drain electrode **175** at a portion between the source electrode **173** and the drain electrode **175**.

[0056] The gate electrode **124**, the source electrode **173**, and the drain electrode **175** form a thin film transistor along with the semiconductor **154**, and a channel of the thin film transistor is formed in the semiconductor **154** between the source electrode **173** and the drain electrode **175**.

[0057] A first passivation layer **180***a* made of an insulating material is formed on the data line **171**, the drain electrode **175**, and the exposed semiconductor **154**. The first passivation layer **180***a* has a contact hole **185***a* that exposes the drain electrode **175**.

[0058] A plurality of lower pixel electrodes **91** are formed on the first passivation layer **180***a*.

[0059] Referring to FIG. **4**, the lower pixel electrode **91** includes a main body **92**, a bar-shaped portion **94***z*, and at least one connector **93***z*.

[0060] The main body **92** is an electrode having a plate shape and overlaps, via the insulating layer, a plurality of minute branches **193** of an upper pixel electrode **191** that will be described below. A shape of the main body **92** is an approximate rectangular, however it is not limited thereto. A length W**4** of the main body **92** in the horizontal direction may be determined according to design conditions of the liquid crystal display. The plate shape of the main body **92** is intact and does not include slits. A protrusion **95** protruded for connection with other layers may be formed at a lower end of the main body **92**. The protrusion **95** of the lower pixel electrode **91** is electrically connected to the drain electrode **175** through the contact hole **185***a*.

[0061] The bar-shaped portion **94***z* is an electrode having a bar shape that extends in either the horizontal direction (as shown in FIG. **4**) or the vertical direction, and faces an edge of the main body **92**. The bar-shaped portion **94***z* may extend with either a variable or constant (as shown in FIG. **4**) gap

with the edge of the main body **92**. FIG. **4** is an example in which the bar-shaped portion **94***z* extends along the horizontal direction and extends parallel to the upper edge B**2** of the main body **92**. The length W**5** of the bar-shaped portion **94***z* is equal to or more than ½ of the length W**4** at the edge of the main body **92** facing the bar-shaped portion **94***z*. The width W**3** of the bar-shaped portion **94***z* may be larger than 0 and less than about 10 μm. The width W**3** of the bar-shaped portion **94***z* may be constant or may change along the length direction.

[0062] The shape of the bar-shaped portion **94***z* is not limited to the rectangle as shown in FIG. **4**, and may be modified, and various examples of the bar-shaped portion **94***z* are shown in FIG. **5** and FIG. **6**. In detail, FIG. **5** shows an example in which the inner edge of the bar-shaped portion **94***z* that faces the edge of the main body **92** is parallel to the edge of the main body **92** facing the bar-shaped portion **94***z*, and FIG. **6** shows an example in which the outer edge of the bar-shaped portion **94***z* is parallel to the edge of the main body **92** facing the bar-shaped portion **94***z*. For reference, the side of the bar-shaped portion **94***z* toward the interior of the main body **92** of the lower pixel electrode **91** (nearest the edge of the main body **92**) is hereinafter referred to as the inside, or inner edge, and the side of the bar-shaped portion **94***z* toward the exterior of the main body **92**, opposite the inside, is hereinafter referred to as the outside, or outer edge. For instance, in FIG. **4**, the edge of the main body **92** facing the bar-shaped portion is marked B**2** and the outer edge is marked B**3**. The inner edge is not marked.

[0063] FIG. **5** (*a*) is an example of a right triangle shape of the bar-shaped portion **94***z*. An acute angle between the outer edge and the inner edge of the bar-shaped portion **94***z* may be disposed at the right side as shown in FIG. **5** (*a*), or alternatively may be disposed at the left side.

[0064] FIG. **5** (*b*) and FIG. **5** (*c*) are examples in which the bar-shaped portion **94***z* is formed of two right triangles that are symmetrical with respect to a longitudinal line. As shown in FIG. **5** (*b*), the vertices of two right triangles forming the right angle may meet each other, or the vertices of two right triangles forming the acute angle may meet each other as shown in FIG. **5** (*c*).

[0065] FIG. **5** (*d*) and FIG. **5** (*e*) show examples in which the bar-shaped portion **94***z* is made of two trapezoids that are symmetrical with reference to the longitudinal line. Particularly, the bar-shaped portion **94***z* of the exemplary embodiments shown in FIG. **5** (*d*) and FIG. **5** (*e*) includes the vertex forming the right angle. As shown in FIG. **5** (*d*), the vertexes of two right trapezoids forming the right angle may face each other and be spaced apart along the length of the bar-shaped portion **94***z*, and the vertices of two right trapezoids forming the acute angle may meet each other as shown in FIG. **5** (*e*).

[0066] FIG. **5** (*f*) shows an example of the bar-shaped portion **94***z* formed as one trapezoid. The vertex of the trapezoid forming the acute angle may be positioned at the right side as shown in FIG. **5** (*f*), or alternatively may be positioned at the left side. Also, the bar-shaped portion **94***z* may have various shapes.

[0067] The connector **93***z* electrically connects the main body **92** and the bar-shaped portion **94***z* to each other. The number of connectors **93***z* and the position of the connector **93***z* are not limited to FIG. **4**, and connector **93***z* may be formed with various numbers and in various positions. For example, the connector **93***z* may be positioned at the left edge or the right edge of the main body **92** and the bar-shaped portion **94***z*. The length W**2** (FIG. **4**) of the connector **93***z*, that is, a distance W**2** between the main body **92** and the bar-shaped portion **94***z*, is larger than 0, and the main body **92** and the bar-shaped portion **94***z* are separated from each other except at the connector **93***z*. The width W**1** of the connector **93***z* may be larger than 0 and may be less than about a sum of the width of the longitudinal stem of an upper pixel electrode **191** that will be described later and about 1 μm.

[0068] The lower pixel electrode **91** may be formed of a transparent conductive material such as ITO (indium tin oxide) or IZO (indium zinc oxide) or a reflective metal such as aluminum, silver, chromium, or alloys thereof.

[0069] A second passivation layer **180***b* (FIG. **2**) made of the insulating material is formed on the lower pixel electrode **91**. The second passivation layer **180***b* may have a thickness of less than 3.5 μm, and a dielectric ratio thereof may have a value of between about 1.5 and 8.5. The second passivation layer **180***b* has a contact hole **185***b* overlapping the contact hole **185***a* of the first passivation layer **180***a* and exposing at least one of the drain electrode **175** and the lower pixel electrode **91**. The edges of two contact holes **185***a* and **185***b* may approximately line up with each other.

[0070] The upper pixel electrode **191** is positioned on the second passivation layer **180***b*.

[0071] The upper pixel electrode **191** is rectangular and includes a stem **192** (FIG. **4**), a plurality of minute branches **193** outwardly extending from the stem **192**, connection branches **194***x* and **194***y* connecting ends of at a least portion of the minute branches **193**, and a protrusion **195**.

[0072] The stem **192** may include a transverse stem and a longitudinal stem crossing each other. The width W**6** of the stem **192** may be larger than a value of the width W**1** of the connector **93***z* of the lower pixel electrode **91** from which about 1 μm is subtracted (i.e., W**6**>(W**1**−(≈1 μm)), and thus the width W**1** of the connector **93***z* is larger than zero and less than a sum of the width W**6** of the stem plus 1 μm (i.e., 0<W**1**<(W**6**+(≈1 μm)).

[0073] The upper pixel electrode **191** is divided into a plurality of sub-regions by the stems **192**, for example four sub-regions. The direction in which the plurality of minute branches **193** extends is different at each sub-region. In detail, the minute branches **193** of the sub-region positioned in the right upper quadrant obliquely extend from the stem **192** in the right upper direction, the minute branches **193** of the sub-region positioned at the right lower quadrant obliquely extend from the stem **192** in the right lower direction, the minute branches **193** of the sub-region positioned at the left upper quadrant obliquely extend from the stem **192** in the left upper direction, and the minute branches **193** of the sub-region positioned at the left lower quadrant obliquely extend from the stem **192** in the left lower direction. The extending direction of the minute branches **193** makes an angle of about 45° with the extending direction of the gate line **121** or the transverse stem or the longitudinal stem.

[0074] The connection branches **194***x* and **194***y* may connect the ends of at least a portion of the minute branches along the edges of upper pixel electrode **191** that are not in a position corresponding to the position of an edge facing the bar-shaped portion **94***z* of the lower pixel electrode **91** (for instance, not along edge B**1** in FIG. **4**). Accordingly, in the present exemplary embodiment, the connection branches **194***x* and **194***y* may be positioned along the edges of the upper pixel electrode **191** except for the upper edge. In detail, the connection branch **194***x* connects the ends of the minute

branches **193** obliquely extending in the left direction, and it extends in the vertical direction thereby forming the left edge of the upper pixel electrode **191**. The connection branch **194***y* connects the ends of the minute branches **193** obliquely extending in the right direction, and it extends in the vertical direction thereby forming the right edge of the upper pixel electrode **191**.

[0075] Differently from FIG. **4**, the upper pixel electrode **191** may further include a connection branch (not shown) connecting the ends of the minute branches **193** obliquely extending in the lower direction and extending in the horizontal direction thereby forming the lower end of the upper pixel electrode **191**.

[0076] At least one of the connection branches **194***x* and **194***y* may be omitted.

[0077] Also, it is preferable that the ends of the minute branches **193** of the upper pixel electrode **191** positioned along the side corresponding to side in which the bar-shaped portion **94***z* of the lower pixel electrode **91** is positioned (e.g., the minute branches **193** positioned at edge B1 in FIG. **4**) are not connected to each other. For example, referring to FIG. **4**, when the lower pixel electrode **91** includes the bar-shaped portion **94***z* at the upper end, at the upper edge of the upper pixel electrode **191** corresponding thereto, a configuration such as the connection branch connecting the ends of the minute branches **193** may not be included.

[0078] The protrusion **195** for connection with other layers may be protruded from the lower end of the longitudinal stem of the stem **192** to the lower side. The protrusion **195** of the upper pixel electrode **191** is electrically connected to at least one of the drain electrode **175** and the lower pixel electrode **91** through the contact hole **185***b*.

[0079] The upper pixel electrode **191** may also be made of a transparent conductive material such as ITO or IZO or a reflective metal such as aluminum, silver, chromium, or alloys thereof.

[0080] Next, the upper panel **200** (FIG. **2**) will be described.

[0081] A light blocking member **220** and a color filter **230** are formed on an insulation substrate **210**. Each color filter **230** may display one of primary colors such as three primary colors of red, green, and blue.

[0082] An overcoat **250** may be formed on the color filter **230** and the light blocking member **220**, and an opposing electrode **270** is formed on the entire surface of the substrate on the overcoat **250**. The opposing electrode **270** may be formed as a plate to face a plurality of lower and upper pixel electrodes **91** and **191**.

[0083] Alignment layers **11** and **21** are respectively positioned on inner surfaces of the display panel **100** and **200**, and they may be vertical alignment layers.

[0084] A polarizer (not shown) is provided on the outer surface of the display panels **100** and **200**, the polarization axis of the two polarizers may be crossed, and one polarization axis of them is preferably parallel to the gate line **121**. In a case of the reflective liquid crystal display, one of the two polarizers may be omitted.

[0085] A liquid crystal layer **3** is positioned between the two display panels **100** and **200**, and includes liquid crystal molecules **31** having negative dielectric anisotropy. The liquid crystal molecules **31** may have a pretilt, in which the liquid crystal molecule **31** is tilted without application of an electric field, such that the long axes thereof are oriented approximately parallel to the length direction (the extending direction) of the minute branches **193** of the upper pixel electrode **191**. The liquid crystal molecules **31** may be aligned to be vertical with respect to the surface of the display panels **100** and **200** in a state that an electric field is not applied to the liquid crystal layer **3**. Also, the liquid crystal layer **3** may further include an alignment assistance agent including a reactive mesogen such that the liquid crystal molecules **31** may have the pretilt as a result of the alignment assistance agent such that the long axes thereof are approximately parallel to the length direction of the minute branches **193**.

[0086] In another exemplary embodiment, the alignment assistance agent may be included in the alignment layers **11** and **21**. The alignment layers **11** and **21** include a main chain and a side chain, and the alignment assistance agent forms the side chain of the alignment layer **11** and **21** and may have negative dielectric anisotropy. The liquid crystal molecules **31** may have a pretilt so that they are oriented approximately parallel to the length direction of the minute branches **193** by the side chain.

[0087] Next, an operation of the liquid crystal display according to an exemplary embodiment will be described.

[0088] When a signal is applied to the gate line **121**, the switching element of the thin film transistor connected to the gate line **121** is turned on. Thus, a data voltage, which is applied to the data line **171**, is applied to the lower pixel electrode **91** and the upper pixel electrode **191** through the turned-on switching element. The lower and upper pixel electrodes **91** and **191** applied with the data voltage along with a predetermined voltage such as a common voltage Vcom applied to the opposing electrode **270** generate an electric field in the liquid crystal layer **3**. Thus, the orientations of the liquid crystal molecules **31** of the liquid crystal layer **3** are changed such that their direction is parallel to the direction of the electric field in response to the electric field. In this case, the orientation of the liquid crystal molecules is approximately vertical with respect to the plane of the substrates.

[0089] The lower pixel electrode **91** and the opposing electrode **270** may form the vertical electric field in the liquid crystal layer **3** such that the electric field between the minute branches **193** adjacent to the upper pixel electrode **191** is distorted thereby forming a fringe field. The liquid crystal molecules **31** are arranged in a predetermined direction by the fringe field, and resultantly they are inclined in the direction approximately parallel to the length direction of the minute branches **193**. When the polarization axis of the polarizer attached to the outer surface of the lower panel **100** and the polarization axis of the polarizer attached to the outer surface of the upper panel **200** are respectively in about a horizontal direction and a vertical direction, and the liquid crystal molecules **31** are arranged parallel to the length direction of the minute branches **193**, the display displays the brightest white.

[0090] Referring to FIG. **3**, for the portion of upper pixel **191** where the ends of the minute branches **193** are not connected to each other, the horizontal component E**1** of the fringe field formed between the upper edge of the minute branches **193** and the opposing electrode **270** is approximately perpendicular to the edge of the minute branches **193**. The horizontal component E**2** of the fringe field formed between the inner edge of the bar-shaped portion **94***z* of the lower pixel electrode **91** and the opposing electrode **270** is approximately perpendicular to the lower edge of the bar-shaped portion **94***z* and is opposite to the direction of the horizontal component E**1** of the fringe field formed by the minute branches **193**. Accordingly, the horizontal component E**1** of the fringe field by the edge of the minute branches **193**

and the horizontal component E2 of the fringe field by the inner edge of the bar-shaped portion **94***z* may be offset to each other. Also, the bar-shaped portion **94***z* of the lower pixel electrode **91** may block an external electric field. Accordingly, the bar-shaped portion **94***z* of the lower pixel electrode **91** may prevent the liquid crystal molecules **31** from not being arranged approximately parallel to the length direction of the minute branches **193** such that the arrangement direction is scattered. Accordingly, the transmittance may be increased in the edge portion of the lower and upper pixel electrodes **91** and **191**.

[0091] As described above, the horizontal components of the fringe field are offset along the edge of the lower and upper pixel electrodes **91** and **191** to effectively increase the transmittance, as shown in FIG. **1**, FIG. **3**, FIG. **4**, and FIG. **7**, and it is preferable that the edge B1 of the upper pixel electrode **191** is not disposed outside the outer edge B3 of the bar-shaped portion **94***z* of the lower pixel electrode **91** on the plane, and also is not inside the edge B2 of the main body facing the bar-shaped portion **94***z*. In other words, when the edge B1 along the ends of the minute branches **193** of the upper pixel electrode **191** facing the bar-shaped portion **94***z* of the lower pixel electrode **91** is arranged to align with the outer edge B3 of the bar-shaped portion **94***z* of the lower pixel electrode **91** or the edge B2 of the main body **92** facing the bar-shaped portion **94***z* or is positioned therebetween, the transmittance at the edge of the lower and the upper pixel electrodes **91** and **191** may be further improved. FIG. **1** shows an example in which the outer edge B3 of the bar-shaped portion **94***z* of the lower pixel electrode **91** is arranged to align with the edge B1 connecting the upper ends of the minute branches **193** of the upper pixel electrode **191**, and FIG. **7** shows an example in which the upper edge B2 of the main body **92** facing the bar-shaped portion **94***z* of the lower pixel electrode **91** is arranged to align with the edge B1 connecting the ends of the minute branches **193** of the upper pixel electrode **191**.

[0092] However, in an exemplary embodiment, the end of the minute branches **193** of the upper pixel electrode **191** facing the bar-shaped portion **94***z* of the lower pixel electrode **91** may emerge from the outer edge B3 of the bar-shaped portion **94***z* of the lower pixel electrode **91** or may be positioned inside the edge B2 of the main body **92** facing the bar-shaped portion **94***z*. In this case, as a distance that the ends of the minute branches **193** of the upper pixel electrode **191** facing the bar-shaped portion **94***z* of the lower pixel electrode **91** deviate from the outer edge B3 of the bar-shaped portion **94***z* of the lower pixel electrode **91** or the edge B2 of the main body **92** is decreased, the transmittance may be increased along the edge of the lower and upper pixel electrodes **91** and **191**.

[0093] Next, the lower electrode and the upper pixel electrode according to various exemplary embodiments of the liquid crystal display will be described with reference to FIG. **8** to FIG. **16** as well as the above-described drawings. Like reference numerals designate like elements in the embodiments, and repetitive description will be omitted.

[0094] FIG. **8** is a top plan view respectively showing a lower pixel electrode and an upper pixel electrode according to an exemplary embodiment, and FIG. **9** and FIG. **10** are layout views showing the lower pixel electrode and the upper pixel electrode of FIG. **8** together.

[0095] Referring to FIG. **8**, the lower pixel electrode **91** of the liquid crystal display according to the present exemplary embodiment is the same as most of the exemplary embodiment shown in FIG. **4**, however it further includes a bar-shaped portion **94***w* connected through a connection **93***w* at the lower end of the main body **92**. The protrusion **95** may protrude from the bar-shaped portion **94***w*. The lower bar-shaped portion **94***w* may be approximately symmetrical to the upper bar-shaped portion **94***z* with respect to the main body **92**. Also, the various dimensions, arrangements, and shapes of the bar-shaped portion **94***w* and the connection **93***w* can be the same as those of the above-described bar-shaped portion **94***z* and connection **93***z*, such that the detailed description is omitted.

[0096] Also, the upper pixel electrode **191** of the liquid crystal display according to the present exemplary embodiment is the same as in the exemplary embodiment shown in FIG. **4** such that the detailed description is omitted.

[0097] The lower pixel electrode **91** and the upper pixel electrode **191** according to the present exemplary embodiment overlap each other via the second passivation layer **180***b*, and the upper end and the lower end of the upper pixel electrode **191** may be arranged to align with the outer edge of the bar-shaped portion **94***z* and **94***w* of the lower pixel electrode **91** or the edge of the main body **92** facing the bar-shaped portions **94***z* and **94***w*, or may be positioned therebetween. FIG. **9** is an example in which the outer edge of the bar-shaped portions **94***w* and **94***z* of the lower pixel electrode **91** is arranged to align with the lower end and the upper end, respectively of the upper pixel electrode **191**, and FIG. **10** is an example in which the edge of the main body **92** facing the bar-shaped portions **94***w* and **94***z* of the lower pixel electrode **91** is arranged to align with the upper end and the lower end, respectively, of the upper pixel electrode **191**.

[0098] FIG. **11** is a top plan view respectively showing a lower pixel electrode and an upper pixel electrode according to an exemplary embodiment, and FIG. **12** and FIG. **13** are layout views showing the lower pixel electrode and the upper pixel electrode of FIG. **11** together.

[0099] Referring to FIG. **11**, the lower pixel electrode **91** of the liquid crystal display according to the present exemplary embodiment is the same as most of the exemplary embodiment shown in FIG. **4**, however the bar-shaped portion is not positioned along the upper side and the lower side of the main body **92**, but along the left side or the right side. That is, the lower pixel electrode **91** may include a main body **92**, a bar-shaped portion **94***x* connected to the main body **92** through the left connection **93***x*, or a bar-shaped portion **94***y* connected to the main body **92** through the right connection **93***y*.

[0100] The two bar-shaped portions **94***x* and **94***y* may be symmetrical with respect to each other and with respect to the main body **92**. Also, the various dimensions, arrangements, and shapes of the bar-shaped portions **94***x* and **94***y* and the connections **93***x* and **93***y* can be the same as those previously described for the bar-shaped portion **94***z* and the connection **93***z* such that the detailed description is omitted.

[0101] Further, the upper pixel electrode **191** of the liquid crystal display according to the present exemplary embodiment is the same as most of the upper pixel electrode **191** shown in FIG. **4**, however connection branches **194***z* connecting the ends of the minute branches **193** at the upper end of the upper pixel electrode **191** are further included and there are no left or right connection branches of the upper pixel electrode **191** shown in FIG. **4**. The lower pixel electrode **91** includes the bar-shaped portions **94***x* and **94***y* positioned at the left side

and the right side of the main body **92** such that the connection branches connecting the ends of the left and right minute branches **193** of the upper pixel electrode **191** are not necessary. Also, in the present exemplary embodiment, the connection branches **194***z* positioned on the upper pixel electrode **191** may be omitted.

[0102] The lower pixel electrode **91** and the upper pixel electrode **191** according to the present exemplary embodiment overlap each other via the second passivation layer **180***b*, and the left edge and the right edge of the upper pixel electrode **191** may be arranged to align with the outer edge of the bar-shaped portions **94***x* and **94***y*, respectively, of the lower pixel electrode **91** or the edge of the main body **92** facing the bar-shaped portions **94***x* and **94***y*, respectively, or may be positioned therebetween. FIG. **12** shows an example in which the outer edge of the bar-shaped portion **94***x* and **94***y* of the lower pixel electrode **91** is arranged to align with the left edge or the right edge, respectively, of the upper pixel electrode **191**, and FIG. **13** shows an example in which the edge of the main body **92** facing the bar-shaped portion **94***x* and **94***y* of the lower pixel electrode **91** is arranged to align with the left edge and the right edge, respectively, of the upper pixel electrode **191**.

[0103] FIG. **14** is a top plan view respectively showing a lower pixel electrode and an upper pixel electrode according to an exemplary embodiment of the present invention, and FIG. **15** and FIG. **16** are layout views showing the lower pixel electrode and the upper pixel electrode of FIG. **14** together.

[0104] Referring to FIG. **14**, the lower pixel electrode **91** of the liquid crystal display according to the present exemplary embodiment includes features of the exemplary embodiments shown in both FIG. **4** and FIG. **11**. That is, the lower pixel electrode **91** may include a main body **92**, a bar-shaped portion **94***x* connected to the main body **92** through the left connection **93***x*, a bar-shaped portion **94***y* connected to the main body **92** through the right connection **93***y*, and a bar-shaped portion **94***z* connected to the main body **92** through the upper connection **93***z*. Alternatively, only one or two of the left connection **93***x*, the right connection **93***y*, and the upper connection **93***z* may exist.

[0105] Also, the upper pixel electrode **191** of the liquid crystal display according to the present exemplary embodiment is the same as most of the upper pixel electrode **191** shown in FIG. **11**, however the connection branch connecting the ends of the upper minute branches **193** of the upper pixel electrode **191** may be omitted. The lower pixel electrode **91** includes the bar-shaped portions **94***x*, **94***y*, and **94***z* of the left side, the right side, and the upper side, respectively, such that the connection branch connecting the ends of the minute branches **193** of the upper pixel electrode **191** is not necessary. In contrast, a connection branch (not shown) connecting the ends of the minute branches **193** positioned at the lower end of the upper pixel electrode **191** may be added.

[0106] The lower pixel electrode **91** and the upper pixel electrode **191** according to the present exemplary embodiment overlap each other via the second passivation layer **180***b*, and the left, right, and upper edges of the upper pixel electrode **191** may be arranged to align with the outer edge of the bar-shaped portions **94***x*, **94***y*, and **94***z*, respectively, of the lower pixel electrode **91** or the edge of the main body **92** facing the bar-shaped portions **94***x*, **94***y*, and **94***z*, respectively. FIG. **15** shows an example in which the outer edge of the bar-shaped portions **94***x*, **94***y*, and **94***z* of the lower pixel electrode **91** is arranged to align with the edge of the upper pixel electrode **191**, and FIG. **16** shows an example in which the edge of the main body **92** facing the bar-shaped portion **94***x*, **94***y*, and **94***z* of the lower pixel electrode **91** is arranged to align with the edge of the upper pixel electrode **191**.

[0107] Next, a liquid crystal display according to an exemplary embodiment will be described with reference to FIG. **17**, FIG. **18**, and FIG. **19**.

[0108] FIG. **17** is a layout view of one pixel of a liquid crystal display according to an exemplary embodiment, FIG. **18** is a top plan view of a lower pixel electrode and an upper pixel electrode of the liquid crystal display of FIG. **16**, and FIG. **19** is a layout view showing the lower pixel electrode and the upper pixel electrode of FIG. **18** together.

[0109] The liquid crystal display according to the present exemplary embodiment has a similar cross-section to the liquid crystal display according to the exemplary embodiment shown in FIG. **1** to FIG. **7**. Differences from the above-described exemplary embodiment will be described.

[0110] Referring to the lower panel, a plurality of gate conductors include a plurality of gate lines **121**, a plurality of step-down gate lines **123**, and a plurality of storage electrode lines **125** are formed on an insulation substrate **110**.

[0111] The gate lines **121** and the step-down gate lines **123** extend in a mainly transverse direction and transmit gate signals. The gate line **121** includes a first gate electrode **124***a* and a second gate electrode **124***b*, and the step-down gate line **123** includes a third gate electrode **124***c*. The first gate electrode **124***a* and the second gate electrode **124***b* are connected to each other.

[0112] The storage electrode line **125** may extend mainly in the transverse direction and transmits a predetermined voltage such as a common voltage Vcom. The storage electrode line **125** may include a storage expansion **126** extending downward.

[0113] A gate insulating layer **140** is positioned on the gate conductor, and a plurality of semiconductor stripes (not shown) are formed thereon. The semiconductor stripes include first and second semiconductors **154***a* and **154***b* extending mainly in the longitudinal direction toward the first and second gate electrodes **124***a* and **124***b* and connected to each other, and a third semiconductor **154***c* connected to the second semiconductor **154***b*.

[0114] A plurality of ohmic contacts (not shown) are positioned on the semiconductor stripes, and data conductors including a plurality of data lines **171**, a plurality of first drain electrodes **175***a*, a plurality of second drain electrodes **175***b*, and a plurality of third drain electrodes **175***c* are formed thereon.

[0115] Each data line **171** includes a first source electrode **173***a* and a second source electrode **173***b* extending, respectively, toward the first gate electrode **124***a* and the second gate electrode **124***b*.

[0116] The first drain electrode **175***a*, the second drain electrode **175***b*, and the third drain electrode **175***c* include one end having a wide area and the other end having a bar shape. The bar-shaped ends of the first drain electrode **175***a* and the second drain electrode **175***b* are partially enclosed by the first source electrode **173***a* and the second source electrode **173***b*. The wide end of the first drain electrode **175***a* extends again, thereby forming a third source electrode **173***c*. A wide end **177***c* of the third drain electrode **175***c* overlaps the storage expansion **126** thereby forming a step-down capacitor Cstd, and the bar end is partially enclosed by the third source electrode **173***c*.

[0117] The first/second/third gate electrode **124***a*/**124***b*/**124***c*, the first/second/third source electrode **173***a*/**173***b*/**173***c*, and the first/second/third drain electrode **175***a*/**175***b*/**175***c* form first/second/third thin film transistors (TFT) (Qa/Qb/Qc of FIG. **17**) together with the first/second/third semiconductor **154***a*/**154***b*/**154***c*. A channel of the thin film transistor is formed in each semiconductor **154***a*/**154***b*/**154***c* between each source electrode **173***a*/**173***b*/**173***c* and each drain electrode **175***a*/**175***b*/**175***c*.

[0118] The first passivation layer (not shown) is formed on the data conductor and the exposed portion of the semiconductors **154***a*, **154***b*, and **154***c*. The first passivation layer **180***a* includes a contact hole **188***a* exposing the first drain electrode **175***a* and a contact hole **189***a* exposing the second drain electrode **175***b*.

[0119] A plurality of lower pixel electrodes including a first lower sub-pixel electrode **91***a* and a second lower sub-pixel electrode **91***b* are formed on the first passivation layer **180***a*. The first lower sub-pixel electrode **91***a* (FIG. **18**) includes a main body **92***a*, a protrusion **95***a*, a bar-shaped portion **94***az*, and a connector **93***az*, and the second lower sub-pixel electrode **91***b* includes a main body **92***b*, a protrusion **95***b*, a bar-shaped portion **94***bz*, and a connector **93***bz*. The various detailed shapes and dimensions of the first lower sub-pixel electrode **91***a* and the second lower sub-pixel electrode **91***b* are the same as most of the exemplary embodiment shown in FIG. **1** to FIG. **7** such that the detailed description is omitted.

[0120] The second passivation layer **180***b* is positioned on the lower pixel electrode **91***a* and **91***b*. The second passivation layer **180***b* has contact holes **188***b* and **189***b* approximately overlapping the contact holes **188***a* and **189***a* of the first passivation layer **180***a* exposing the first and second drain electrodes **175***a* and **175***b*, and at least one of the first and second lower sub-pixel electrodes **91***a* and **91***b*. The edges of the two corresponding contact holes **188***a* and **188***b* may approximately align with each other, and the edges of two contact holes **189***a* and **189***b* may approximately align with each other.

[0121] A plurality of upper pixel electrodes including first and second upper sub-pixel electrodes **191***a* and **191***b* are formed on the second passivation layer **180***b*.

[0122] The overall shape of the first upper sub-pixel electrode **191***a* is rectangular and includes a stem **192***a* including a transverse stem and a longitudinal stem, a plurality of minute branches **193***a* extending outwardly from the stem **192***a*, connection branches **194***ax* and **194***ay* connecting the ends of at least a portion of the minute branches **193***a*, and a protrusion **195***a*. The second upper sub-pixel electrode **191***b* also is a rectangular and includes a stem **192***b* including a transverse stem and a longitudinal stem, a plurality of minute branches **193***b* extending outwardly from the stem **192***b*, connection branches **194***bx* and **194***by* connecting the ends of at least a portion of the minute branches **193***b*, and a protrusion **195***b*. The detailed shape of the first upper sub-pixel electrode **191***a* and the second upper sub-pixel electrode **191***b* is the same as most of the upper pixel electrode of the exemplary embodiment shown in FIG. **1** to FIG. **7** such that the detailed description is omitted.

[0123] The first and second lower sub-pixel electrodes **91***a* and **91***b* and the first and second upper sub-pixel electrodes **191***a* and **191***b* overlap each other via the second passivation layer **180***b*, and the various possible overlapping arrangements are the same as in the exemplary embodiment shown in FIG. **1** to FIG. **7**. FIG. **17** shows the example in which the outer edge of the bar-shaped portions **94***az* and **94***bz* of the first and second lower sub-pixel electrodes **91***a* and **91***b* is arranged to align with the edge of the first and second upper sub-pixel electrodes **191***a* and **191***b*, and FIG. **19** shows the example in which the edge of the main bodies **92***a* and **92***b* of the bar-shaped portions **94***az* and **94***bz* of the first and second lower sub-pixel electrodes **91***a* and **91***b* is arranged to align with the edge of the first and second upper sub-pixel electrodes **191***a* and **191***b*.

[0124] The first lower sub-pixel electrode **91***a* and the first upper sub-pixel electrode **191***a* receive the data voltages from the first drain electrode **175***a* through the contact holes **188***a* and **188***b*, and the second lower sub-pixel electrode **91***b* and the second upper sub-pixel electrode **191***b* receives the data voltages from the second drain electrode **175***b* through the contact holes **189***a* and **189***b*.

[0125] The description of the upper panel, the liquid crystal layer, the alignment layer, etc. is the same as most of the above-described exemplary embodiment such that the detailed description thereof is omitted.

[0126] The operation of the liquid crystal display according to the present exemplary embodiment will now be described.

[0127] First, when a gate-on voltage Von is applied to gate line **121**, the first and second thin film transistors Qa and Qb connected thereto are turned on, and the data voltage applied to the data line **171** is equally applied to the first lower and upper sub-pixel electrodes **91***a* and **191***a* and the second lower and upper sub-pixel electrodes **91***b* and **191***b* through the turned-on first and second thin film transistors Qa and Qb. At this time, the step-down gate line **123** is applied with the gate-off voltage Voff.

[0128] Next, when the gate-off voltage is applied to the gate line **121** and simultaneously the gate-on voltage is applied to the step-down gate line **123**, the first and second switching elements Qh and Ql connected to the gate line **121** are turned off, and the third switching element Qc is turned on. Accordingly, the charges of the second lower and upper sub-pixel electrodes **91***b* and **191***b* connected to the output terminal of the second switching element Qb flows in the step-down capacitor Cstd such that the voltage of the second lower and upper sub-pixel electrodes **91***b* and **191***b* is decreased. The first lower sub-pixel electrode and second lower subpixel electrode are supplied with different voltages obtained from a same image information, and the first upper sub-pixel electrode and the second upper sub-pixel electrode are supplied with different voltages obtained from the same image information. Therefore, the voltage of the second lower and upper sub-pixel electrodes **91***b* and **191***b* is always lower than the voltage of the first lower and upper sub-pixel electrodes **91***a* and **191***a*, thereby improving the lateral visibility of the liquid crystal display.

[0129] Next, the lower and upper sub-pixel electrodes according to various exemplary embodiments of the liquid crystal display of the exemplary embodiment shown in FIG. **17** will be described with reference to FIG. **20** to FIG. **25**. The same constituent elements as in the previous exemplary embodiment are indicated by the same reference numerals, and repetitive description is omitted.

[0130] FIG. **20** is a top plan view of a lower pixel electrode and an upper pixel electrode according to an exemplary embodiment, and FIG. **21** and FIG. **22** are layout views showing the lower pixel electrode and the upper pixel electrode of FIG. **20** together.

[0131] Referring to FIG. **20**, the first and second lower sub-pixel electrodes **91***a* and **91***b* of the liquid crystal display according to the present exemplary embodiment are the same as most of the lower pixel electrode shown in FIG. **18**, however the bar-shaped portion is not positioned on a top or under side of the main body **92***a* and **92***b*, but is positioned at the left side and/or the right side. That is, the first and second lower sub-pixel electrodes **91***a* and **91***b* may respectively include main bodies **92***a* and **92***b*, bar-shaped portions **94***ax* and **94***bx* connected to the main body **92***a* and **92***b* through left connections **93***ax* and **93***bx*, and/or bar-shaped portions **94***ay* and **94***by* connected to the main bodies **92***a* and **92***b* through right connections **93***ay* and **93***by*. Accordingly, the first upper sub-pixel electrode **191***a* may comprise a connection branch **194***az* connecting the upper ends of the minute branches **193***a* extending upward, and the second upper sub-pixel electrode **191***b* may comprise a connection branch **194***bz* connecting the bottom ends of the minute branches **193***b* extending downward.

[0132] Also, the features of the first and second lower sub-pixel electrodes **91***a* and **91***b* and the features of the first and second upper sub-pixel electrodes **191***a* and **191***b* are the same as most of the lower pixel electrode and the upper pixel electrode of the exemplary embodiment shown in FIG. **11** such that the detailed description thereof is omitted.

[0133] The lower pixel electrodes **91***a* and **91***b* and the upper pixel electrodes **191***a* and **191***b* according to the present exemplary embodiment overlap each other via the second passivation layer, and the left edge and the right edge of the upper pixel electrodes **191***a* and **191***b* may be arranged to align, respectively, with the outer edge of the bar-shaped portions **94***ax*, **94***ay*, **93***bx*, and **94***by* of the lower pixel electrodes **91***a* and **91***b* or the edge of the main bodies **92***a* and **92***b* facing the bar-shaped portions **94***ax*, **94***ay*, **93***bx*, and **94***by*, or may be positioned therebetween. FIG. **21** shows an example in which the outer edge of the bar-shaped portions **94***ax*, **94***ay*, **93***bx*, and **94***by* of the lower pixel electrodes **91***a* and **91***b* is arranged to align, respectively, with the edge of the upper pixel electrodes **191***a* and **191***b*, and FIG. **22** shows an example in which the edge of the main bodies **92***a* and **92***b* facing the bar-shaped portions **94***ax*, **94***ay*, **93***bx*, and **94***by* of the lower pixel electrodes **91***a* and **91***b* is arranged to align, respectively, with the edge of the upper pixel electrodes **191***a* and **191***b*.

[0134] FIG. **23** is a top plan view of a lower pixel electrode and an upper pixel electrode according to an exemplary embodiment, and FIG. **24** and FIG. **25** are layout views showing the lower pixel electrode and the upper pixel electrode of FIG. **23** together.

[0135] Referring to FIG. **23**, the first and second lower sub-pixel electrodes **91***a* and **91***b* of the liquid crystal display according to the present exemplary embodiment may include all the characteristics of the lower pixel electrode of the exemplary embodiment shown in FIG. **18** and the exemplary embodiment of FIG. **20**. That is, the first and second lower sub-pixel electrodes **91***a* and **91***b* may respectively include main bodies **92***a* and **92***b*, bar-shaped portions **94***ax* and **94***bx* connected to the main bodies **92***a* and **92***b* through the connectors, bar-shaped portions **94***ay* and **94***by* connected to the main bodies **92***a* and **92***b* through the connectors, and bar-shaped portions **94***az* and **94***bz* connected to the main bodies **92***a* and **92***b* through the connectors **93***az* and **93***bz*. As shown in FIG. **23**, the connectors connecting the left and right bar-shaped portions **94***ax*, **94***bx*, **94***ay*, and **94***by* to the main body **92***a* and **92***b* along the left and right sides of the main body **92***a*, **92***b* may be omitted, as bar-shaped portions **94***ax*, **94***bx*, **94***ay*, and **94***by* are connected, respectively, to bar-shaped portions **94***az* and **94***bz*, which are connected to the main body **92***a* and **92***b* via connectors **93***az* and **93***bz*.

[0136] Also, the first and second upper sub-pixel electrodes **191***a* and **191***b* of the liquid crystal display according to the present exemplary embodiment may be the same as most of the upper pixel electrode **191** shown in FIG. **14** and FIG. **17**.

[0137] The lower pixel electrodes **91***a* and **91***b* and the upper pixel electrodes **191***a* and **191***b* according to the present exemplary embodiment overlap each other via the second passivation layer, and the outer edge of the upper pixel electrodes **191***a* and **191***b* may be arranged to align, respectively, with the outer edge of the bar-shaped portions **94***ax*, **94***ay*, **94***az*, **94***bx*, **94***by*, and **94***bz* of the lower pixel electrode **91***a* and **91***b* or the edge of the main bodies **92***a* and **92***b* facing the bar-shaped portions **94***ax*, **94***ay*, **94***az*, **94***bx*, **94***by*, and **94***bz*, or may be positioned therebetween. FIG. **24** shows an example in which the outer edge of the bar-shaped portions **94***ax*, **94***ay*, **94***az*, **94***bx*, **94***by*, and **94***bz* of the lower pixel electrodes **91***a* and **91***b* is arranged to align, respectively, with the edge of the upper pixel electrodes **191***a* and **191***b*, and FIG. **25** shows an example in which the edge of the main bodies **92***a* and **92***b* facing the bar-shaped portions **94***ax*, **94***ay*, **94***az*, **94***bx*, **94***by*, and **94***bz* of the lower pixel electrodes **91***a* and **91***b* is arranged to align, respectively, with the edge of the upper pixel electrodes **191***a* and **191***b*.

[0138] The structure according to the various exemplary embodiments may be applied to a liquid crystal display of various structures including an upper pixel electrode including a plurality of minute branch electrodes and a lower pixel electrode overlapping the plurality of minute branch electrodes.

[0139] While the embodiments have been described in connection with what is presently considered to be practical exemplary embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the disclosure including the appended claims.

<Description of Symbols>

3: liquid crystal layer	11, 21: alignment layer
31: liquid crystal molecule	91, 91a, 91b: lower pixel electrode
100: lower panel	110, 210: insulation substrate
121, 123: gate line	
124, 124a, 124b, 124c: gate electrode	
125: storage electrode line	
140: gate insulating layer	154, 154a, 154b,
154c: semiconductor	
163, 165: ohmic contact	171: data line
173, 173a, 173b, 173c: source electrode	
175, 175a, 175b, 175c: drain electrode	
180a, 180b: passivation layer	
185, 185a, 185b, 188a, 188b, 189a, 189b: contact hole	
191, 191a, 191b: upper pixel electrode	
200: upper panel	220: light blocking member
230: color filter	250: overcoat
270: opposing electrode	

What is claimed is:

1. A liquid crystal display comprising:

a first substrate and a second substrate facing each other;

a liquid crystal layer between the first substrate and the second substrate;

a lower pixel electrode positioned on the first substrate;

a first passivation layer positioned on the lower pixel electrode;

an upper pixel electrode positioned on the first passivation layer; and

an opposing electrode positioned on the second substrate,

wherein the upper pixel electrode comprises a stem and a plurality of minute branches extending outwardly from the stem, and

the lower pixel electrode comprises a main body overlapping the plurality of minute branches and at least one bar-shaped portion extending along an edge of the main body maintaining a gap with the edge of the main body.

2. The liquid crystal display of claim **1**, wherein

a position of an edge of the upper pixel electrode is arranged in one of: alignment with an outer edge of the bar-shaped portion of the lower pixel electrode, alignment with the edge of the main body facing the bar-shaped portion, and between the outer edge of the bar-shaped portion of the lower pixel electrode and the edge of the main body facing the bar-shaped portion.

3. The liquid crystal display of claim **2**, wherein

the lower pixel electrode and the upper pixel electrode are electrically connected to each other.

4. The liquid crystal display of claim **3**, further comprising

at least one connector connecting the bar-shaped portion and the main body.

5. The liquid crystal display of claim **4**, wherein

ends of the minute branch electrodes of the upper pixel electrode facing the bar-shaped portion are separated from each other.

6. The liquid crystal display of claim **5**, wherein

the upper pixel electrode further comprises a connection branch connecting the ends of the minute branch electrodes of the upper pixel electrode that do not face the bar-shaped portion.

7. The liquid crystal display of claim **6**, wherein

a length of the bar-shaped portion is equal to or more than ½ of a length of the edge of the main body facing the bar-shaped portion.

8. The liquid crystal display of claim **7**, wherein

a width of the connector is larger than 0 and less than a sum of a width of the stem of the upper pixel electrode and 1 μm.

9. The liquid crystal display of claim **8**, wherein

a width of the bar-shaped portion is more than 0 and less than 10 μm.

10. The liquid crystal display of claim **9**, wherein

a length of the connector is larger than 0.

11. The liquid crystal display of claim **10**, wherein

the lower pixel electrode comprises a first lower sub-pixel electrode and a second lower sub-pixel electrode that are supplied with different voltages obtained from a same image information, and

the upper pixel electrode comprises a first upper sub-pixel electrode and a second upper sub-pixel electrode that are supplied with the different voltages obtained from the same image information.

12. The liquid crystal display of claim **1**, wherein

the lower pixel electrode and the upper pixel electrode are electrically connected to each other.

13. The liquid crystal display of claim **1**, further comprising

at least one connector connecting the bar-shaped portion and the main body.

14. The liquid crystal display of claim **13**, wherein

a width of the connector is larger than 0 and less than a sum of a width of the stem of the upper pixel electrode and 1 μm.

15. The liquid crystal display of claim **13**, wherein

a length of the connector is larger than 0.

16. The liquid crystal display of claim **1**, wherein

ends of the minute branch electrodes of the upper pixel electrode facing the bar-shaped portion are separated from each other.

17. The liquid crystal display of claim **1**, wherein

the upper pixel electrode further comprises a connection branch connecting the ends of the minute branch electrodes of the upper pixel electrode that do not face the bar-shaped portion.

18. The liquid crystal display of claim **1**, wherein

a length of the bar-shaped portion is equal to or more than ½ of a length of the edge of the main body facing the bar-shaped portion.

19. The liquid crystal display of claim **1**, wherein

a width of the bar-shaped portion is more than 0 and less than 10 μm.

20. The liquid crystal display of claim **1**, wherein

the lower pixel electrode comprises a first lower sub-pixel electrode and a second lower sub-pixel electrode that are supplied with different voltages obtained from a same image information, and

the upper pixel electrode comprises a first upper sub-pixel electrode and a second upper sub-pixel electrode that are supplied with different voltages obtained from the same image information.

* * * * *

专利名称(译)	液晶显示器		
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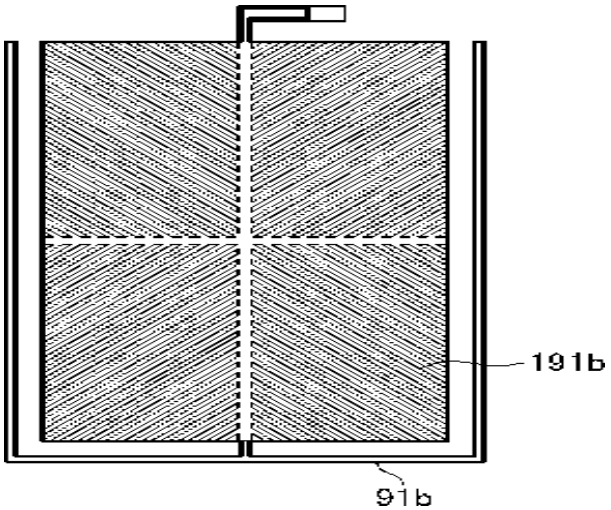
摘要(译)

一种液晶显示器，包括：第一基板和第二基板，彼此面对;第一基板和第二基板之间的液晶层;位于第一基板上的下像素电极;第一钝化层位于下像素电极上;位于第一钝化层上的上像素电极;位于第二基板上的相对电极，其中上部像素电极包括杆和从杆向外延伸的多个微小分支，下部像素电极包括与多个微小分支重叠的主体和至少一个条沿着主体的边缘延伸的形状部分与主体的边缘保持预定的间隙。