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(54) **LIQUID CRYSTAL DISPLAY**

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(52) **U.S. Cl.** **349/129; 349/155**

(58) **Field of Classification Search** 349/129

See application file for complete search history.

(57) **ABSTRACT**

A liquid crystal display includes a first substrate, a first field generating electrode arranged on the first substrate and including first and second cutouts, and a second substrate facing the first substrate. A second field generating electrode is arranged on the second substrate and includes a third cutout, and a liquid crystal layer is interposed between the first and second field generating electrodes. A column spacer is interposed between the first and second substrates and is disposed in the first cutout region.

19 Claims, 6 Drawing Sheets

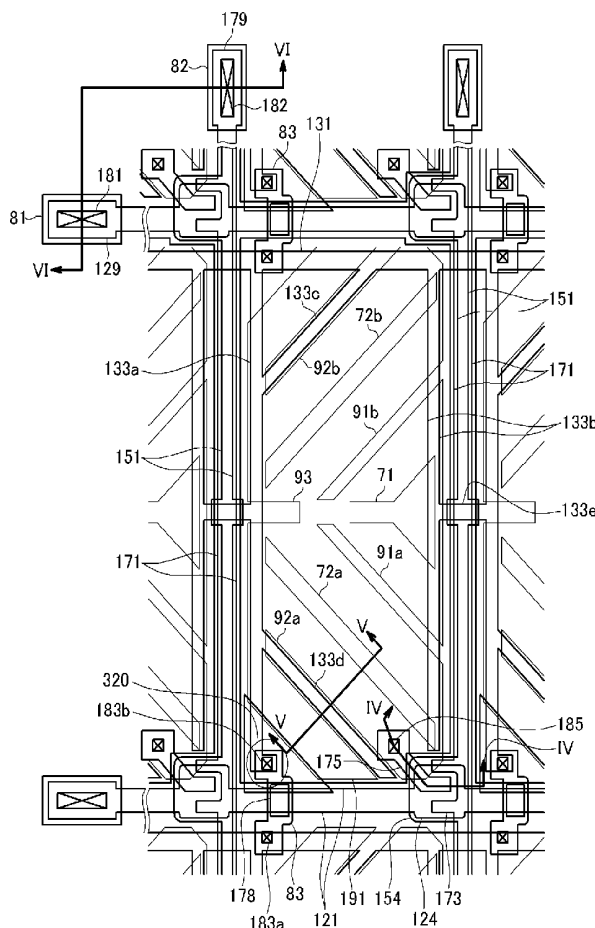


FIG. 1

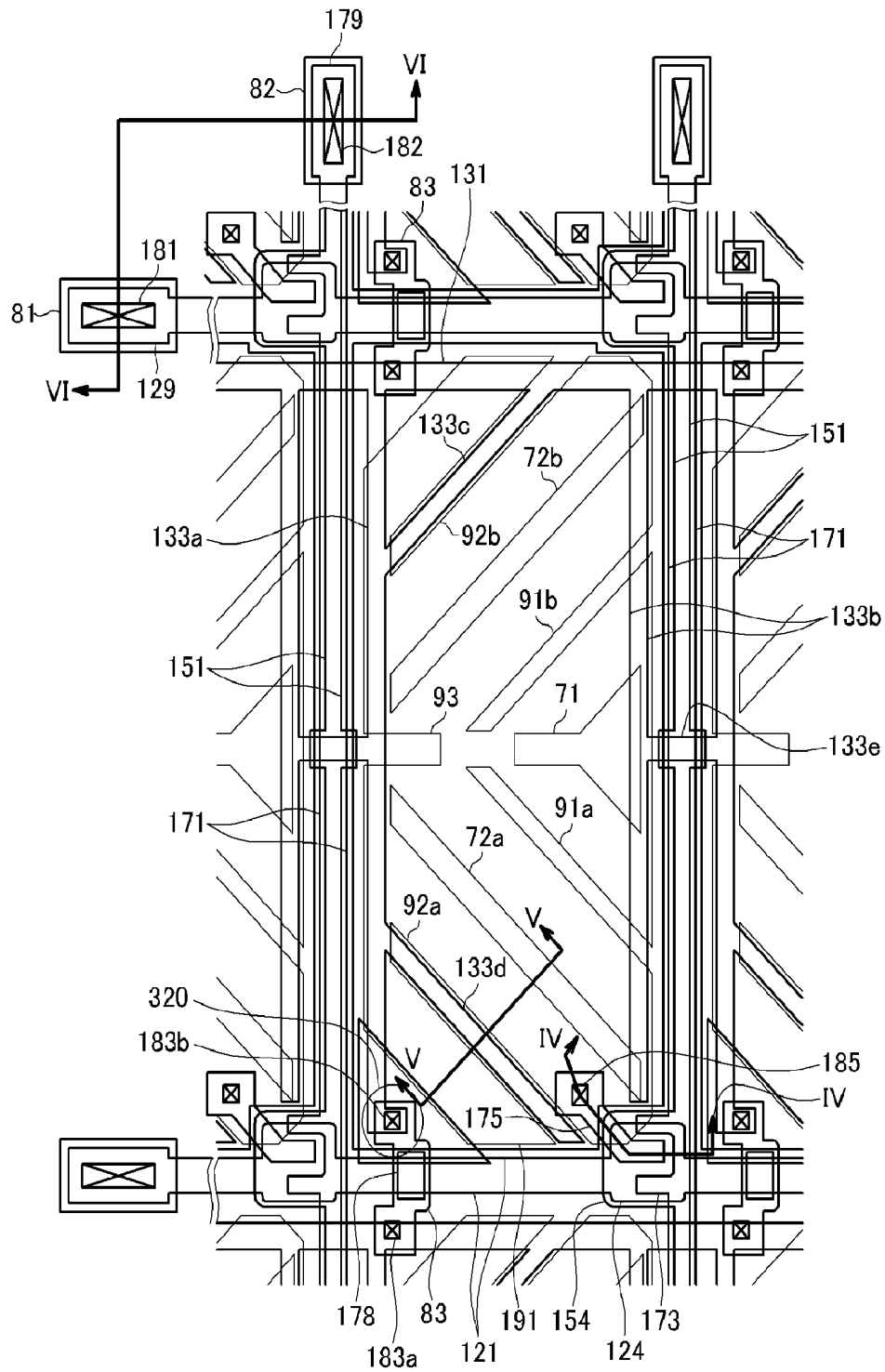


FIG.2

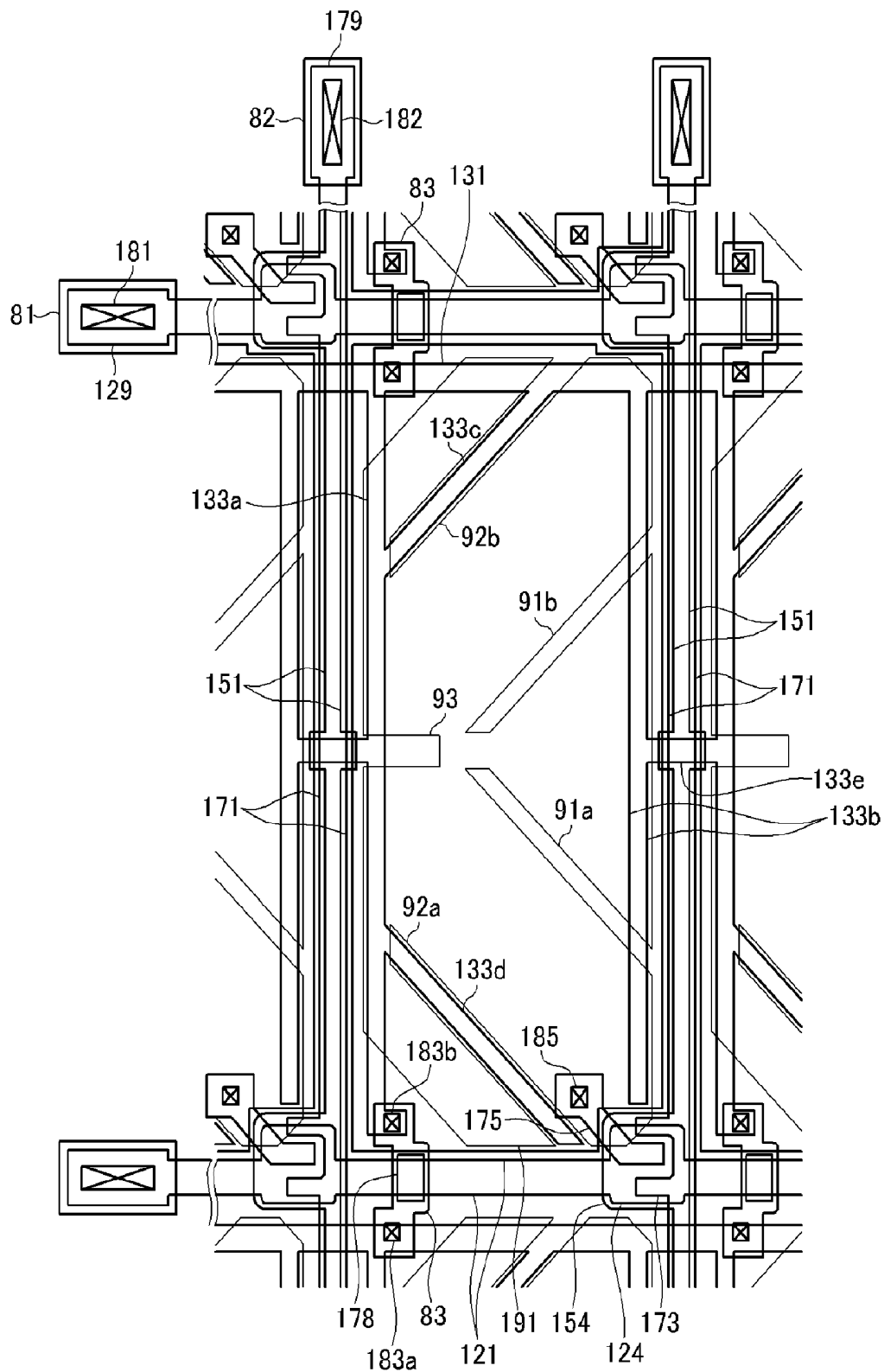


FIG.3

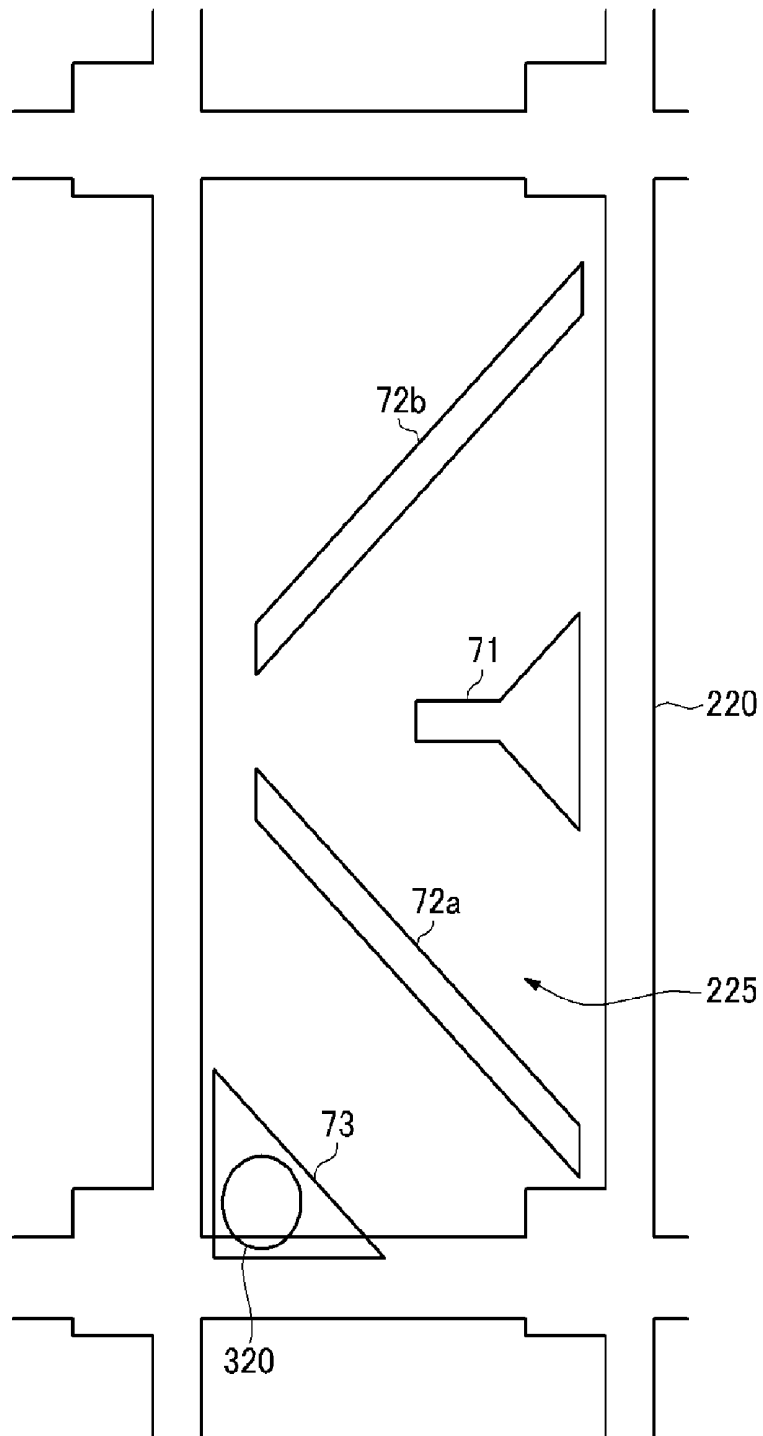


FIG. 4

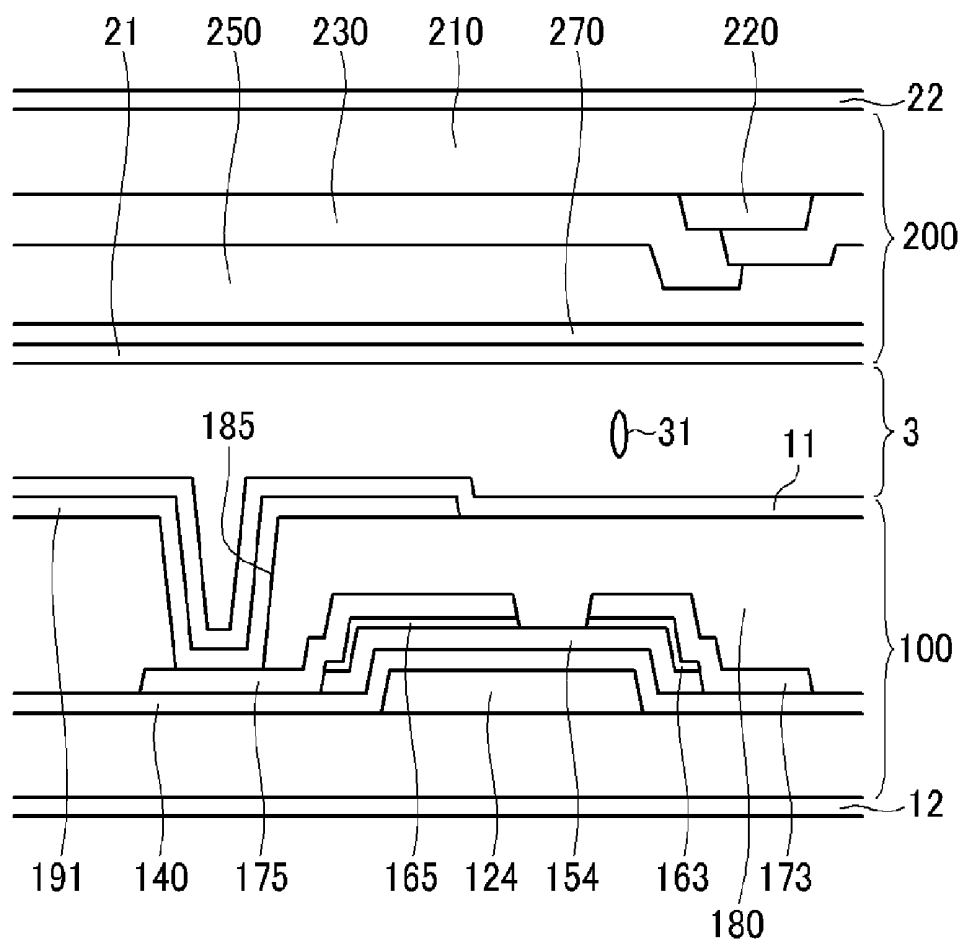


FIG. 5

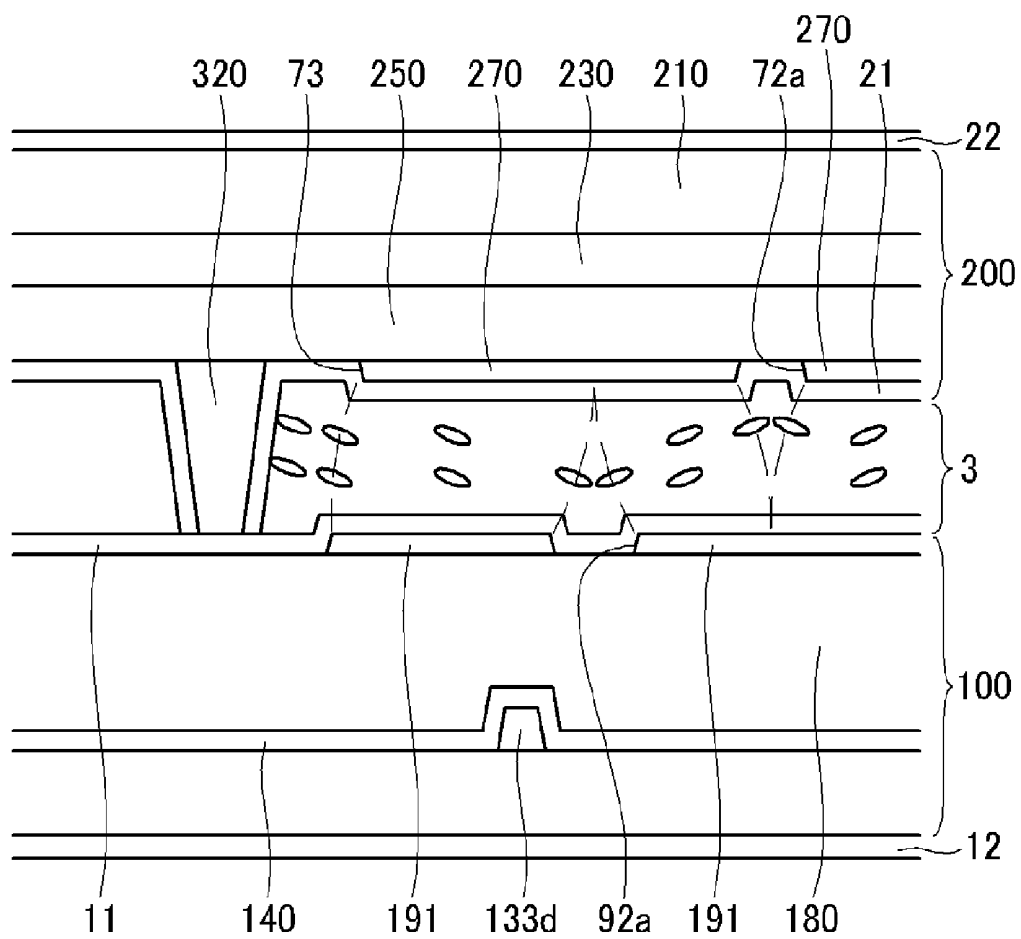
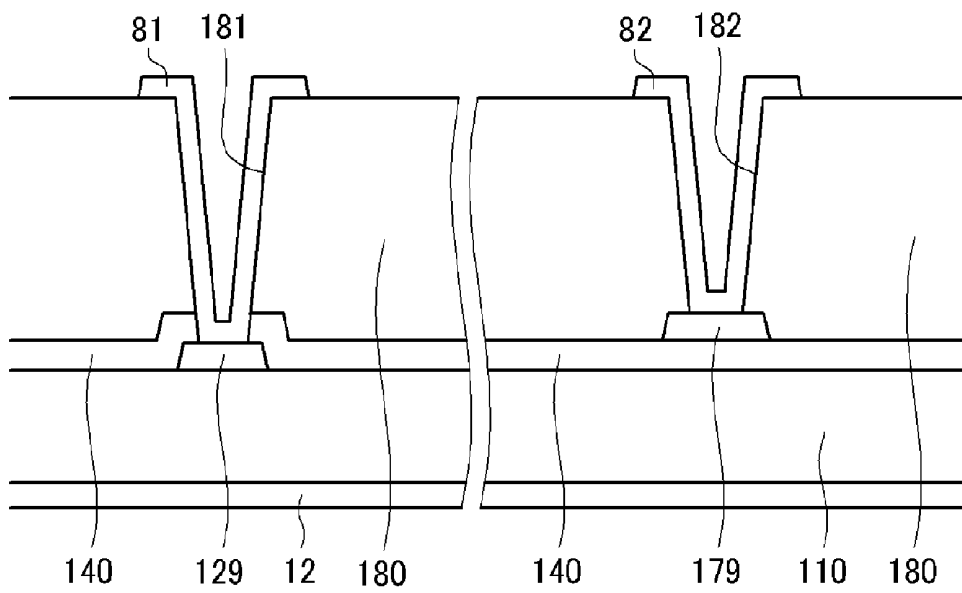


FIG.6



LIQUID CRYSTAL DISPLAY

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority from and the benefit of Korean Patent Application No. 10-2006-0019288, filed on Feb. 28, 2006, which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND OF THE INVENTION

1. Field of Invention

The present invention relates to a liquid crystal display.

2. Discussion of the Background

A liquid crystal display (LCD) is one of the most widely distributed flat panel displays. Generally, the LCD includes two display panels having field generating electrodes, such as pixel electrodes and a common electrode, and a liquid crystal layer interposed therebetween. The LCD displays an image by applying a voltage to the field generating electrodes to generate an electric field in the liquid crystal layer, whereby an orientation of liquid crystal molecules in the liquid crystal layer controls the polarization of incident light.

A vertical alignment (VA) mode LCD has been widely used because it may have a high contrast ratio and may provide a wide viewing angle. Without an electric field, the major axes of liquid crystal molecules in the VA mode LCD may be arranged perpendicular to the display panels.

A number of methods may be used to provide a wide viewing angle in a VA mode LCD. For example, cutouts may be formed in the field generating electrodes, or protrusions may be formed on the field generating electrodes. Because the orientation to which the liquid crystal molecules are tilted may be determined using cutouts and protrusions, the reference viewing angle may be widened by changing the arrangements of the cutouts and protrusions, thereby providing various directions of the tilt orientation of the liquid crystal molecules.

However, for an LCD including cutouts, the liquid crystal molecules corresponding to the cutouts may not be suitably aligned, thereby causing texture. Furthermore, when a structure, such as a column spacer, is included in the LCD, distortion of an electric field may occur, thereby increasing the texture. The above information disclosed in this Background section is only for enhancement of understanding of the background of the invention 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

The present invention provides an LCD that may be capable of reducing texture by decreasing the distortion of an electric field caused by a column spacer.

Additional features of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention.

The present invention discloses a liquid crystal display including a first substrate, a first field generating electrode arranged on the first substrate and including first and second cutouts, and a second substrate facing the first substrate. A second field generating electrode is arranged on the second substrate, and it includes a third cutout. A liquid crystal layer is interposed between the first and second field generating

electrodes. A column spacer is arranged between the first and second substrates in a region substantially corresponding to the first cutout.

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

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention are incorporated in and constitute a part of this specification, illustrate embodiments of the invention, and together with the description serve to explain the principles of the invention.

FIG. 1 is a layout view showing an LCD according to an exemplary embodiment of the present invention.

FIG. 2 is a layout view showing a thin film transistor array panel of the LCD of FIG. 1.

FIG. 3 is a layout view showing a common electrode panel of the LCD of FIG. 1.

FIG. 4 is a cross-sectional view taken along line IV-IV of FIG. 1.

FIG. 5 is a cross-sectional view taken along line V-V of FIG. 1.

FIG. 6 is a cross-sectional view taken along line VI-VI of FIG. 1.

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENTS

The invention is described more fully hereinafter with reference to the accompanying drawings, in which embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure is thorough, and will fully convey the scope of the invention to those skilled in the art. In the drawings, the size and relative size of layers and regions may be exaggerated for clarity. Like reference numerals in the drawings denote like elements.

It will be understood that when an element such as a layer, film, region, or substrate is referred to as being "on", "connected to", or "coupled to" another element or layer, it can be directly on, directly connected to, or directly coupled to the other element or layer, or intervening elements or layers may also 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.

Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the attached drawings.

FIG. 1 is a layout view showing a liquid crystal display (LCD) according to an exemplary embodiment of the present invention, FIG. 2 is a layout view showing a thin film transistor array panel of the LCD of FIG. 1, and FIG. 3 is a layout view showing a common electrode panel of the LCD of FIG. 1. FIG. 4, FIG. 5, and FIG. 6 are cross-sectional views taken along lines IV-IV, V-V, and VI-VI of FIG. 1, respectively.

An LCD according to an exemplary embodiment of the present invention includes a thin film transistor array panel 100, a common electrode panel 200 facing the thin film transistor array panel 100, and a liquid crystal layer 3 interposed between panels 100 and 200.

First, the thin film transistor array panel **100** will be described in detail with reference to FIG. 1, FIG. 2, FIG. 4, FIG. 5, and FIG. 6.

A plurality of gate lines **121** and a plurality of storage electrode lines **131** are arranged on an insulating substrate **110**.

The gate lines **121** transmit gate signals, and they extend horizontally. Further, each gate line **121** includes a plurality of upward and downward protruding gate electrodes **124** and a large-area end portion **129** for connecting to other layers or external driving circuits. A gate driving circuit (not shown), which generates the gate signals, may be mounted on a flexible printed circuit film (not shown) attached on the substrate **110**, directly mounted on the substrate **110**, or integrated on the substrate **110**. When the gate driving circuit is integrated on the substrate **110**, the gate lines **121** may extend to be directly connected to the gate driving circuit.

The storage electrode lines **131** may be supplied with a predetermined voltage. Further, each storage electrode line **131** includes stem lines extending substantially parallel with the gate lines **121**, a plurality of storage electrode sets **133a**, **133b**, **133c**, and **133d** branching from the stem lines, and connections **133e**. Each storage electrode line **131** is disposed between two adjacent gate lines **121**, and the stem line thereof may be closer to the upper of the two adjacent gate lines **121**.

Each storage electrode set includes first and second storage electrodes **133a** and **133b**, which extend vertically and are spaced apart from each other, and third and fourth storage electrodes **133c** and **133d**, which extend obliquely.

The first and second storage electrodes **133a** and **133b** each include a fixed end connected to the corresponding storage electrode line **131** and a free end located opposite to the fixed end. The free end of each first storage electrode **133a** has a protruded portion.

The third storage electrode **133c** extends obliquely from a central portion of the storage electrode line **131** to the first storage electrode **133a**, and the fourth storage electrode **133d** is connected to the first storage electrode **133a** and extends obliquely toward the free end of the second storage electrode **133b**.

The third and fourth storage electrodes **133c** and **133d** form inversion symmetry about the center line between the two neighboring gate lines **121**. The connections **133e** connect the first storage electrode **133a** and the second storage electrode **133b**, which are adjacent to each other, in adjacent sets of storage electrodes **133a** to **133d**.

The gate lines **121** and the storage electrode lines **131** may be made of aluminum (Al), an Al alloy, silver (Ag), an Ag alloy, copper (Cu), a Cu alloy, molybdenum (Mo), a Mo alloy, chromium (Cr), titanium (Ti), or tantalum (Ta). The gate lines **121** and the storage electrode lines **131** may have a multi-layered structure including two conductive layers (not shown) having different physical properties from each other. For example, one conductive layer thereof may be made of metal having low resistivity, such as Al, Ag, Cu, or their alloys, so as to reduce signal delay or voltage drop. The other conductive layer may be made of metals having superior physical, chemical, and electrical contact characteristics with indium tin oxide (ITO) or indium zinc oxide (IZO), such as Mo, a Mo alloy, Cr, Ti, and Ta. Exemplary combinations of layers include a Cr lower layer and an Al (alloy) upper layer, and an Al (alloy) lower layer and a Mo (alloy) upper layer. Alternatively, the gate lines **121** and the storage electrode lines **131** may be made of various metals and conductive materials. Sides of the gate lines **121** and the storage electrode lines **131** may be slanted at an angle in the range of about 30° to about 80° with respect to the surface of the substrate **110**.

A gate insulating layer **140**, which may be made of silicon nitride (SiN_x), silicon oxide (SiO_x), or the like, is formed on the gate lines **121** and the storage electrode lines **131**.

A plurality of semiconductor stripes **151**, which may be made of hydrogenated amorphous silicon (a-Si) or polysilicon, are formed on the gate insulating layer **140**. Each semiconductor stripe **151** extends vertically and includes a plurality of protrusions **154** extending toward the gate electrodes **124**.

The semiconductor stripes **151** widen in the vicinity of the gate lines **121** and the storage electrode lines **131** to cover the gate lines **121** and the storage electrode lines **131**.

A plurality of ohmic contact stripes (not shown) and ohmic contact islands **165** are formed on the semiconductor stripes **151**. The ohmic contact islands **165** may be made of silicide or a material such as n⁺ hydrogenated a-Si doped with a high concentration of n-type impurities such as phosphorous. Each ohmic contact stripe includes a plurality of protrusions **163**. The protrusions **163** and the ohmic contact islands **165**, which form pairs, are disposed on the protrusions **154**.

Sides of the semiconductor stripes **151** and the ohmic contacts **163** and **165** may also slant at an angle in the range of about 30° to about 80° with respect to the surface of the substrate **110**.

A plurality of data lines **171**, a plurality of drain electrodes **175**, and a plurality of isolated metal pieces **178** are formed on the ohmic contacts **163** and **165** and the gate insulating layer **140**.

The data lines **171** deliver data signals and extend mainly in the vertical direction to cross the gate lines **121**. Each data line **171** also crosses the stem lines of the storage electrode lines **131** at the connections **133e**. Each data line **171** includes a plurality of source electrodes **173**, which extend toward the gate electrodes **124**, and a large-area end portion **179**, which may be connected to another layer or an external driving circuit. A data driving circuit (not shown) that generates data signals may be mounted on a flexible printed circuit film (not shown) attached on the substrate **110**, directly mounted on the substrate **110**, or integrated on the substrate **110**. When the data driving circuit is integrated on the substrate **110**, the data lines **171** may be directly connected to the data driving circuit.

The drain electrode **175** is spaced apart from the data line **171** and faces a source electrode **173** with the gate electrode **124** interposed therebetween. Each drain electrode **175** has a large-area end portion and a bar-shaped end portion. The bar-shaped end portion curves toward the source electrode **173** and is partially surrounded by the source electrode **173**, which protrudes in a C-shape.

A gate electrode **124**, a source electrode **173**, and a drain electrode **175** constitute one thin film transistor (TFT) together with the protrusion **154** of the semiconductor stripes **151**. The TFT's channel is formed in the protrusion **154** between the source electrode **173** and the drain electrode **175**.

The metal pieces **178** are disposed on the gate lines **121** in the vicinity of the free end portions of the storage electrodes **133a**.

The data lines **171**, the drain electrodes **175**, and the metal pieces **178** may be made of a refractory metal such as Mo, Cr, Ta, and Ti, or alloys thereof, and they may have a multi-layered structure (not shown) including a refractory metal layer and a conductive layer having low resistance. Examples of the multi-layered structure include a double-layered film including a Cr (alloy) or Mo (alloy) lower layer and an Al (alloy) upper layer, and a triple-layered film including a Mo (alloy) lower layer, an Al (alloy) intermediate layer, and a Mo (alloy) upper layer. Alternatively, the data lines **171**, the drain

electrodes **175**, and the metal pieces **178** may be made of a variety of metals or conductive materials.

Sides of the data lines **171** and the drain electrodes **175** may also slant at an angle in the range of about 30° to about 80° with respect to the surface of the substrate **1110**.

The ohmic contacts **163** and **165**, which decrease contact resistance, are arranged only between the semiconductor stripes **151** and the data lines **171** and drain electrodes **175**. The semiconductor stripes **151** are narrower than the data lines **171** at most places, but as described above, the semiconductor stripes **151** widen where they cross the gate lines **121** so as to provide a smooth surface profile, thereby preventing a short circuit of the data lines **171**.

A passivation layer **180** is formed on the data lines **171**, the drain electrodes **175**, the metal pieces **178**, and the exposed portions of the semiconductor stripes **151**. The passivation layer **180** may be made of an inorganic insulator or organic insulator. The surface of the passivation layer **180** may be flat. Silicon nitride and silicon oxide may be used as the inorganic insulator. The organic insulator may have photosensitivity, and its dielectric constant may be 4.0 or less. Alternatively, the passivation layer **180** may have a double-layered structure of a lower inorganic layer and an upper organic layer in order to use the superior insulating characteristics of an organic layer and protect the exposed portions of the semiconductor stripes **151**.

A plurality of contact holes **182** and **185**, which expose data line end portions **179** and the drain electrodes **175**, respectively, are formed in the passivation layer **180**. A plurality of contact holes **181**, which expose gate line end portions **129**, a plurality of contact holes **183a**, which expose portions of the storage electrode lines **131** at regions near the fixed ends of the first storage electrodes **133a**, and a plurality of contact holes **183b**, which expose the protrusions of the free ends of the first storage electrodes **133a**, are formed in the passivation layer **180** and the gate insulating layer **140**.

A plurality of pixel electrodes **191**, a plurality of overpasses **83**, and a plurality of contact assistants **81** and **82** are formed on the passivation layer **180**. These components may be made of transparent conductive materials such as ITO and IZO or reflective metals such as Al and an Ag alloy.

The pixel electrodes **191** are connected to the drain electrodes **175** through the contact holes **185** and are supplied with data voltages from the drain electrodes **175**. The pixel electrodes **191**, which are supplied with the data voltage, generate an electric field together with the common electrode **270** of the common electrode panel **200**, which is supplied with the common voltage, thereby determining the direction of the liquid crystal molecules **31** interposed between the two electrodes **191** and **270**. Polarization of the light passing through the liquid crystal layer **3** changes according to the determined direction of the liquid crystal molecules **31**. The pixel electrodes **191** and the common electrode **270** constitute capacitors ("liquid crystal capacitors") and hold the supplied voltage after the TFTs turn off.

The pixel electrodes **191** overlap the storage electrodes **133a**, **133b**, **133c**, and **133d** and the storage electrode lines **131**. The left and right sides of the pixel electrodes **191** may be arranged closer to the data lines **171** than to the storage electrodes **133a** and **133b**. The pixel electrodes **191** and the drain electrodes **175** electrically connected thereto overlap with the storage electrode lines **131** to form storage capacitors. The storage capacitors supplement a voltage holding ability of the liquid crystal capacitors.

The pixel electrode **191** has a shape of an approximate quadrangle with four chamfered corners that have an angle of about 45° with respect to the gate lines **121**.

Each pixel electrode includes lower cutouts **91a** and **92a**, upper cutouts **91b** and **92b**, and a center cutout **93**. Therefore, the cutouts **91a**, **91b**, **92a**, **92b**, and **93** divide the pixel electrodes **191** into a plurality of partitions. The cutouts **91a**, **91b**, and **92a**, **92b** have approximate inversion symmetry with respect to a virtual transverse center line bisecting the pixel electrode **191**. The lower and upper cutouts **91a**, **91b**, **92a**, and **92b** may extend substantially in slanted directions from the upper or lower side of the pixel electrode **191** to the left side of the pixel electrode **191** or from the right side of the pixel electrode **191** to the virtual transverse center line bisecting the pixel electrode **191**. The lower cutout **92a** overlaps with the fourth storage electrode **133d**, and the upper cutout **92b** overlaps with the third storage electrode **133c**.

The lower and upper cutouts **91a**, **91b**, **92a**, and **92b** are disposed in lower and upper halves of the pixel electrode **191**, respectively, with respect to the pixel electrode's transverse center line. The lower and upper cutouts **92a** and **92b** extend substantially perpendicular to each other with slope angles of about 45° with respect to the gate lines **121**.

The center cutout **93** extends along the transverse center line of the pixel electrode **191** and has an inlet at the left side of the pixel electrode **191**.

The number of cutouts may vary according to design factors such as the size of the pixel electrode **191**, a ratio of lengths of the transverse and longitudinal sides of the pixel electrode **191**, and types or characteristics of the liquid crystal layer **3**.

The contact assistants **81** and **82** are connected to the gate line end portions **129** and the data line end portions **179** through the contact holes **181** and **182**, respectively. The contact assistants **81** and **82** may enhance adhesion between the end portions **129** and **179** and external apparatuses, as well as protect these end portions.

The overpasses **83** are disposed across the gate lines **121** and connected to the exposed end portions of the free ends of the first storage electrodes **133a** and the exposed portions of the storage electrode lines **131** through the contact holes **183b** and **183a**, which are located on opposite sides of the gate lines **121**, respectively. The overpasses **83** may overlap with, and be connected to, the metal pieces **178**. The storage electrode lines **131** may be used together with the overpasses **83** and the metal pieces **178** to repair defects of the gate lines **121**, the data lines **171**, or the TFTs. When repairing the gate lines **121**, the storage electrode lines **131** may be connected to the gate lines **121** by irradiating a laser beam at crossing points between the gate lines **121** and the overpasses **83** to connect the gate lines **121** to the overpasses **83**. Here, the metal pieces **178** may reinforce the connection between the gate lines **121** and the overpasses **83**.

Next, the common electrode panel **200** will be described below with reference to FIG. 1, FIG. 3, FIG. 4, and FIG. 5.

A light blocking member **220**, often referred to as a black matrix, is formed on an insulating panel **210**, which may be made of transparent glass or the like. The light blocking member **220** includes linear portions extending along the data lines **171** and portions opposed to the TFTs. Additionally, the light blocking member **220** has a plurality of openings **225** that are opposed to, and have substantially the same shape as, the pixel electrodes **191**. The light blocking member **220** may be formed as a single-layered film of Cr, a double-layered film of Cr and Cr oxide, or an organic layer including black pigment.

A plurality of color filters **230** are formed on the insulating panel **210** predominantly in a region defined by the light blocking member **220**. The color filters **230** may extend in the vertical direction along the pixel electrodes **191**. Each color

filter **230** can display one of three primary colors, and examples of the three primary colors include red, green, and blue. Edges of neighboring color filters **230** may overlap with each other.

An overcoat **250**, which may prevent the color filters **230** from being exposed and provide a flat plane, may be formed on the color filters **230**.

The common electrode **270** may be made of a transparent conductive material such as ITO or IZO, and it is formed on the overcoat **250**.

A plurality of sets of cutouts **71**, **72a**, **72b**, and **73** are formed on the common electrode **270**.

One set of cutouts faces one pixel electrode **191** and includes a center cutout **71**, a lower cutout **72a**, an upper cutout **72b**, and a corner cutout **73**. The cutouts **71**, **72a**, and **72b** are disposed between the adjacent cutouts **91a**, **91b**, **92a**, and **92b** of the pixel electrode **191**. Additionally, the upper and lower cutouts **72a** and **72b** extend substantially in parallel with the lower and upper cutouts **92a** and **92b**, respectively, of the pixel electrode **191**.

The center cutout **71** includes a central transverse portion and an enlarged portion. The central transverse portion extends substantially along the transverse center line of the pixel electrode **191**, and the enlarged portion widens in a direction from the end of the central transverse portion to the right edge of the pixel electrode **191**.

The corner cutout **73** corresponds to the lower left corner of the pixel electrode **191**, and it has a triangular shape having an oblique side that is substantially parallel with the cutout **92a** of the pixel electrode **191**.

The number and directions of the cutouts **71**, **72a**, **72b**, and **73** may vary according to design factors, and the light-blocking member **220** overlaps the cutouts **71**, **72a**, **72b**, and **73** to prevent light leakage in the vicinity of the cutouts **71**, **72a**, **72b**, and **73**.

A column spacer **320** is formed on the overcoat **250** at a position corresponding to the corner cutout **73**. The column spacer **320** decreases in width in the direction from the upper panel **200** to the lower panel **100**.

Alignment layers **11** and **21** are arranged on inner surfaces of the display panels **100** and **200**, respectively. The alignment layers **11** and **21** may be vertical alignment layers. Polarizers **12** and **22** are disposed on outer surfaces of the display panels **100** and **200**, respectively. The transmission axes of the polarizers are perpendicular to each other, and one of the transmission axes is preferably parallel to the gate lines **121**. With a reflective LCD, one of the two polarizers **12** and **22** may be omitted.

The LCD may include a backlight unit (not shown) for supplying light to the polarizers **12** and **22**, the panels **100** and **200**, and the liquid crystal layer **3**.

The liquid crystal layer **3** has a negative anisotropy, and the liquid crystal molecules of the liquid crystal layer **3** are aligned so as for major axes thereof to be perpendicular to the surfaces of the panels **100** and **200** without application of an electric field to the liquid crystal molecules. Therefore, incident light cannot pass through the crossed polarizers **12** and **22**.

Applying the common voltage and the data voltage to the common electrode **270** and the pixel electrodes **191**, respectively, generates an electric field in a direction substantially perpendicular to the surfaces of the panels **100** and **200**. In response to the electric field, the major axis direction of the liquid crystal molecules changes to be perpendicular to the direction of the electric field. Hereinafter, the pixel electrodes **191** and the common electrode **270** are collectively referred to as field generating electrodes.

The cutouts **71**, **72a**, **72b**, **73**, **91a**, **91b**, **92a**, and **92b** of the field generating electrodes **270** and **191**, and the oblique sides of the pixel electrodes **191** that are parallel with the cutouts, distort the electric field to generate a horizontal component of the electric field for determining the tilted orientation of the liquid crystal molecules. The horizontal component of the electric field is perpendicular to the oblique sides of the cutouts **71**, **72a**, **72b**, **73**, **91a**, **91b**, **92a**, and **92b** and the oblique sides of the pixel electrodes **191**. One set of cutouts **71**, **72a**, **72b**, **91a**, **91b**, **92a**, and **92b** divides one pixel electrode **191** into a plurality of sub-areas having two slanted primary edges. Because the tilted orientations of the liquid crystal molecules in the sub-areas are determined by the horizontal component of the electric field, the tilted orientations include about four directions. Similarly, since the liquid crystal molecules can be adjusted to have various tilt angles, it is possible to increase an LCD's reference viewing angle.

The liquid crystal molecules **31** in the vicinity of the column spacer **320** are slanted to be perpendicular to the surface of the column spacer **320**. When the corner cutout **73** is formed according to an exemplary embodiment of the present invention, the slope direction of the liquid crystal molecules caused by the column spacer **320** is the same as that of the liquid crystal molecules caused by the electric field generated between the oblique side of the cutout **73** and the oblique side of the pixel electrode **191**.

Accordingly, since the slope direction of the liquid crystal molecules **31** caused by the column spacer **320** is different from that of the liquid crystal molecules **31** caused by the electric field formed between the pixel electrode **191** and the cutout of the common electrode **270**, the liquid crystal molecules may not collide with each other, thereby reducing texture.

As described above and shown in FIG. 1, a distance between a center axis of the column spacer **320** and an oblique side (oblique side formed by chamfering the corner) of the pixel electrode **191** should be less than a distance between the center axis of the column spacer **320** and the oblique side of the corner cutout **73** that is parallel with the oblique side of the pixel electrode **191** and the cutout **92a**, so that the alignment direction of the liquid crystal molecule **31** in the vicinity of the column spacer **320** may be the same as the alignment direction of the liquid crystal molecule **31** caused by the electric field generated by the field generating electrodes **191** and **270**.

As described in exemplary embodiments of the present invention, when the corner cutout is formed, the alignment direction of the liquid crystal molecules caused by the column spacer is the same as the direction of a domain of the LCD, and the liquid crystal molecules may not collide with each other, thereby reducing texture.

It will be apparent to those skilled in the art that various modifications and variation can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A liquid crystal display, comprising:

a first substrate;

a first field generating electrode arranged on the first substrate, the first field generating electrode comprising a first cutout and a second cutout;

a second substrate facing the first substrate;

a thin film transistor arranged on the second substrate;

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- a second field generating electrode arranged on the second substrate and connected to the thin film transistor, the second field generating electrode comprising a third cutout;
- a liquid crystal layer interposed between the first field generating electrode and the second field generating electrode; and
- a column spacer arranged between the first substrate and the second substrate, the column spacer being arranged in a region substantially corresponding to the first cutout.
- 10
2. The liquid crystal display of claim 1, wherein the second field generating electrode comprises a first oblique side, and the first cutout comprises a second oblique side that is parallel with the first oblique side, and
- 15
- wherein a distance between a center axis of the column spacer and the first oblique side is less than a distance between the center axis of the column spacer and the second oblique side.
- 20
3. The liquid crystal display of claim 2, wherein the column spacer decreases in width in a direction from the first substrate to the second substrate.
4. The liquid crystal display of claim 2, wherein the first oblique side and the second oblique side are slanted at an angle of about 45° with respect to a gate line.
- 25
5. The liquid crystal display of claim 1, wherein the second cutout and the third cutout are alternately disposed.
- 30
6. The liquid crystal display of claim 1, further comprising a color filter arranged on the first substrate.
7. The liquid crystal display of claim 1, wherein the first cutout is triangular shaped.
- 35
8. The liquid crystal display of claim 2, wherein the first cutout is triangular shaped.
9. The liquid crystal display of claim 1, wherein the column spacer is arranged entirely within the region corresponding to the first cutout.
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10. A liquid crystal display, comprising:
- a first substrate;
- a first field generating electrode arranged on the first substrate, the first field generating electrode comprising a first cutout and a second cutout;
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- a second substrate facing the first substrate;

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- a second field generating electrode arranged on the second substrate, the second field generating electrode comprising a third cutout;
- a storage electrode arranged on the second substrate, the storage electrode overlapping with the second field generating electrode to form a storage capacitor;
- a liquid crystal layer interposed between the first field generating electrode and the second field generating electrode; and
- a column spacer arranged between the first substrate and the second substrate, the column spacer being arranged in a region substantially corresponding to the first cutout.
11. The liquid crystal display of claim 10, wherein the second field generating electrode comprises a first oblique side, and the first cutout comprises a second oblique side that is parallel with the first oblique side, and
- wherein a distance between a center axis of the column spacer and the first oblique side is less than a distance between the center axis of the column spacer and the second oblique side.
12. The liquid crystal display of claim 11, wherein the column spacer decreases in width in a direction from the first substrate to the second substrate.
13. The liquid crystal display of claim 11, wherein the first oblique side and the second oblique side are slanted at an angle of about 45° with respect to a gate line.
14. The liquid crystal display of claim 10, wherein the second cutout and the third cutout are alternately disposed.
15. The liquid crystal display of claim 10, further comprising a color filter arranged on the first substrate.
16. The liquid crystal display of claim 10, further comprising a thin film transistor arranged on the second substrate, wherein the thin film transistor is connected to the second field generating electrode.
17. The liquid crystal display of claim 10, wherein the first cutout is triangular shaped.
18. The liquid crystal display of claim 11, wherein the first cutout is triangular shaped.
19. The liquid crystal display of claim 10, wherein the column spacer is arranged entirely within the region corresponding to the first cutout.

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专利名称(译)	液晶显示器		
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[标]申请(专利权)人(译)	三星电子株式会社		
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摘要(译)

一种液晶显示器，包括第一基板，布置在第一基板上并包括第一和第二切口的第一场产生电极，以及面对第一基板的第二基板。第二场产生电极布置在第二基板上并包括第三切口，并且液晶层插入在第一和第二场产生电极之间。柱状间隔物插入在第一和第二基板之间，并设置在第一切口区域中。

