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(54) **LIQUID CRYSTAL DISPLAY DEVICE AND
METHOD FOR MANUFACTURING THE
SAME**

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(52) **U.S. Cl.** **349/107**; 349/106; 349/155

(58) **Field of Classification Search** 349/106–109,
349/155–157

See application file for complete search history.

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(57) **ABSTRACT**

A liquid crystal display device includes a first substrate and a second substrate facing each other, a plurality of gate lines and a plurality of data lines on the first substrate crossing each other to define pixel regions, a black matrix layer on the second substrate in regions corresponding to the gate lines and the data lines, color filter layers on the second substrate covering at least the pixel regions, a plurality of column spacers on respective portions of the black matrix layer excluding the color filter layers, and a liquid crystal layer between the first substrate and the second substrate.

13 Claims, 8 Drawing Sheets

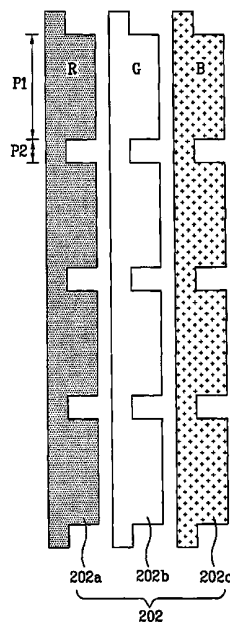


FIG. 1
Related Art

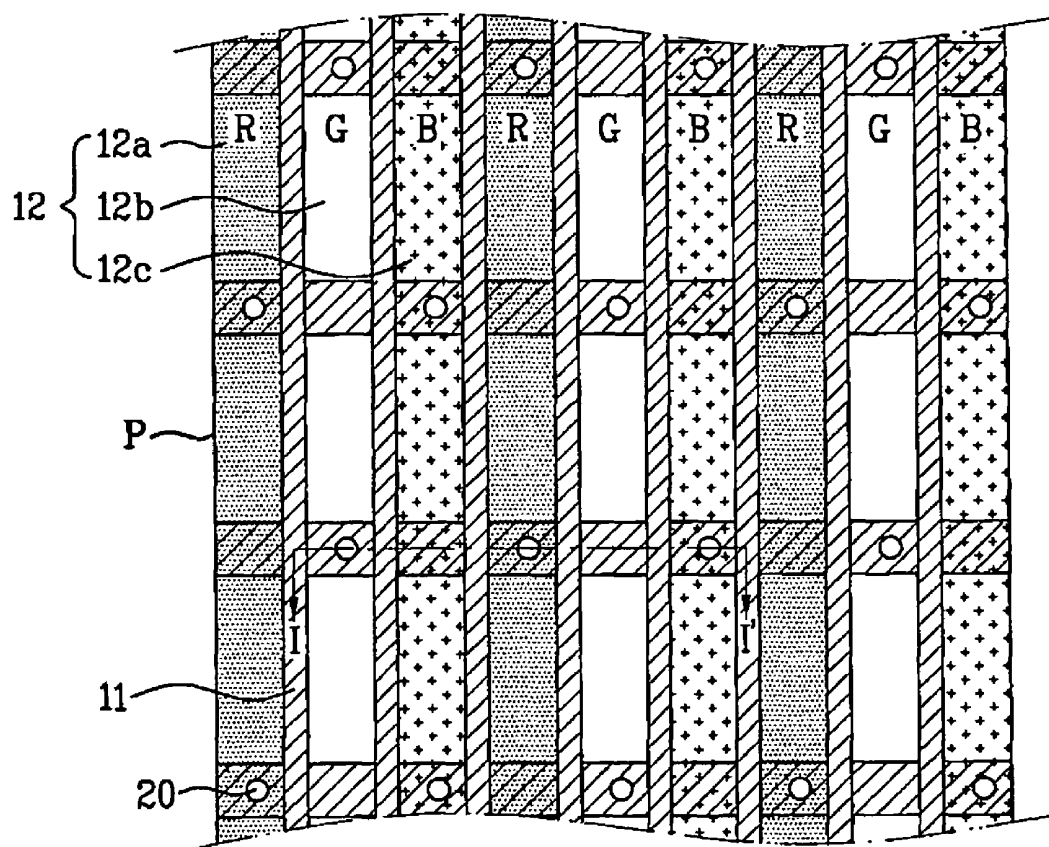


FIG. 2
Related Art

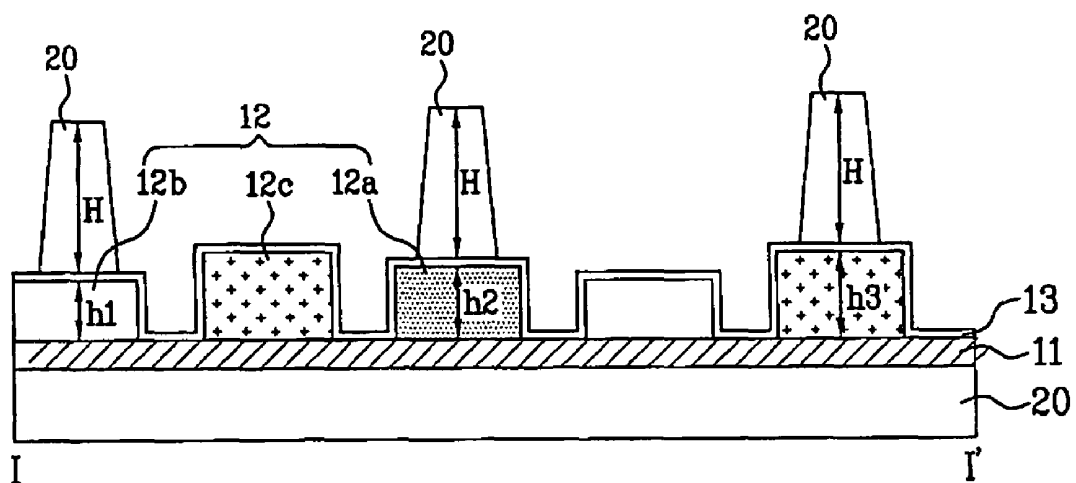


FIG. 3

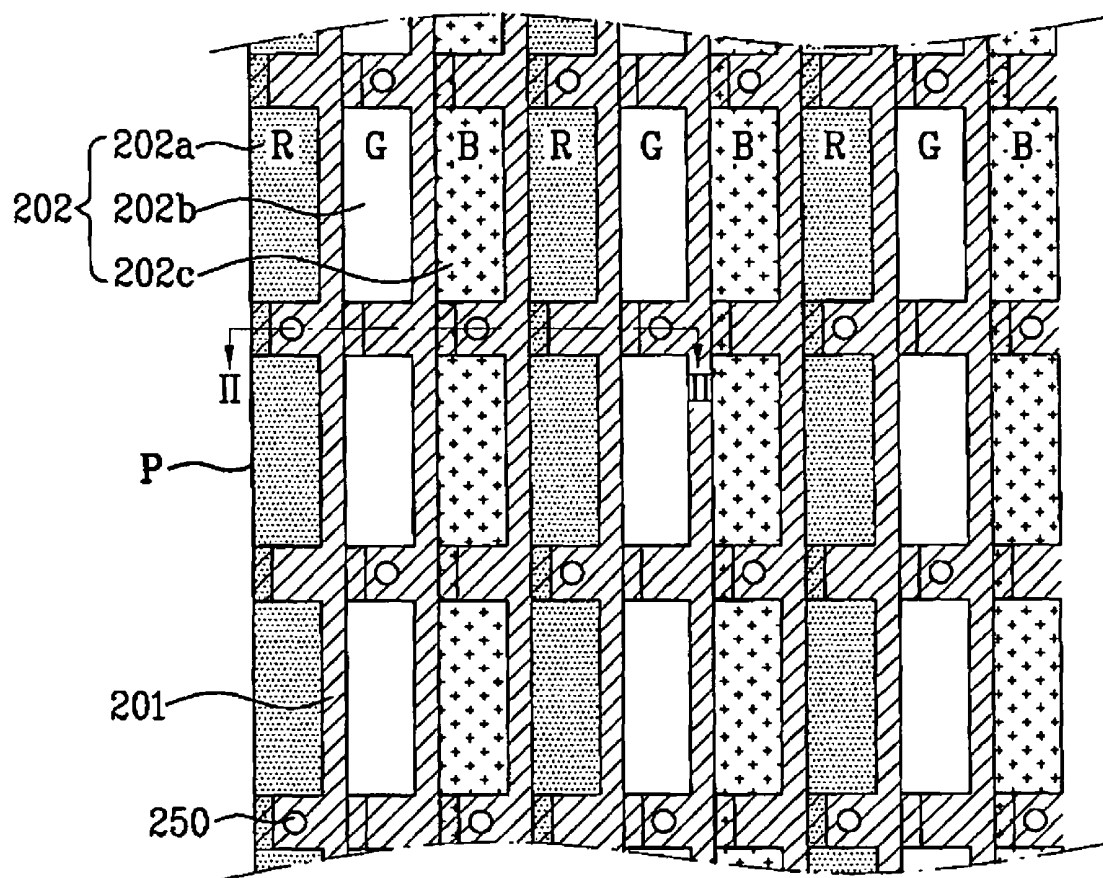


FIG. 4

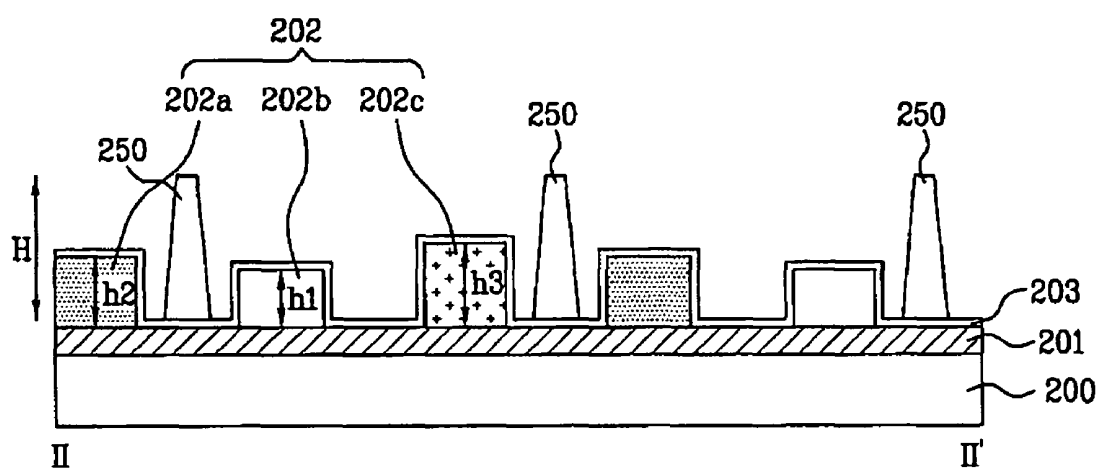


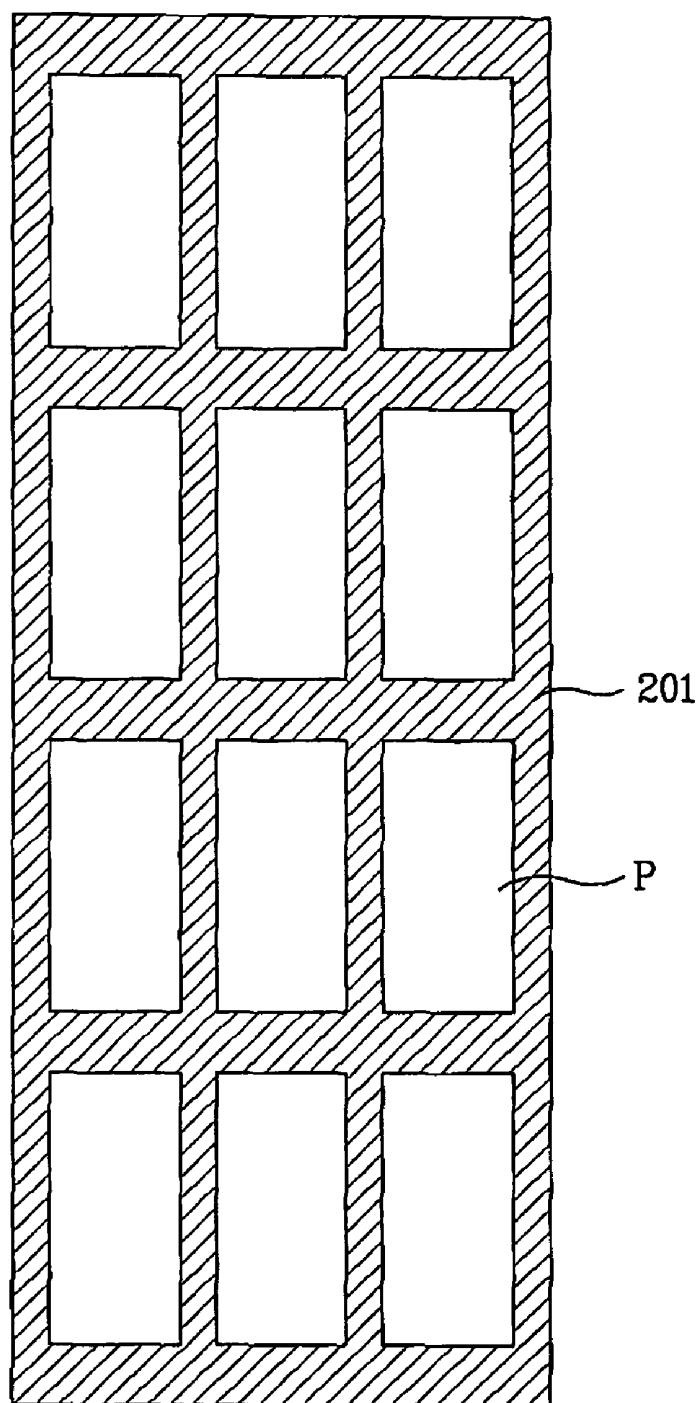
FIG. 5A

FIG. 5B

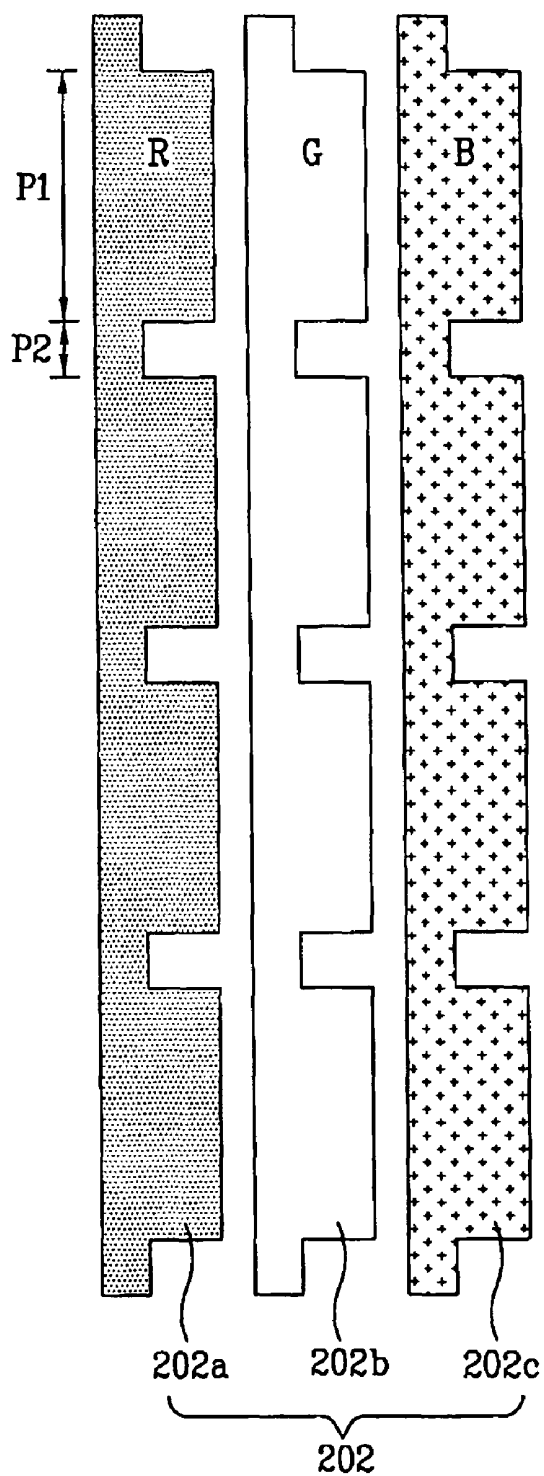


FIG. 6

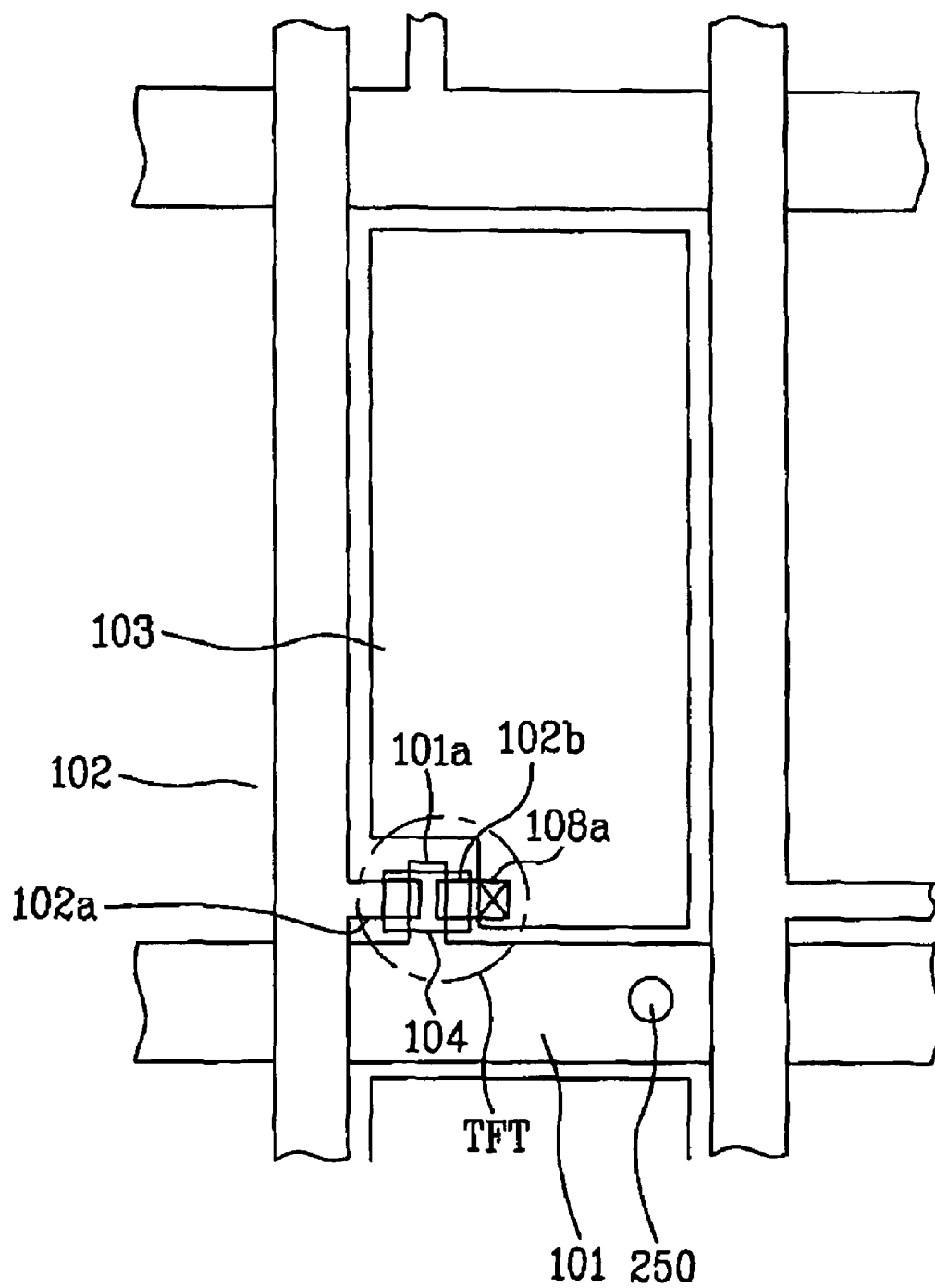
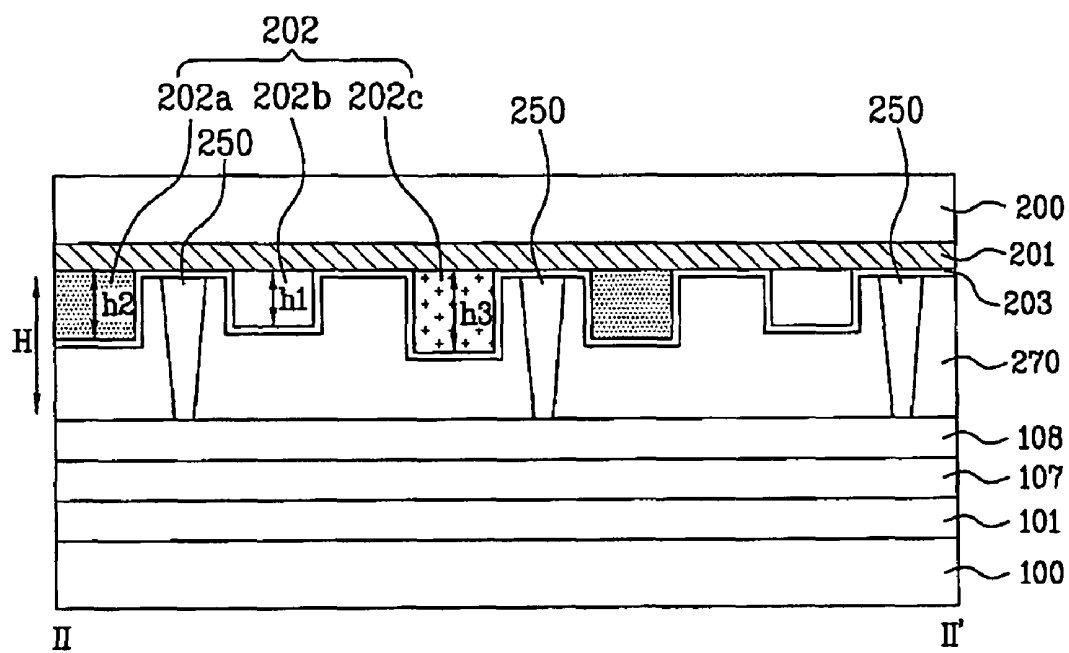


FIG. 7



LIQUID CRYSTAL DISPLAY DEVICE AND METHOD FOR MANUFACTURING THE SAME

This application claims the benefit of Korean Patent Appli-
cation No. 10-2006-0058597, filed on Jun. 28, 2006, which is
hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

Embodiments of the present invention relate to a liquid
crystal display (LCD) device, and more particularly, to a
method for manufacturing an LCD device. Embodiments of
the invention are suitable for a wide scope of applications. In
particular, embodiments of the invention are suitable for
reducing a non-uniformity associated with a layering topol-
ogy of the LCD device.

2. Discussion of the Related Art

The progress toward information-driven society has
pushed the demand for various display devices. To meet such
a demand, efforts have recently been made to develop flat
panel display devices such as liquid crystal display (LCD)
devices, plasma display panels (PDPs), electro-luminescent
display (ELD) devices, vacuum fluorescent display (VFD)
devices, and the like. Such flat panel display devices have
been applied to various appliances.

In particular, LCDs have been used as a substitute for
cathode ray tubes (CRTs) in association in mobile applica-
tions because of their superior picture quality, lightness, thin-
ness, and low power consumption. Currently, LCDs are
widely used not only as monitors for notebook computers, but
also for desktop computers and television (TV) receivers.
Successful application of LCDs to more diverse image dis-
play devices depends on whether the LCDs can produce high
picture quality including high resolution, high brightness,
large display area, and the like, while remaining light, thin,
and consuming low power.

Generally, an LCD includes a first substrate and a second
substrate joined spaced apart from each other, with a liquid
crystal material between the first and second substrates. The
first substrate includes a plurality of gate lines arranged in one
direction and uniformly spaced apart from one another, and a
plurality of data lines arranged crossing the gate lines and
uniformly spaced apart from one another, to define pixel
regions P. The first substrate also includes a plurality of pixel
electrodes formed at respective pixel regions P, and a plurality
of thin film transistors (TFTs) each formed at a crossing
between a corresponding one of the gate lines and a corre-
sponding one of the data lines. A data signal on each data line
is applied to a corresponding one of the pixel electrodes in
response to a signal applied to a corresponding one of the gate
lines.

The second substrate includes a black matrix layer for
blocking light incident to a region other than the pixel regions
P. The second substrate also includes R, G, and B color filter
layers formed at a region corresponding to each pixel region
P for displaying color images, and a common electrode
formed on the color filter layers to produce a voltage differ-
ence with respect to the pixel electrode corresponding to a
pixel region.

The liquid crystals of the liquid crystal layer are oriented in
a certain direction by an electric field generated between the
corresponding pixel electrode and the corresponding com-
mon electrode. The amount of light passing through the liquid
crystal layer is controlled in accordance with the orientation
of the liquid crystal layer, to display a desired image.

The LCD having the above-mentioned driving principle is
called a twisted nematic (TN) mode LCD. However, such a
TN mode LCD has a narrow view image. In order to over-
come the drawback of the TN mode LCD, an in-plane switch-
ing (IPS) mode LCD has been developed. In the IPS mode
LCD, a pixel electrode and a common electrode are formed on
a first substrate at each pixel region of the first substrate such
that the pixel electrode and common electrode extend parallel
to each other, to generate an in-plane electric field (i.e., hori-
zontal field). The liquid crystal layer is oriented in a certain
direction by the in-plane electric field.

Spacers are formed between the first and second substrates
to secure a certain space for sealing the liquid crystal layer
between the first and second substrates. Spacers are classified
into ball spacers and column spacers depending on their
shape. The ball spacers have a ball-shape, and are formed on
the first and second substrates in accordance with a spraying
method. Even after the first and second substrates are joined
together, the ball spacers are more or less movable, and have
a small area contacting with the first and second substrates.
Meanwhile, column spacers are formed on the first and sec-
ond substrates by an array process. Each column spacer is
fixed in the form of a column having a certain height on one
of the substrates. Thus, the column spacers have a relatively
large area contacting with the first and second substrates, as
compared to ball spacers.

FIG. 1 shows a planar view of a first substrate of the related
art LCD device. FIG. 2 shows a cross-sectional view along
line I-I' of FIG. 1. Referring to FIGS. 1 and 2, a first substrate
2 includes a black matrix layer 11 formed on the first substrate
2 in a region other than pixel regions P. The first substrate 2
also includes color filter layers 12, 12a, 12b and 12c. The color
filter layers 12a, 12b and 12c are formed to be spaced apart
from one another on the first substrate 2 including the black
matrix layers 11. The first substrate 2 also includes a common
electrode 13. The common electrode 13 is formed over the
entire upper surface of the first substrate 2 including the black
matrix layer 11 and the color filter layers 12. The first sub-
strate 2 also includes column spacers 20 respectively formed
on the common electrode 13 in regions corresponding to
predetermined portions of the black matrix layer 11.

The first substrate 2 faces a second substrate (not shown)
having a thin film transistor array (not shown). The first
substrate 2 and the second substrate are spaced apart from
each other by the column spacers 20.

As shown in FIG. 2, the color filter layers 12, including the
color filter layers 12a, 12b and 12c, have different heights to
compensate for differences in transmissivity caused by dif-
ferent material characteristics of the R, G and B color filter
layers 12a, 12b and 12c. Thus, the color filter layers 12a, 12b
and 12c have the same transmissivity. For example, the R, G
and B color filter layers 12a, 12b and 12c have different
heights h1, h2 and h3, respectively. Accordingly, although the
column spacers 20 have the same thickness or height H, the
levels of the upper surfaces of the column spacers 20 mea-
sured from an upper surface of the first substrate 2 may be
different when the column spacers 20 are arranged on differ-
ent regions. For example, as shown in FIG. 2, when the G, R
and B color filter layers 12b, 12a and 12c have a first height
h1, a second height h2, and a third height h3, respectively,
there is a difference in level among the upper surfaces of
column spacers 20 arranged on the respective color filter
layers 12a, 12b and 12c, due to the difference in height
between the color filter layers 12a, 12b and 12c. In this case,
the difference in level between the upper surface of the col-
umn spacer 20 formed on the B color filter layer 12c having
the largest height (h3) and the upper surface of the column

spacer **20** formed on the G color filter layer **12b** having the smallest height (h_1) corresponds to " h_3-h_1 ". Also, the difference in level between the upper surface of the column spacer formed on the R color filter layer **12a** having the largest height (h_2) and the upper surface of column spacer formed on the G color filter layer **12b** having the smallest height (h_1) corresponds to " h_2-h_1 ".

On the other hand, the color filter layers **12a**, **12b** and **12c** may be respectively formed by different patterning processes, so that they have different heights. In this case, the column spacers **20** formed on the respective color filter layers having a difference in height due to the height difference of the color filter layers **12a**, **12b** and **12c** underneath. Thus, it is difficult to ensure a uniform cell gap in different regions between the first substrate **2** and the second substrate, after the first substrate **2** and the second substrate are joined together. The resulting non-uniform cell gap causes a defective image to be displayed.

Thus, the above-mentioned related art LCD device and the above-mentioned related art method for manufacturing the LCD device have the following problems. In the related art LCD device, the column spacers are formed on the color filter layers having a stripe structure, respectively. The respective heights of the column spacers formed on different color filter layers are different. The upper surfaces of the column spacers differ in levels in different regions. Thus, a difference in cell gap occurs in different regions of the LCD device. Such a difference in cell gap causes a variation in optical properties across different regions. As a result, defective image display may occur.

Moreover, the amount of the liquid crystal material filled in the space between the first substrate and the second substrate depends on the column spacer height. However, the difference in level among the upper surfaces of the column spacers caused by the difference in height of the color filter layers makes it difficult to accurately estimate the amount of the liquid crystal material for each liquid crystal cell. Accordingly, the estimated amount of the liquid crystal material could be erroneous, thereby causing an insufficient or excessive filling of the liquid crystal material.

When an insufficient amount of the liquid crystal material is filled between the first and second substrates, the liquid crystal material may shift to a particular portion of the liquid crystal panel and take a long time to be redistributed uniformly across the liquid crystal panel. As a result, the displayed image is defective until the liquid crystal material returns to its original state. On the other hand, when an excessive amount of the liquid crystal material is filled between the first and second substrates, the liquid crystal material flows downward and forms a bulge at the bottom of the liquid crystal panel because of gravity effects to a great expansion of the liquid crystal at high temperature.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a liquid crystal display device and a method for manufacturing the same that substantially obviate one or more problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a liquid crystal display device and a method for manufacturing the same which provides a uniform cell gap.

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

advantages of the invention will be realized and attained by the structure particularly pointed out in the written description of the exemplary embodiments and claims hereof as well as the appended drawings.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, a liquid crystal display device includes a first substrate and a second substrate facing each other, a plurality of gate lines and a plurality of data lines on the first substrate crossing each other to define pixel regions, a black matrix layer on the second substrate in regions corresponding to the gate lines and the data lines, color filter layers on the second substrate covering at least the pixel regions, a plurality of column spacers on respective portions of the black matrix layer excluding the color filter layers, and a liquid crystal layer between the first substrate and the second substrate.

In another aspect, a method for manufacturing a liquid crystal display device includes facing a first substrate to a second substrate, forming a plurality of gate lines and a plurality of data lines crossing each other on the first substrate to define pixel regions, forming a black matrix layer on the second substrate in regions corresponding to the gate lines and the data lines, forming color filter layers on the second substrate to cover at least the pixel regions, forming a plurality of column spacers on respective portions of the black matrix layer excluding the color filter layers, and forming a liquid crystal layer between the first substrate and the second substrate.

In another aspect, a method for manufacturing a liquid crystal display device includes forming a black matrix lattice on a first substrate to define pixel regions, wherein the pixel regions are regularly disposed each other in a first direction and a second direction, respectively, forming color filter layers to cover pixel regions in the second direction and portions of the black matrix lattice between the adjacent to each other in a second direction, each of color filters being formed larger within each pixel region than within the corresponding covered portion of the black matrix lattice to provide uncovered portions of the black matrix lattice between the adjacent pixel regions; and forming a column spacer on one or more of the uncovered portions corresponding to the color filters.

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

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 1 shows a planar view of a first substrate of the related art LCD device;

FIG. 2 shows a cross-sectional view along line I-I' of FIG. 1;

FIG. 3 shows a planar view of a first substrate of an LCD device according to an embodiment the present invention;

FIG. 4 shows a cross-sectional view along line II-II' of FIG. 3;

FIGS. 5A and 5B are planar views of an exemplary process for forming black matrix and color filter layers according to an embodiment of the invention;

FIG. 6 shows a planar view of an exemplary second substrate for the LCD device according to an embodiment of the invention; and

FIG. 7 shows a cross-sectional view of an exemplary LCD panel according to an embodiment of the invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Reference will now be made in detail to exemplary embodiments of the present invention, which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

FIG. 3 shows a planar view of a first substrate of an LCD device according to an embodiment of the present invention. Referring to FIG. 3, a black matrix layer **201** is formed on a first substrate **200** in a region other than pixel regions P. The first substrate **200** also includes color filter layers **202** (**202a**, **202b** and **202c**). The color filter layers **202a**, **202b** and **202c** are spaced apart from one another on the first substrate **200** including the black matrix layers **201**. The first substrate **200** also includes a common electrode **203**. The common electrode **203** is formed over the entire upper surface **200** including the black matrix layer **201** and the color filter layers **202**. The first substrate **200** also includes column spacers **250** respectively formed on the common electrode **203** in regions corresponding to predetermined portions of the black matrix layer **201**.

The color filter layers **202** include first patterns having a first width each formed in a corresponding pixel region P. The color filter layers **202** also include second patterns having a second width, smaller than the first width, and connecting the first patterns formed in the corresponding adjacent upper and lower pixel regions P. Each column spacer **250** is formed between the adjacent first patterns in a region where no second pattern is formed. The region where each column spacer **250** is formed to correspond to the region where each gate line is formed on a second substrate.

FIG. 4 shows a cross-sectional view along line II-II' of FIG. 3. As shown in FIG. 4, each of the color filter layers **202** may have a height different from that of the other color filter layers **202** to compensate for a difference in transmissivity caused by different material characteristics of the R, G and B color filter layers **12a**, **12b** and **12c**, and thus, provide a uniform transmissivity across the entire surface of the LCD device. However, the column spacers **250** have the same height with respect to the upper surface of the first substrate **200**, irrespective of the difference in height between the color filter layers **12a**, **12b** and **12c**. The uniform height is provided by forming the column spacers **250** on a uniformly-leveled surface of portions of the black matrix layer **201** and common electrode **203** corresponding to regions where there is no color filter.

FIGS. 5A and 5B are planar views of an exemplary process for forming black matrix and color filter layers according to an embodiment of the invention. Referring to FIG. 5A, the black matrix layer **201** is formed to correspond to a region other than the pixel regions P. The black matrix layer **201** has a lattice structure corresponding to the gate lines and data lines of the second substrate. The black matrix layer **201** may be made of a light-shielding metal or black resin. Accordingly, the black matrix layer **201** blocks light from being transmitted through the regions covered therewith.

Referring to FIG. 5B, the R, G and B color filter layers **202a**, **202b** and **202c** are subsequently formed. The respective R, G and B color filter layers **202a**, **202b** and **202c** include

first patterns P1 having a first width. Each of the first patterns P1 is formed in a corresponding pixel region P. The respective R, G and B color filter layers **202a**, **202b** and **202c** also include second patterns having a second width smaller than the first width, integrally connected to the first patterns P1. Thus, the first and second patterns P1 and P2 form a continuous structure. For example, each of the R, G and B color filter layers **202a**, **202b** and **202c** including the first patterns P1 and second patterns P2 may be formed by a single patterning process. In an embodiment, the R, G and B color filter layers **202a**, **202b** and **202c** may have the same shape. In another embodiment, the color filter layers may be different in shape, so that the first patterns P1 thereof may have the same shape, while the second patterns P2 have different shapes. For example, as shown in FIG. 5B, when the second pattern P2 of the R color filter layer **202a** is arranged at a left side, the second pattern P2 of the G color filter layer **202b** or B color filter layer **202c** may be arranged at a center or right side. The second pattern P2 is formed to have a width smaller than the first pattern P1. Thus, a space is provided between adjacent first patterns P1, in which each column spacer is to be formed in a region where no second pattern P2 is formed.

In accordance with an embodiment of the invention, the color filter layers are not formed in the form of islands in pixel regions P, but formed to include the first pattern P1 and second pattern P2. This is because separate patterns in the form of islands may cause an increase in pattern loss. Furthermore, when the alignment of the patterns is poor, the patterns may be formed in regions other than pixel regions P.

The width of the first pattern P1 on each of the R, G and B color filter layers **202a**, **202b** and **202c** may be equal to or greater than the width of the corresponding pixel region P. Accordingly, the first pattern P1 may partially overlap the black matrix layer **201** underneath at left and right sides thereof, without overlapping the adjacent color filter layer.

Hereinafter, the formation of the R, G and B color filter layers **202a**, **202b** and **202c** will be explained. A color filter formation layer is formed over the first substrate **200** including the black matrix layer **201**. A photoresist film pattern is selectively formed on portions of the color filter formation layer corresponding to regions where the color filter layers are to be formed. Then, the color filter formation layer is exposed to light and patterned, using the photoresist film pattern as a mask, to remove an unnecessary portion of the color filter formation layer. In this case, the photoresist film pattern is a positive photoresist film pattern. When the photoresist pattern is made of a negative photoresist material, it has a pattern shape opposite to that of the positive photoresist pattern. When the color filter formation layer is formed of a photoresist material, the color filter formation layer may be directly exposed to light and patterned, without forming any photoresist film pattern.

Referring back to FIG. 3, each column spacer **250** is formed to correspond to a region where no second pattern P2 is formed, between the adjacent first patterns P1 in the respective R, G and B color filter layers **202a**, **202b** and **202c**. The column spacers **250** may have a regular arrangement. For example, the column spacers **250** may be formed at respective pixel regions P. Alternatively, the column spacers **250** may be arranged such that one out of two adjacent pixels has a column spacer. The arrangement of the column spacers **250** may be determined depending on the density of column spacers required within the liquid crystal cells. The column spacers may have various arrangements. The arrangement of the column spacers may also be varied depending on the size of the column spacers.

A motivation for forming column spacers **250** between adjacent first patterns **P** in regions where there is no second pattern **P2** is as follows. These regions correspond to leveled gate line regions of the second substrate, and reflect no difference in level among color filter layers **202a**, **202b** and **202c**. Accordingly, the column spacers **250** can be formed on regions flush with one another in both the first and second substrates.

In an embodiment, each column spacer **250** may be arranged between laterally adjacent color filter layers corresponding to different colors. Accordingly, each column spacer **250** is located in a region where there is no color filter layer. However, the regions of the column spacer **250** correspond to data lines in the second substrate. Hence, steps may be formed in regions of the second substrate corresponding to the gate lines. Accordingly, processes associated with the second substrate are performed using four masks for formation of the gate lines, formation of a semiconductor layer and data lines, formation of passivation film holes, and formation of pixel electrodes. In this case, the semiconductor layer is formed beneath the data lines. As a result, the second substrate includes another material layer. Thus, the regions corresponding to the data lines are relatively susceptible to an occurrence of tolerance, as compared to those of gate lines. Furthermore, in a structure requiring a high aperture ratio, overlap of patterns or pixel electrodes may occur in the second substrate so that it is difficult to obtain leveled regions, as compared to those of the gate lines.

In accordance with an embodiment of the invention, the column spacers **250** are formed on the regions corresponding to the gate lines. For example, portions of the color filters overlapping the gate lines are removed. Then, the column spacers **250** are formed in regions corresponding to the eliminated color filter portions. Thus, the column spacers **250** can be formed on regions flush with one another in both the first and second substrates, thereby ensuring a uniform cell gap in the overall region by the column spacers **250**.

The column spacers **250** may be formed on the gate lines **101** while having a horizontal cross-section with a variety of shapes including circular and square shapes.

Hereinafter, the structure of the second substrate in the LCD device according to the present invention, and a state in which the first substrate, on which column spacers are formed, is joined to the second substrate, will be described in detail.

FIG. 6 shows a planar view of an exemplary second substrate for the LCD device according to an embodiment of the invention. FIG. 7 shows a cross-sectional view of an exemplary LCD panel according to an embodiment of the invention. Referring to FIGS. 6 and 7, the second substrate includes gate lines **101** and data lines **102** crossing each other to define pixel region **P** (shown in FIG. 3). The second substrate also includes thin film transistors (TFTs) each located at a crossings of the corresponding data line and gate line, and pixel electrodes **103** formed to correspond to the respective pixel regions **P**. Each TFT includes a gate electrode **101a** protruding from the corresponding gate line **101**, a source electrode **102a** protruding from the corresponding data line **102**, and a drain electrode **102b** protruding from the source electrode **102a**.

A gate insulating film **107** is formed over the entire surface of the second substrate **100** including the gate electrode **101a**. A semiconductor layer **104** is formed in a region corresponding to each gate electrode **101a** on the gate insulating film **107**. The source electrode **102a** and drain electrode **102b** of

the each TFT are formed to contact both sides of an upper surface of the corresponding semiconductor layer **104**, respectively.

A passivation film **108** is formed over the entire surface of the second substrate **200** including the data lines **102**, the source electrodes **102a**, and the drain electrodes **102b**. A passivation film hole **108a** is formed to expose a portion of each drain electrode **102b**. Each pixel electrode **103** is formed to contact the drain electrode **102b** within the corresponding passivation hole **108a**.

The region illustrated in FIG. 7 corresponds to one gate line **101** extending in one direction. The second substrate **100** has a leveled surface in accordance with the sequential formations of the gate insulating film **107** and the passivation film **108** on the gate line **101**. Meanwhile, at the side of the first substrate **200**, the black matrix layer **201** thereof is formed in regions corresponding to the gate line **101**. The second patterns of the color filter layers **202** (**202a**, **202b** and **202c**) are formed on predetermined regions of the black matrix layer **201**, respectively. On the other hand, there is no color filter layer **202** in the remaining region of black matrix layer **201**. The common electrode **203** is formed over the entire upper surface including the black matrix layer **201** and color filter layers **202**. The column spacers **250** are formed on uniformly-leveled surfaces provided by portions of the black matrix layer **201** and common electrode **203** corresponding to regions excluding the color filters.

As illustrated in FIG. 7, at the side of the first substrate **200**, the column spacers **250** are arranged on uniformly-leveled surfaces provided by portions of the black matrix layer **201** and common electrode **203**. Meanwhile, at the side of the second substrate **100**, the column spacers **250** are arranged on uniformly-leveled surfaces provided by portions of the gate line **101**, gate insulating film **107** and passivation film **108**. Thus, a uniform cell gap is ensured in the entire region.

A liquid crystal layer **270** is sealed between the first substrate **200** and the second substrate **100**. In this case, since column spacers **250** flush with one another are interposed between the first substrate **200** and the second substrate **100**, it is possible to calculate a desired amount of the liquid crystal material, based on the height of the column spacers **250**. Also, the column spacers **250**, which support the first and second substrates **200** and **100**, are located on the leveled surfaces, respectively, thereby causing no difference in cell gap among different regions after filling of the liquid crystal. As a result, it is possible to prevent an occurrence of defects due to insufficient or excessive liquid crystal material.

In an embodiment of the invention, the fabricated LCD device operate in a TN mode. In another embodiment, the LCD device may operate in an in-plane switching (IPS) mode. For example, the common electrode **203** may be eliminated from the first substrate **200** as shown in FIG. 7. In this case, the column spacers **250** are arranged on a leveled surface provided by portion of the black matrix layer **201** corresponding to regions where there is no color filter, while corresponding to predetermined portions of the gate lines.

In accordance with an embodiment of the invention, the column spacers are arranged on predetermined portions of the gate lines on the first substrate. Also, the column spacers are arranged on uniformly-leveled surfaces provided by portions of the black matrix layer corresponding to regions where there is no color filter on the second substrate. As a result, the column spacers can correspond to regions flush with one another. Accordingly, regardless of a difference in thickness among color filter layers having different colors, and a difference in thickness among the structures formed on the first and second substrates, the column spacers can have a uniform

level in both the first and second substrates. Thus, a uniformity in cell gap is ensured in the entire region.

In accordance with an embodiment of the invention, an accurate estimate of a desired amount of the liquid crystal material can be made based on the height of the column spacers. Also, the column spacers, which support the first and second substrates **200** and **100**, are located on the leveled surfaces, respectively, thereby causing no difference in cell gap among different regions after filling of the liquid crystal material. As a result, it is possible to prevent an occurrence of defects due to insufficient or excessive amount of liquid crystal material.

It will be apparent to those skilled in the art that various modifications and variations can be made in embodiments of the present invention. Thus, it is intended that embodiments of the present invention cover the modifications and variations of the embodiments described herein provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A liquid crystal display device, comprising:
a first substrate and a second substrate facing each other;
a plurality of gate lines and a plurality of data lines on the first substrate crossing each other to define pixel regions;
a black matrix layer on the second substrate in regions corresponding to the gate lines and the data lines;
color filter layers on the second substrate covering at least the pixel regions, formed in a column direction, wherein each of the color filter layers includes: first and second patterns corresponding to first and second adjacent pixel regions in the column direction, each of the first and second patterns having a first width; and third patterns in regions corresponding to the gate lines, the third pattern integrally connected to the first and second patterns, each of the third patterns having a second width smaller than the first width, wherein the color filter layers have different thicknesses;
a plurality of column spacers on respective portions of the black matrix layer excluding the color filter layers, wherein each of the column spacers is confined where the third pattern is not formed between the first and second patterns; and
a liquid crystal layer between the first substrate and the second substrate.
2. The liquid crystal display device of claim 1, wherein the color filter layers include red, green and blue color filters.
3. The liquid crystal display device of claim 1, further comprising a common electrode over the entire surface of the second substrate including the black matrix layer and the color filter layers.
4. The liquid crystal display device of claim 1, wherein the column spacers are formed in the regions corresponding to the gate lines.
5. A method for manufacturing a liquid crystal display device, comprising:
facing a first substrate to a second substrate;
forming a plurality of gate lines and a plurality of data lines crossing each other on the first substrate to define pixel regions;

forming a black matrix layer on the second substrate in regions corresponding to the gate lines and the data lines;

forming color filter layers on the second substrate to cover at least the pixel regions in a column direction, wherein each of the color filter layers includes: first and second patterns corresponding to first and second adjacent pixel regions in the column direction, each of the first and second patterns having a first width; and third patterns in regions corresponding to the gate lines, the third pattern integrally connected to the first and second patterns, each of the third patterns having a second width smaller than the first width, wherein the color filter layers have different thicknesses;

forming a plurality of column spacers on respective portions of the black matrix layer excluding the color filter layers, wherein each of the column spacers are confined where the third pattern is not formed, between the first and second patterns; and

forming a liquid crystal layer between the first substrate and the second substrate.

6. The method of claim 5, wherein the color filter layers include red, green and blue color filters.

7. The method of claim 5, further comprising forming a common electrode over the entire surface of the second substrate including the black matrix layer and the color filter layers.

8. The method of claim 5, wherein the column spacers are formed in the regions corresponding to the gate lines.

9. A method for manufacturing a liquid crystal display device, comprising:

forming a black matrix lattice on a first substrate to define pixel regions, wherein the pixel regions are regularly disposed with respect to each other in a first direction and a second direction, respectively;

forming color filter layers on the first substrate to cover at least the pixel regions in the second direction, wherein each of the color filter layers includes: a plurality of first patterns to cover each pixel region in the second direction and second patterns to integrally connect the adjacent first patterns in the second direction, each of the first patterns having a first width and each of the second patterns having a second width smaller than the first width, and the second patterns formed directly on the black matrix lattice, wherein the color filter layers have different thicknesses; and

forming a column spacer on the black matrix lattice between the adjacent pixel regions in the second direction excluding the color filter layers, wherein the column spacer is confined where the second pattern is not formed.

10. The method of claim 9, further comprising forming a plurality of gate lines and a plurality of data lines on a second substrate facing the first substrate in correspondence with the black matrix lattice.

11. The method of claim 10, further comprising forming a liquid crystal layer between the first and second substrates.

12. The method of claim 9, wherein each of the color filter layers include one of red, green and blue color filters.

13. The method of claim 9, further comprising forming a common electrode over the entire surface of the first substrate including the black matrix lattice and the color filter layers.

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专利名称(译)	液晶显示装置及其制造方法		
公开(公告)号	US8120733	公开(公告)日	2012-02-21
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[标]申请(专利权)人(译)	乐金显示有限公司		
申请(专利权)人(译)	LG.PHILIPS LCD CO. , LTD.		
当前申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
[标]发明人	LEE KYOUNG MEE		
发明人	LEE, KYOUNG MEE		
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摘要(译)

液晶显示装置包括彼此面对的第一基板和第二基板，第一基板上的多条栅极线和多条数据线彼此交叉以限定像素区域，区域中的第二基板上的黑矩阵层对应于栅极线和数据线，第二基板上的滤色器层至少覆盖像素区域，除了滤色器层之外的黑色矩阵层的各个部分上的多个柱状间隔物，以及第一基板和第二基板。

