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Park et al.

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(54) **COLOR FILTERS OF LIQUID CRYSTAL
DISPLAY AND METHOD FOR FABRICATING
THE SAME**

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(52) **U.S. Cl.** **349/106**; 349/108

(58) **Field of Classification Search** 349/106,
349/108

See application file for complete search history.

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(57) **ABSTRACT**

A liquid crystal display includes: a color filter substrate; and
a plurality of pixels formed in a matrix form on the color filter
substrate, each pixel including a first red sub-pixel, a first
green sub-pixel, a first blue sub-pixel, a pair of second red
sub-pixel and third green sub-pixel, a pair of second green
sub-pixel and third blue sub-pixel, and a pair of second blue
sub-pixel and third red sub-pixel.

16 Claims, 9 Drawing Sheets

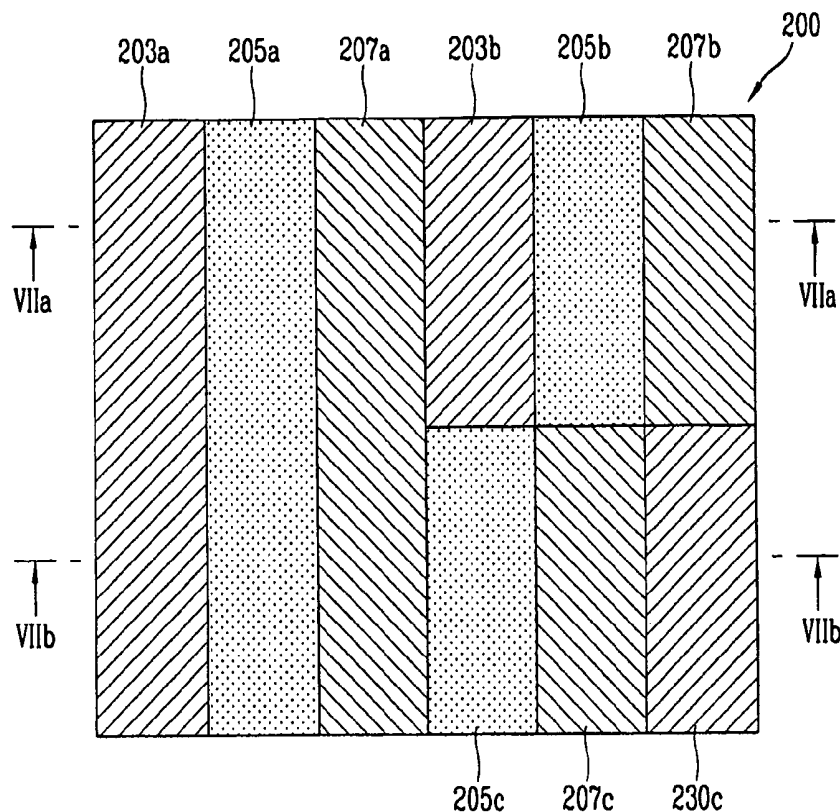


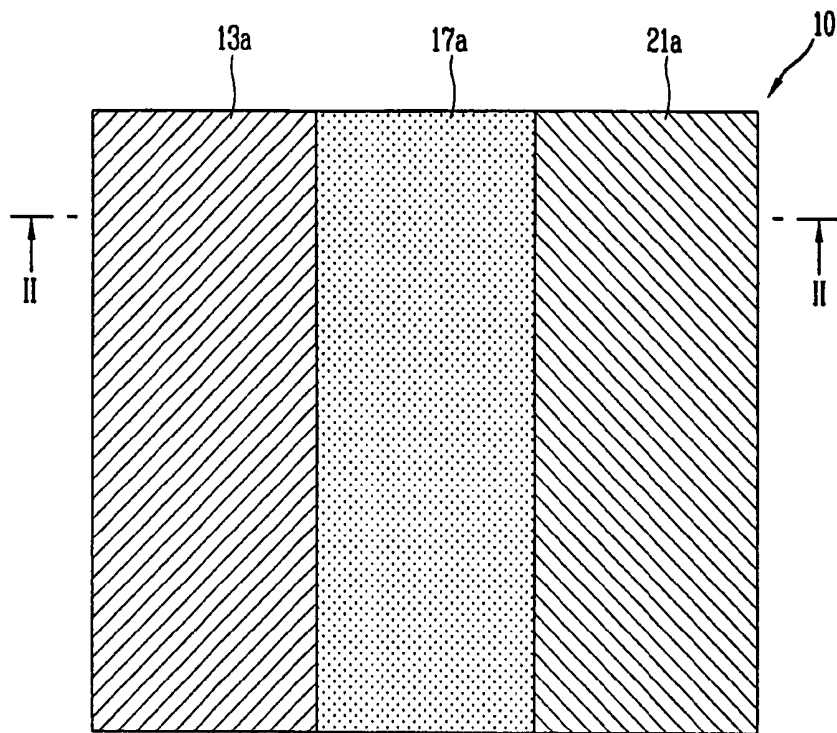
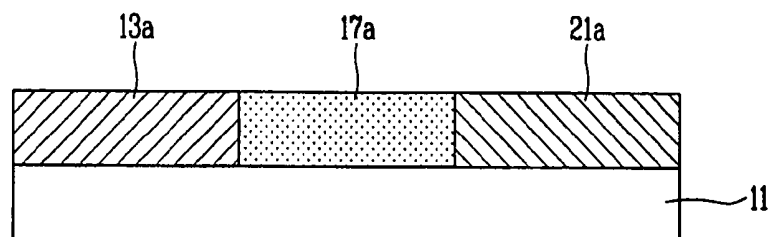
FIG. 1
RELATED ARTFIG. 2
RELATED ART

FIG. 3A
RELATED ART

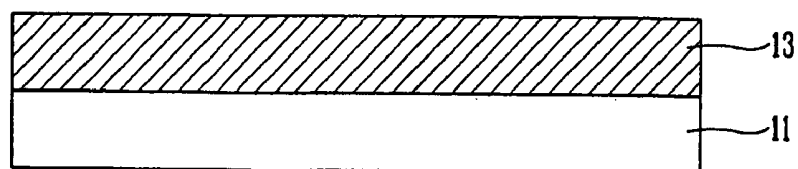


FIG. 3B
RELATED ART

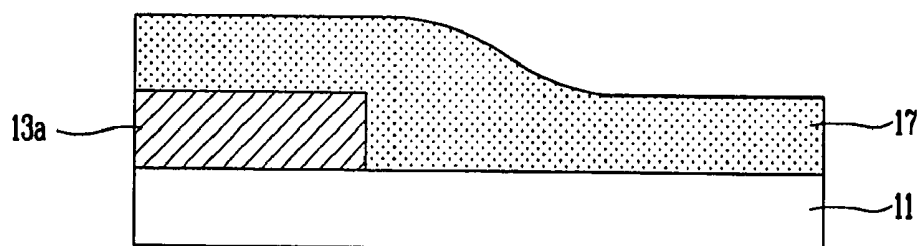


FIG. 3C
RELATED ART

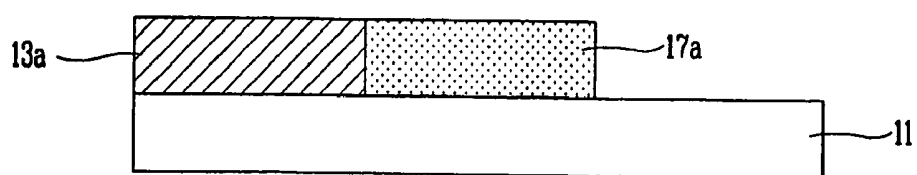


FIG. 3D
RELATED ART

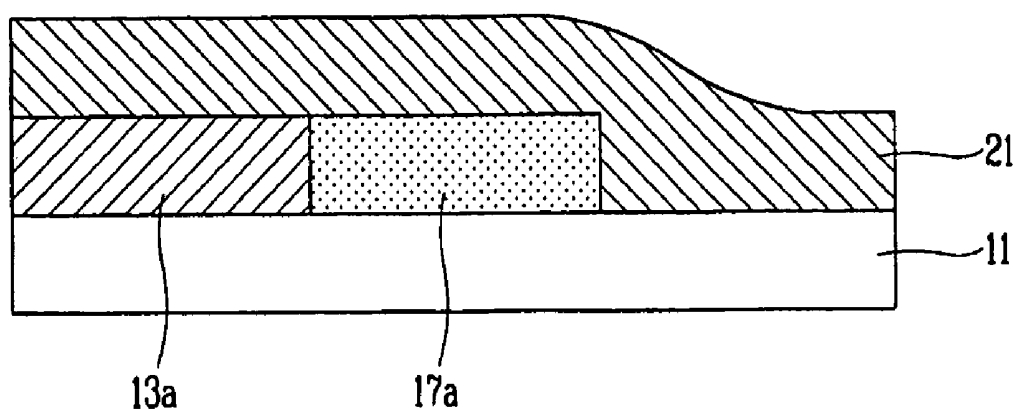


FIG. 3E
RELATED ART

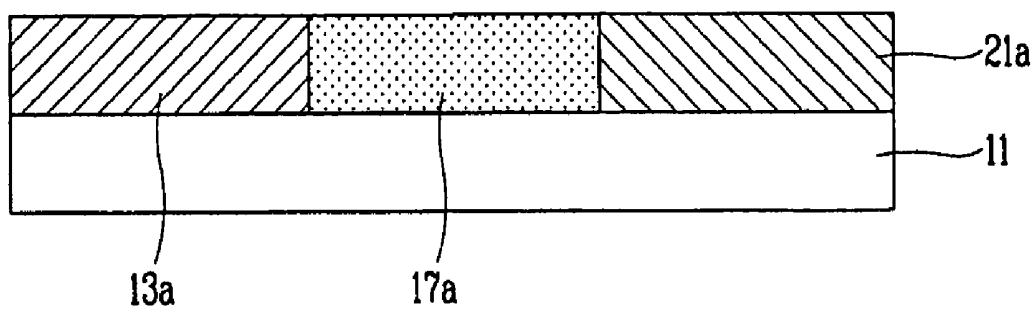


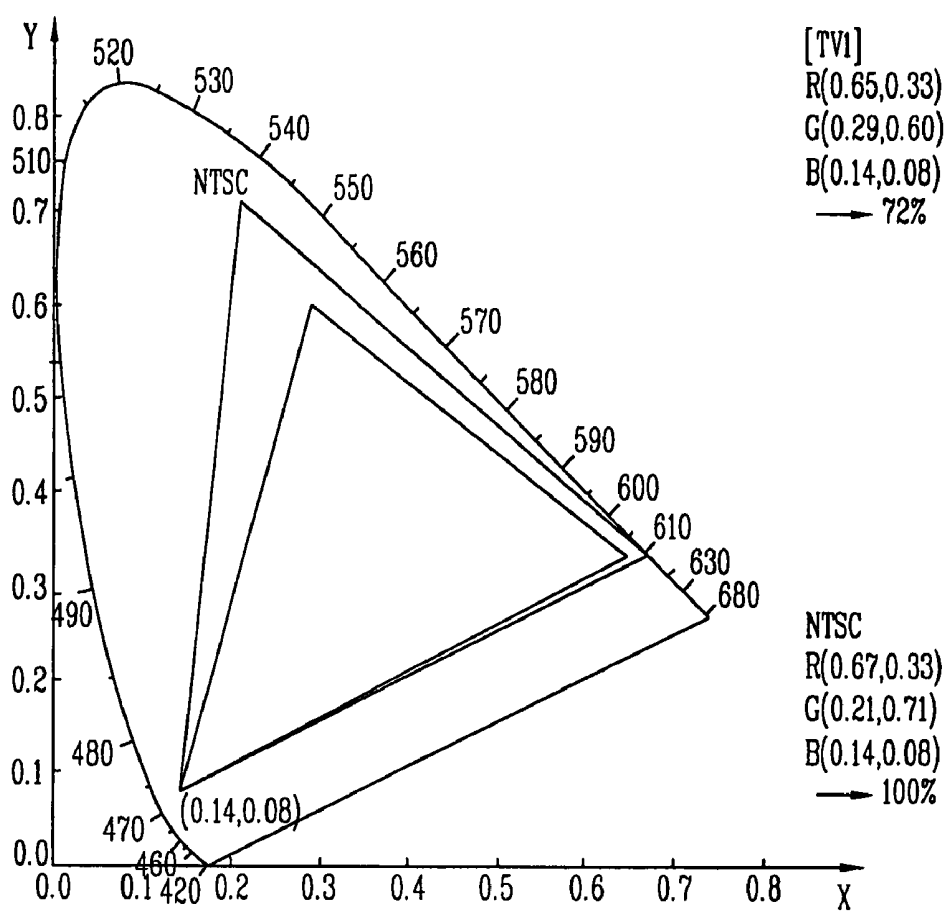
FIG. 4
RELATED ART

FIG. 5

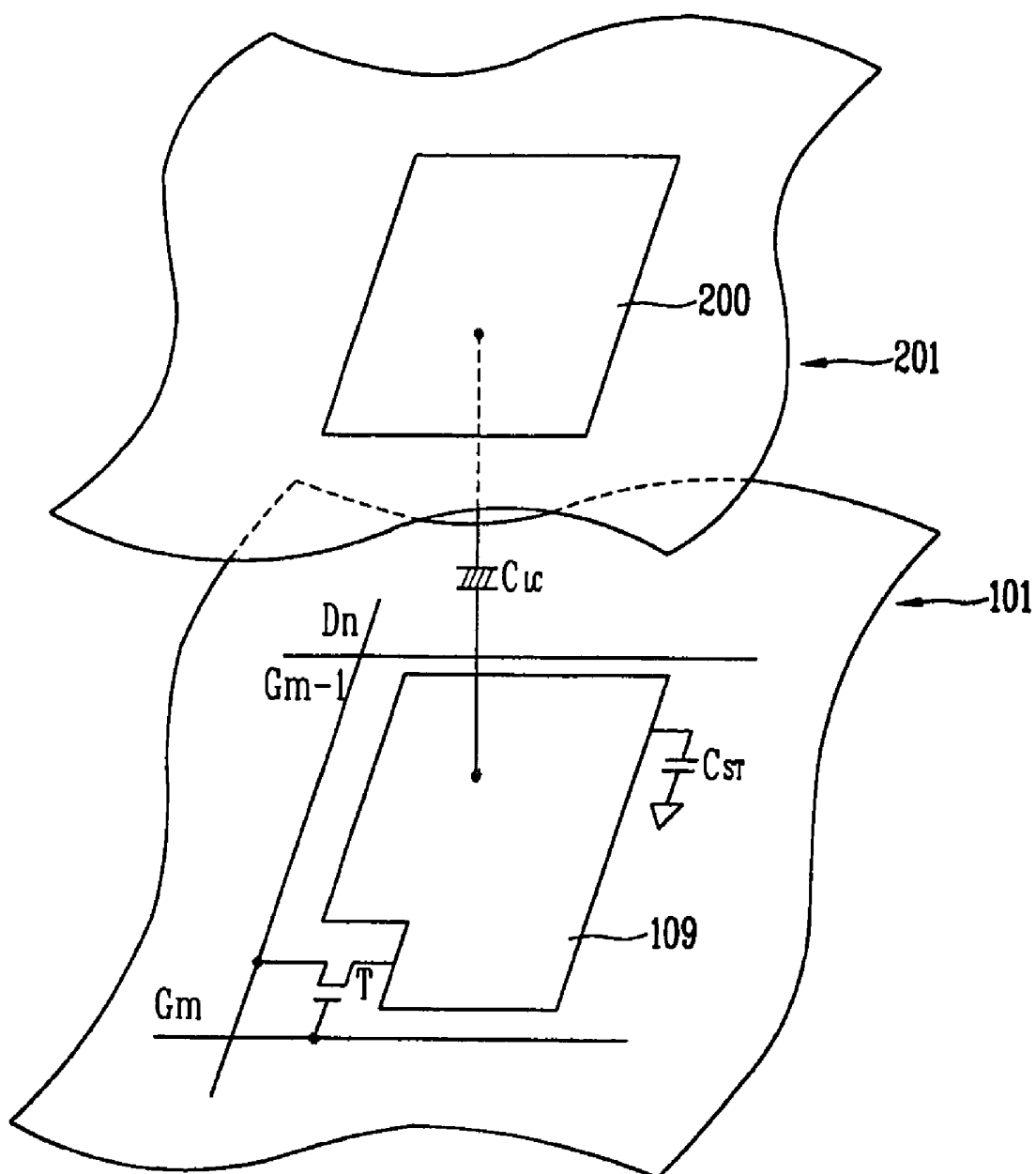


FIG. 6

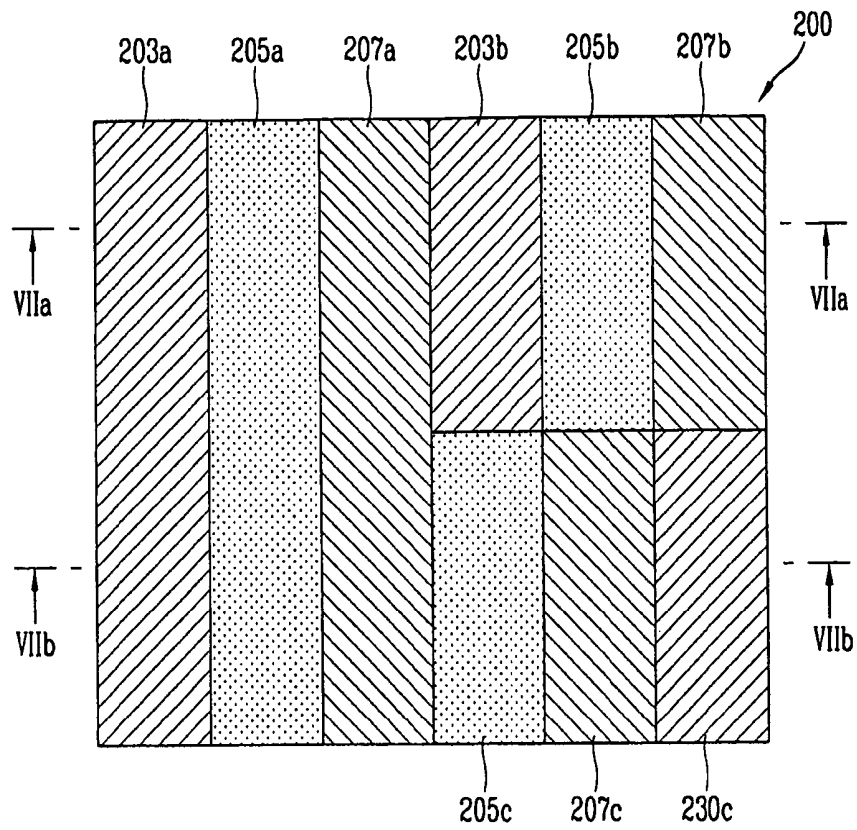


FIG. 7A

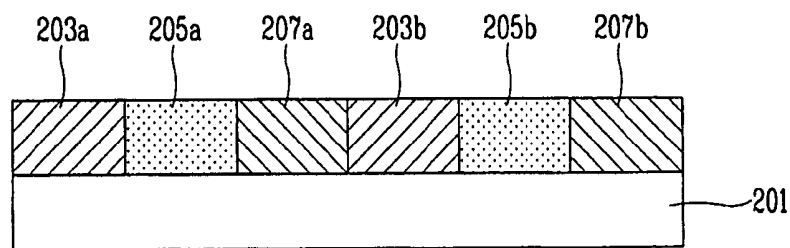


FIG. 7B

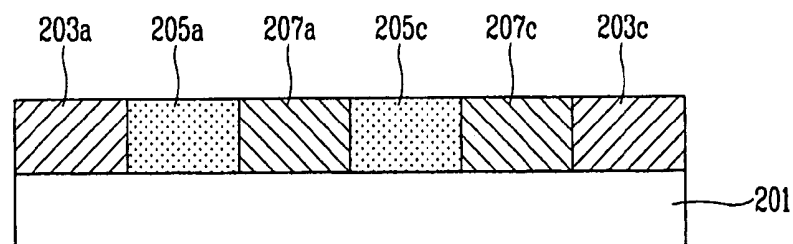


FIG. 8A

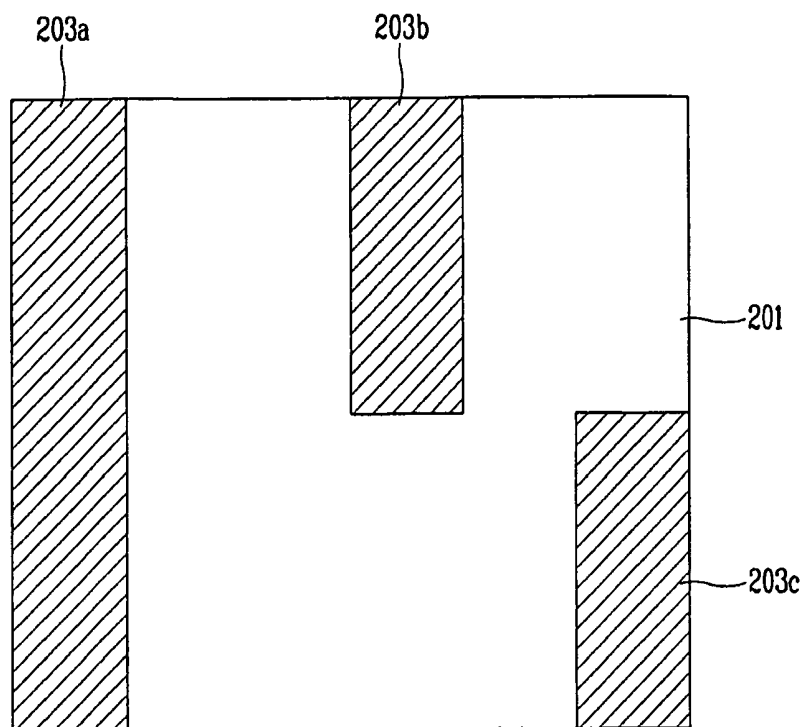


FIG. 8B

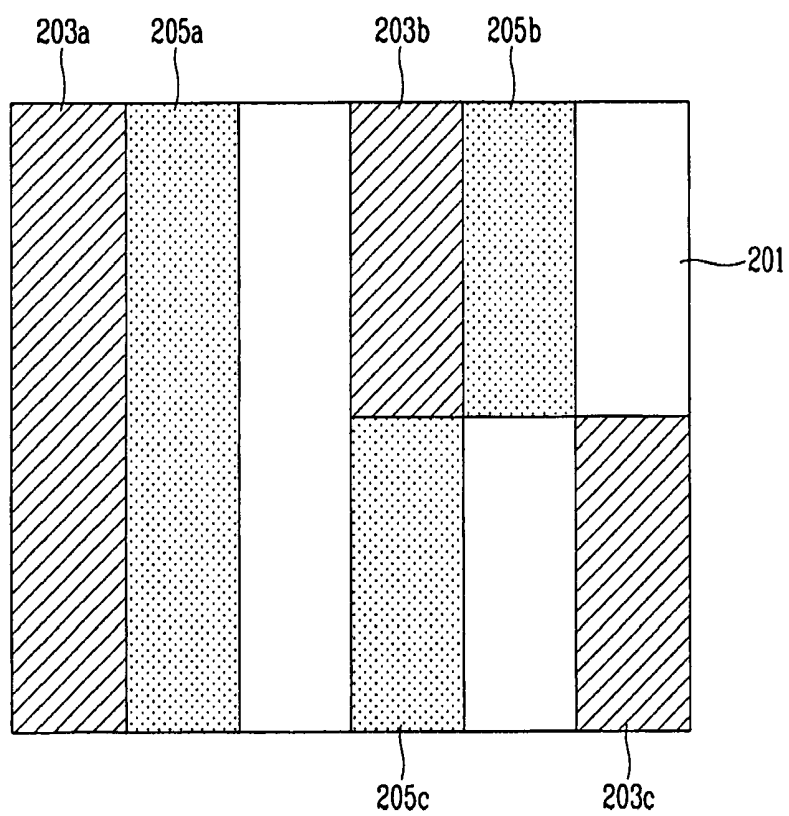


FIG. 8C

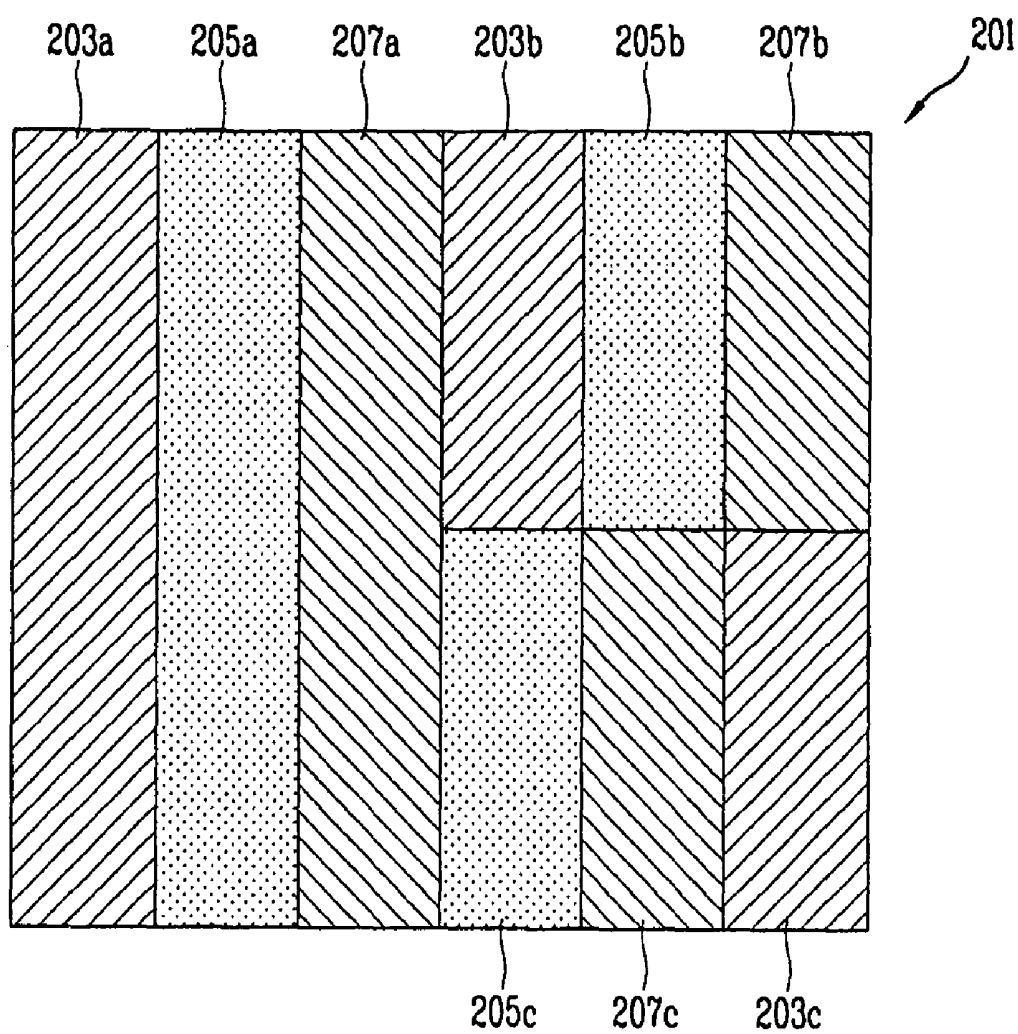
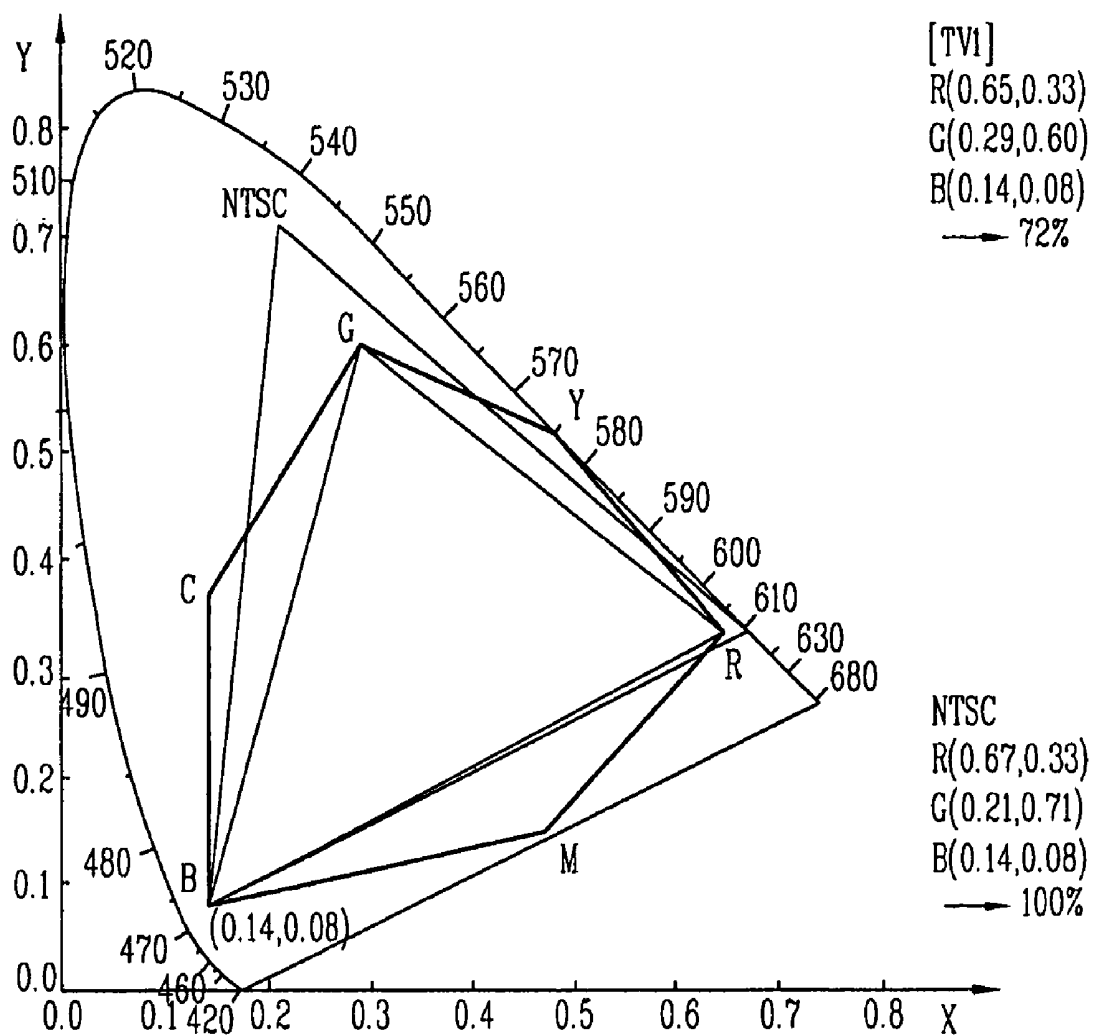


FIG. 9



COLOR FILTERS OF LIQUID CRYSTAL DISPLAY AND METHOD FOR FABRICATING THE SAME

This application claims the benefit of Korean Patent Appli-
cation No. 10-2007-0025111, filed on Mar. 14, 2007, which is
hereby incorporated by reference for all purposes as if fully
set forth herein.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a color filter of a liquid
crystal display (LCD) and, more particularly, to a color filter
of an LCD that can implement 6 primary colors by adding
cyan (C), magenta (M) and yellow (Y) complementary colors
to a color reproduction range using the existing red (R), green
(G) and blue (B).

2. Discussion of the Related Art

In general, an LCD includes two display panels and a liquid
crystal layer, which has dielectric anisotropy, interposed
between the two display panels.

In the LCD, an electric field is applied to the liquid crystal
layer, and the strength of the electric field is controlled to
adjust transmittance of light that passes through the liquid
crystal layer to obtain a desired image.

The LCD is a typical device among portable flat panel
displays (FPDs), and a thin film transistor (TFT) LCD includ-
ing TFTs as switching elements is commonly used.

The LCD includes a plurality of sub-pixels including pixel
electrodes (not shown) and red, green and blue color filters.

Each sub-pixel is driven by a signal applied via a display
signal line to perform a display operation.

Signal lines include gate lines (or scan signal lines) that
transfer scan signals and data lines that transfer data signals.
Each sub-pixel includes a TFT which is connected with a
single gate line and a single data line, through which an image
signal transferred to a pixel electrode formed in the sub-pixel
is controlled.

In the related art LCD, the red (R), green (G) and blue (B)
color filters are arranged in various forms.

For example, in a stripe type color filter arrangement, the
same color filters are arranged in units of sub-pixel rows. In a
mosaic type color filter arrangement, the red (R), green (G)
and blue (B) color filters are sequentially arranged in rows
and columns. In a delta type color filter arrangement, sub-
pixels are disposed in zigzags in a column direction, and red
(R), green (G) and blue (B) color filters are sequentially
arranged.

The related art LCD using the delta-type color filter
arrangement method will now be described with reference to
FIGS. 1 and 2.

FIG. 1 is a plan view showing sub-pixels constituting a
single pixel of the related art LCD, and FIG. 2 is a sectional
view of the sub-pixels constituting a single pixel of the LCD,
taken along line II-II in FIG. 1.

Although not shown, the related art LCD may include a
liquid crystal panel that displays a desired image, and a back-
light unit that supplies light to the liquid crystal panel.

Here, the liquid crystal panel (not shown) includes a TFT
array substrate (not shown) on which TFTs are formed, a
color filter substrate (not shown) which is attached to the TFT
array substrate and includes red (R), green (G) and blue (B)
color filters, and a liquid crystal layer (not shown) filled
between the TFT array substrate and the color filter substrate.

A backlight unit of the LCD includes a plurality of lamps to
provide light to the liquid crystal panel.

With reference to FIG. 1 and FIG. 2, three sub-pixels
including red (R), green (G) and blue (B) color filters 13a, 17a
and 21a constituting a single unit pixel 10 are formed on the
color filter substrate 11. Here, the color filters 13a, 17a and
21a will be considered to refer to the sub-pixels.

The red (R), green (G) and blue (B) color filters 13a, 17a
and 21a are arranged in a column direction.

A black matrix layer (not shown) is formed to block light at
boundaries of the red (R), green (G) and blue (B) color filters
13a, 17a and 21a.

The method for fabricating the color filters of the LCD
according to the related art having such array structure will
now be described with reference to FIGS. 3a to 3e.

FIGS. 3a to 3e are sectional views sequentially showing the
process of fabricating sub-pixels constituting a single pixel of
the related art LCD.

With reference to FIG. 3A, first, a black matrix layer (not
shown) is formed on the color filter substrate 11, a glass
substrate, for example, with an opaque material in order to
prevent light transmission to portions other than the unit pixel
area.

Next, one of a color, which is among red, green and blue,
resin layer is coated on the color filter substrate 11 including
the black matrix layer (not shown). Here, for example, the red
color resin layer 13, among the red, green and blue color resin
layers, may first be coated.

Then, the red color resin layer 13 is selectively removed
through exposing and developing processes using photoli-
thography to form a red color resin layer pattern 13a. In this
case, the red color resin layer pattern 13a is used as a red color
filter and corresponds to the red sub-pixel.

Subsequently, as shown in FIG. 3b, a green (G) color resin
layer 17 is coated on the color filter substrate 11 including the
red color resin layer pattern 13a.

Then, as shown in FIG. 3c, the green color resin layer 17 is
selectively removed through exposing and developing pro-
cesses using photolithography to form the green color resin
layer pattern 17a. In this case, the green color resin layer
pattern 17a is used as a green color filter and corresponds to
the green sub-pixel.

Thereafter, as shown in FIG. 3d, a blue (B) color resin layer
21 is coated on the color filter substrate 11 including the red
and green color resin layer patterns 13a and 17a.

And then, as shown in FIG. 3e, the blue color resin layer 21
is selectively removed through exposing and developing pro-
cesses using photolithography to form the blue color resin
layer pattern 21a. In this case, the blue color resin layer
pattern 21a is used as a blue color filter and corresponds to a
blue sub-pixel.

The color filters of the related art LCD fabricated as
described above and the fabrication method have the follow-
ing problems.

That is, in the color filters of the related art LCD and its
fabrication method, only the three R, G and B colors are used
to form the color filters, and as shown in FIG. 4, formation of
the color filters with three colors has limited color reproduc-
tion characteristics close to the natural colors.

Thus, a method of adding three cyan, magenta and yellow
color filters to the three R, G and B color filters has been
proposed, which, however, has failed to be employed for mass
production because it incurs high fabrication costs for devel-
opment of additional color inks (cyan, magenta and yellow)
and an additional photo process.

SUMMARY OF THE INVENTION

Therefore, in order to address the above matters the various
features described herein have been conceived. One aspect of

the exemplary embodiments is to provide a color filter of a liquid crystal display (LCD) capable of implementing six colors including red (R), green (G) and blue (B) without additional inks or processes by using complementary characteristics of the red (R), green (G) and blue (B), and its fabrication method.

This present invention provides an LCD including: a color filter substrate; and a plurality of pixels formed in a matrix form on the color filter substrate, each pixel including a first red sub-pixel, a first green sub-pixel, a first blue sub-pixel, a pair of second red sub-pixel and third green sub-pixel, a pair of second green sub-pixel and third blue sub-pixel, and a pair of second blue sub-pixel and third red sub-pixel.

This present invention also provides an LCD including: a thin film transistor (TFT) array substrate; a color filter substrate attached to the TFT array substrate; a plurality of pixels formed in a matrix form on the color filter substrate, each pixel including a first red sub-pixel, a first green sub-pixel, a first blue sub-pixel, a pair of second red sub-pixel and third green sub-pixel, a pair of second green sub-pixel and third blue sub-pixel, and a pair of second blue sub-pixel and third red sub-pixel; and a liquid crystal layer formed between the TFT array substrate and the color filter substrate.

This present invention also provides a method for fabricating color filters of an LCD, including: providing a color filter substrate; and forming a plurality of pixels on the color filter substrate, wherein the forming of the plurality of pixels includes: forming first to third red sub-pixels on the color filter substrate; forming first to third green sub-pixels on other portions of the color filter substrate than the area where the first to third red sub-pixels have been formed; and forming first to third blue sub-pixels on other portions of the color filter substrate than the area where the first to third green sub-pixels and the first to third red sub-pixels have been formed.

This present invention also provides a method for fabricating an LCD, including: providing a color filter substrate; and forming a plurality of pixels on the color filter substrate, wherein the forming of the plurality of pixels includes: forming first to third red color resin layer patterns on the color filter substrate; forming first to third green sub-pixels on other portions of the color filter substrate than the area where the first to third red color resin layer patterns have been formed; and forming first to third blue color resin layer patterns on other portions of the color filter substrate than the area where the first to third green color resin layer patterns and the first to third red color resin layer patterns have been formed.

These and other advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view showing sub-pixels constituting a single pixel of a liquid crystal display (LCD) according to the related art;

FIG. 2 is a sectional view of the sub-pixels constituting a single pixel of the LCD, taken along line II-II in FIG. 1;

FIGS. 3a through and including 3e are sectional views sequentially showing the process of fabricating sub-pixels of a single pixel of the LCD according to the related art;

FIG. 4 is a graph showing a color coordinate of a color filter of the LCD according to the related art;

FIG. 5 is an equivalent circuit diagram of a single sub-pixel of an LCD according to an exemplary embodiment of the present invention;

FIG. 6 is a plan view of sub-pixels constituting a single pixel of the LCD according to an exemplary embodiment of the present invention;

FIGS. 7a and 7b are sectional views constituting a single pixel of the LCD according to an exemplary embodiment of the present invention, wherein

FIG. 7a is a sectional view taken along line VIIa-VIIa in FIG. 6; and

FIG. 7b is a sectional view taken along line VIIb-VIIb in FIG. 6.

FIG. 8a to 8c are plan views for explaining the process of forming sub-pixels of a single pixel of the LCD according to an exemplary embodiment of the present invention; and

FIG. 9 is a graph showing a color coordinate of a color filter of the LCD according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Color filters of a liquid crystal display (LCD) and its fabrication method according to an exemplary embodiment of the present invention will now be described in detail with reference to the accompanying drawings.

FIG. 5 is an equivalent circuit diagram of a single sub-pixel of an LCD according to an exemplary embodiment of the present invention.

FIG. 6 is a plan view of sub-pixels constituting a single pixel of the LCD according to an exemplary embodiment of the present invention.

FIGS. 7a and 7b are sectional views constituting a single pixel of the LCD according to an exemplary embodiment of the present invention, wherein FIG. 7a is a sectional view taken along line VIIa-VIIa in FIG. 6, and FIG. 7b is a sectional view taken along line VIIb-VIIb in FIG. 6.

FIG. 8a to 8c are plan views for explaining the process of forming sub-pixels of a single pixel of the LCD according to an exemplary embodiment of the present invention.

With reference to FIG. 5, the LCD according to an exemplary embodiment of the present invention includes a liquid crystal panel including a thin film transistor (TFT) array substrate 101, a color filter substrate 201 with red (R), green (G) and blue (B) color filters formed thereon, and a liquid crystal layer (not shown) filled between the substrates, and a backlight unit (not shown) that provides light to the liquid crystal panel.

A plurality of gate lines Gm-1 and Gm and a plurality of data lines Dn are arranged to cross each other to form a sub-pixel area on the TFT array substrate 101, and a TFT (T), a switching element, is formed at each crossing of the gate lines and the data lines.

A pixel electrode 109 is connected with the TFT (T) formed at each sub-pixel area.

Each sub-pixel includes the TFT (T), the switching element, connected with the gate lines Gm-1 and Gm and the data line Dn, a liquid crystal capacitor Clc connected to the TFT (T), and a storage capacitor Cst. In this case, the storage capacitor may be omitted as necessary.

The liquid crystal capacitor Clc uses the pixel electrode 109 of the lower array substrate 101 and a common electrode (not shown) of the upper color filter substrate 201 as two terminals, and the liquid crystal layer (not shown) between the two electrodes serves as a dielectric substance.

The pixel electrode 109 is connected with the TFT (T), and the common electrode (not shown) is formed on the upper color filter substrate 201 and receives a common voltage Vcom.

The common electrode (not shown) may be provided on the lower array substrate **101**, and in this case, the pixel electrode **109** and the common electrode (not shown) may be formed in a linear or bar shape.

The backlight unit (not shown) of the LCD includes a plurality of lamps to provide light to the liquid crystal panel. In this case, as the lamps, CCFLs (Cold Cathode Fluorescent Lamp), EEFLs (External Electrode Fluorescent Lamps), LEDs (Light Emitting Diodes), and the like, can be used.

On the color filter substrates, a plurality of pairs of sub-pixels that implement cyan (C), magenta (M) and yellow (Y) colors together with red (R), green (G), and blue (B) colors form a single pixel as a basic unit of an image.

Although not shown, black matrixes are formed at boundaries of sub-pixels to prevent light transmission. Here, it is assumed that the black matrixes are formed at boundaries of the respective sub-pixels in the following description.

The disposition structure and disposition method of sub-pixels of the color filter substrates of the LCD according to an exemplary embodiment of the present invention will now be described in detail.

FIG. **6** is a plan view of sub-pixels constituting a single pixel of the LCD according to an exemplary embodiment of the present invention.

FIGS. **7a** and **7b** are sectional views constituting a single pixel of the LCD according to an exemplary embodiment of the present invention, wherein FIG. **7a** is a sectional view taken along line VIIa-VIIa in FIG. **6**, and FIG. **7b** is a sectional view taken along line VIIb-VIIb in FIG. **6**.

With reference to FIGS. **6** and **7a** and **7b**, the sub-pixels of a single pixel **200** of the color filters of the LCD according to an exemplary embodiment of the present invention has a basic structure of 1×6 matrix. Of the sub-pixels, the first, red (R), the first green (G) and the first blue (B) sub-pixels **203a**, **205a** and **207a** are disposed at the three rows, and pairs of sub-pixels are formed at the remaining rows in a 2×3 matrix form.

In detail, in the 2×3 matrix form, a second red sub-pixel **203b** and a third green sub-pixel **205c** make a pair in a first column, a second green sub-pixel **205b** and a third blue sub-pixel **207c** make a pair in a second column, and a second blue sub-pixel **207b** and a third red sub-pixel **203c** make a pair in a third column.

Here, the pair of second red sub-pixel **203b** and the third green sub-pixel **205c** implement yellow color, the pair of second green sub-pixel **205b** and third blue sub-pixel **207c** implement cyan color, and the pair of second blue sub-pixel **207b** and third red sub-pixel **203c** implement magenta color.

In this manner the red, green, blue, cyan, magenta and yellow colors are implemented by the nine sub-pixels (namely, color filters) constituting the single pixel **200**.

The method for forming a plurality of sub-pixels constituting a single pixel of the color filter will now be described with reference to FIGS. **8a** to **8c**.

FIG. **8a** to **8c** are plan views for explaining the process of forming sub-pixels of a single pixel of the LCD according to an exemplary embodiment of the present invention.

Although not shown, one of red, green and blue color filter resin layers (not shown) is coated on the color filter substrate **201**. Here, a case where a red color resin layer **13**, among the red, green and blue color resin layers, is first coated will be taken as an example.

In this case, major components of the color resin layer include photopolymerization type photosensitive composition such as a photopolymerization initiator, monomer, a binder, and organic pigments assuming R, G and B and their similar colors.

Although not shown, a black matrix layer (not shown) is formed with an opaque material to prevent light from transmitting through other portions than unit pixel areas on the color filter substrate **201** at a previous stage before the red color resin layer is coated. Here, it is assumed that the black matrix is formed at boundaries of the respective sub-pixels in the following description.

Subsequently, with reference to FIG. **8a**, the red color resin layer (not shown) is selectively removed through exposing and developing processes using photolithography to form red color resin layer patterns **203a**, **203b** and **203c**. In this case, the red color resin layer patterns **203a**, **203b** and **203c** are used as the first to third red sub-pixels **203a**, **203b** and **203c**.

Among the sub-pixels **203a**, **203b** and **203c**, the second and third red sub-pixels **203b** and **203c** are disposed in columns different from that of the first red sub-pixel **203a**, and respectively have an area corresponding to a half of or smaller than that of the first red sub-pixel **203a**.

Thereafter, although not shown, a green color resin layer (not shown) is formed on the color filter substrate **201** including the red color resin layer patterns **203a**, **203b** and **203c**.

And then, as shown in FIG. **8b**, the green color resin layer (not shown) is selectively removed through exposing and developing processes using photolithography to form green color resin layer patterns **205a**, **205b** and **205c**. In this case, the green color resin layer patterns **205a**, **205b** and **205c** can be used as first to third green sub-pixels **205a**, **205b** and **205c**.

Among the green sub-pixels **205a**, **205b** and **205c**, the second and third green sub-pixels **205b** and **205c** are disposed in columns different from that of the first green sub-pixel **205a** and respectively have an area corresponding to a half of or smaller than that of the first green sub-pixel **205a**.

The green sub-pixels **205a**, **205b** and **205c** do not overlap with the red sub-pixels **203a**, **203b** and **203c**.

The second green sub-pixel **205b** is disposed in the a different column from that of the second red sub-pixel **203b**, and the third green sub-pixel **205c** is disposed in the same column as the second red sub-pixel **203b**. The third green sub-pixel **205c** and the second red sub-pixel **203b** disposed in the same column implement the yellow color.

Subsequently, although not shown, a blue color resin layer (not shown) is formed on the color filter substrate **201** including the red color resin layer patterns **203a**, **203b** and **203c** and the green color resin layer patterns **205a**, **205b** and **205c**.

And then, as shown in FIG. **8c**, the blue color resin layer (not shown) is selectively removed through exposing and developing processes using photolithography to form the blue color resin layer patterns **207a**, **207b** and **207c**, thus completing formation of the plurality of sub-pixels constituting a single pixel.

In this case, the red color resin layer patterns **207a**, **207b** and **207c** are used as first to third blue sub-pixels **207a**, **207b** and **207c**.

The blue sub-pixels **207a**, **207b** and **207c** do not overlap with the red sub-pixels **203a**, **203b** and **203c** and the green sub-pixels **205a**, **205b** and **205c**.

The second blue sub-pixel **207b** is disposed in the same column in which the third red sub-pixel **203c** is disposed, and the third blue sub-pixel **207c** is disposed in the same column in which the second green sub-pixel **205b** is disposed.

The second blue sub-pixel **207b** and the red sub-pixel **203c** disposed in the same column implement a magenta color, and the third blue sub-pixel **207c** and the second green sub-pixel **205b** disposed in the same column implement a cyan color.

By disposing the nine sub-pixels constituting a single pixel in such manners, a change in six color coordinates of the LCD as shown in FIG. **9** can be recognized.

Namely, in FIG. 9, the triangle in the color coordinates indicates a general color coordinates, and because cyan (C), magenta (M) and yellow (Y) color coordinates are added, every color within the hexagon can be implemented.

A method for fabricating the TFTs on the array substrate which is to be attached to the color filter substrate on which a plurality of sub-pixels are formed will now be described.

Although not shown, a gate metallic material is deposited on an insulation substrate made of transparent glass to form a gate metallic film, and the gate metallic film is selectively patterned through a masking process to form gate lines and gate electrodes protruded from the gate lines.

In this case, as the gate metallic material, an aluminum-based metal such as Al, an Al alloy, etc., a silver-based metal such as Ag, an Ag alloy, etc., a molybdenum-based metal such as Mo, an Mo alloy, etc., Cr, Ti, Ta, etc.

In addition, the gate metallic film may include two layers each having different physical properties, namely, a lower layer and an upper layer. The upper layer may be made of a metal with low resistivity, such as an aluminum-based metal or silver-based metal, in order to reduce a signal delay or a voltage drop of the gate line.

The lower layer may be made of a different material, in particular, a material having good physical, chemical and electrical contact characteristics with ITO (Indium Tin Oxide) or IZO (Indium Zinc Oxide). For example, the lower layer may be made of Ti, Ta, Cr, Mo-based metal, etc. The combination of the lower layer and the upper layer can be, for example, a Cr/Al—Nd alloy.

Next, a gate insulating layer made of silicon nitride (SiNx), etc., is formed on the insulation substrate including the gate lines and the gate electrodes.

Subsequently, a semiconductor layer made of hydrogenated amorphous silicon, etc., is formed on the gate insulating layer.

And then, an ohmic contact layer made of a material such as n+ hydrogenated amorphous silicon, etc., in which silicide or 'n' type impurities are doped with a high density, is formed on the semiconductor layer.

Thereafter, the ohmic contact layer and the semiconductor layer are selectively patterned through a masking process.

And then, a metallic material for data lines is deposited on the insulation substrate including the selectively patterned ohmic contact layer and semiconductor layer to form a metallic film for data lines, and the metallic film for data lines is then selectively patterned through a masking process to form a data line, a source electrode protruded from the data line, and a drain electrode spaced apart from the source electrode.

The data line and the gate line are formed to cross each other, and the source electrode and the drain electrode form the TFT, the switching element, together with the lower gate electrode. A channel of the TFT is formed at the semiconductor layer between the source electrode and the drain electrode.

The metallic film for data lines can be made of an aluminum-based metal, a silver-based metal, a molybdenum-based metal, Cr, Ti, Ta, etc., and may be formed as a multi-layer.

A protection layer made of an organic material having good planarization characteristics and photosensitivity, an insulation material having low dielectric constant characteristics, or silicon nitride, an inorganic material, etc., is formed on the insulation substrate including the data line and the drain electrode.

And then, the protection layer is selectively patterned through a masking process to form a contact hole exposing a portion of the drain electrode in the protection layer.

Thereafter, a metallic material layer made of a transparent conductive material such as ITO or IZO or a reflective metal

is deposited on the protection layer including the contact hole, and then selectively removed through a masking process to form a plurality of pixel electrodes. In this case, when data voltage is applied to the pixel electrodes, the pixel electrodes generate an electric field together with the common electrode of the upper color filter substrate which has been received a common voltage, to thus arrange liquid crystal molecules of the liquid crystal layer between the pixel electrodes and the common electrode.

In the above description, the common electrode is formed on the upper color filter substrate, and as mentioned above, it may be also formed on the lower insulation substrate as necessary.

The color filters of the LCD and its fabrication method according to the present invention have the following advantages.

First, because a plurality of sub-pixels constituting a single pixel are disposed in each different columns and in the same columns to add cyan (C), magenta (M) and yellow (Y) colors to the red (R), green (G) and blue (B) colors, the hexagon of six colors can be implemented, so color reproduction close to the natural colors can be implemented.

In particular, because the cyan (C), magenta (M) and yellow (Y) colors are implemented by using the complementary characteristics of red (R), green (G) and blue (B) colors, the six colors can be implemented without performing additional color filter forming process and masking process.

Therefore, because the six colors can be implemented without any additional process, the fabrication cost can be reduced and the color reproduction characteristics can be improved.

As the present invention may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds are therefore intended to be embraced by the appended claims.

What is claimed is:

1. A liquid crystal display device, comprising:

a color filter substrate; and

a plurality of pixels formed in a matrix form on the color filter substrate, each pixel including a first red sub-pixel, a first green sub-pixel, a first blue sub-pixel, a pair of second red sub-pixel and third green sub-pixel, a pair of second green sub-pixel and third blue sub-pixel, and a pair of second blue sub-pixel and third red sub-pixel, wherein the first red sub-pixel, the first green sub-pixel and the first blue sub-pixel, the pair of second red sub-pixel and third green sub-pixel, the pair of second green sub-pixel and third blue sub-pixel, and the pair of second blue sub-pixel and third red sub-pixel are disposed in different column respectively.

2. The device of claim 1, wherein the pair of second red sub-pixel and third green sub-pixel, the pair of second green sub-pixel and third blue sub-pixel, and the pair of second blue sub-pixel and third red sub-pixel are disposed in the same column respectively.

3. The device of claim 1, wherein the pair of second red sub-pixel and third green sub-pixel implement yellow (Y) color, the pair of second green sub-pixel and third blue sub-pixel implement cyan (C) color, and the pair of second blue sub-pixel and third red sub-pixel implement magenta (M) color.

4. A liquid crystal display device comprising:
 a thin film transistor (TFT) array substrate;
 a color filter substrate attached to the TFT array substrate;
 a plurality of pixels formed in a matrix form on the color
 filter substrate, each pixel including a first red sub-pixel,
 a first green sub-pixel, a first blue sub-pixel, a pair of
 second red sub-pixel and third green sub-pixel, a pair of
 second green sub-pixel and third blue sub-pixel, and a
 pair of second blue sub-pixel and third red sub-pixel,
 wherein the first red sub-pixel, the first green sub-pixel,
 the first blue sub-pixel, the pair of second red sub-pixel
 and third green sub-pixel, the pair of second green sub-
 pixel and third blue sub-pixel, and the pair of second
 blue sub-pixel and third red sub-pixel are disposed in
 different column, respectively; and
 a liquid crystal layer formed between the TFT array sub-
 strate and the color filter substrate.

5. The device of claim 4, wherein the pair of second red
 sub-pixel and third green sub-pixel, the pair of second green
 sub-pixel and third blue sub-pixel, and the pair of second blue
 sub-pixel and third red sub-pixel are disposed in the in the
 same column respectively.

6. The color filters of claim 4, wherein the pair of second
 red sub-pixel and third green sub-pixel implement yellow (Y)
 color, the pair of second green sub-pixel and third blue sub-
 pixel implement cyan (C) color, and the pair of second blue
 sub-pixel and third red sub-pixel implement magenta (M)
 color.

7. A method for fabricating color filters of a liquid crystal
 display, comprising:

providing a color filter substrate; and
 forming a plurality of pixels on the color filter substrate,
 wherein the forming of the plurality of pixels comprises:
 forming first to third red sub-pixels on the color filter
 substrate;
 forming first to third green sub-pixels on other portions
 of the color filter substrate than the area where the first
 to third red sub-pixels have been formed; and
 forming first to third blue sub-pixels on other portions of
 the color filter substrate than the area where the first to
 third green sub-pixels and the first to third red sub-
 pixels have been formed.

8. The method of claim 7, wherein the first red sub-pixel,
 the first green sub-pixel and the first blue sub-pixel are dis-
 posed in different columns.

9. The method of claim 7, wherein the pair of second red
 sub-pixel and third green sub-pixel, the pair of second green
 sub-pixel and third blue sub-pixel, and the pair of second blue
 sub-pixel and third red sub-pixel are disposed in different
 columns.

10. The method of claim 9, wherein the pair of second red
 sub-pixel and third green sub-pixel, the pair of second green
 sub-pixel and third blue sub-pixel, and the pair of second blue
 sub-pixel and third red sub-pixel are disposed in the in the
 same column respectively.

11. The method of claim 7, wherein the pair of second red
 sub-pixel and third green sub-pixel implement yellow (Y)
 color, the pair of second green sub-pixel and third blue sub-
 pixel implement cyan (C) color, and the pair of second blue
 sub-pixel and third red sub-pixel implement magenta (M)
 color.

12. A method for fabricating color filters of a liquid crystal
 display, comprising:

providing a color filter substrate; and
 forming a plurality of pixels on the color filter substrate,
 wherein the forming of the plurality of pixels comprises:
 forming first to third red color resin layer patterns on the
 color filter substrate;
 forming first to third green sub-pixels on other portions
 of the color filter substrate than the area where the first
 to third red color resin layer patterns have been
 formed; and
 forming first to third blue color resin layer patterns on
 other portions of the color filter substrate than the area
 where the first to third green color resin layer patterns
 and the first to third red color resin layer patterns have
 been formed.

13. The method of claim 12, wherein the first red color
 resin layer pattern, the first green color resin layer pattern and
 the first blue color resin layer pattern are disposed in different
 columns.

14. The method of claim 12, wherein the pair of second red
 color resin layer pattern and third green color resin layer
 pattern, the pair of second green color resin layer pattern and
 third blue color resin layer pattern, and the pair of second blue
 color resin layer pattern and third red color resin layer pattern
 are disposed in different columns.

15. The method of claim 14, wherein the pair of second red
 color resin layer pattern and third green color resin layer
 pattern, the pair of second green color resin layer pattern and
 third blue color resin layer pattern, and the pair of second blue
 color resin layer pattern and third red color resin layer pattern
 are disposed in the in the same column respectively.

16. The color filters of claim 1, wherein the pair of second
 red color resin layer pattern and third green color resin layer
 pattern implement yellow (Y) color, the pair of second green
 color resin layer pattern and third blue color resin layer pat-
 tern implement cyan (C) color, and the pair of second blue
 color resin layer pattern and third red color resin layer pattern
 implement magenta (M) color.

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专利名称(译)	液晶显示器的滤色器及其制造方法		
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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.飞利浦液晶CO. , LTD.		
当前申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
[标]发明人	PARK CHOON HO LEE JUNG JAE		
发明人	PARK, CHOON-HO LEE, JUNG-JAE		
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摘要(译)

液晶显示器包括：滤色器基板；多个像素以矩阵形式形成在滤色器基板上，每个像素包括第一红色子像素，第一绿色子像素，第一蓝色子像素，一对第二红色子像素和第三红色子像素绿色子像素，一对第二绿色子像素和第三蓝色子像素，以及一对第二蓝色子像素和第三红色子像素。

