



US009915844B2

(12) **United States Patent**
Son et al.

(10) **Patent No.:** **US 9,915,844 B2**
(45) **Date of Patent:** **Mar. 13, 2018**

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

USPC 349/141
See application file for complete search history.

(71) Applicant: **Samsung Display Co., Ltd.**, Yongin-wi,
Gyeonggi-do (KR)

(56) **References Cited**

(72) Inventors: **Ock Soo Son**, Seoul (KR); **Dong Wook Kim**, Seoul (KR); **Jean Ho Song**, Yongin-si (KR); **Eun Je Jang**, Seongnam-si (KR); **Do Hyun Jung**, Suwon-si (KR)

U.S. PATENT DOCUMENTS

2012/0314169 A1 * 12/2012 Naoe G02F 1/133345
349/138
2013/0100386 A1 * 4/2013 Kim G02F 1/13394
349/110

(73) Assignee: **SAMSUNG DISPLAY CO., LTD.**,
Gyeonggi-Do (KR)

FOREIGN PATENT DOCUMENTS

KR 1020090126767 A 12/2009
KR 1020110052159 A 5/2011
KR 1020120067288 A 6/2012

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

* cited by examiner

(21) Appl. No.: **15/096,502**

Primary Examiner — Lucy Chien

(22) Filed: **Apr. 12, 2016**

(74) *Attorney, Agent, or Firm* — Cantor Colburn LLP

(65) **Prior Publication Data**

US 2016/0357080 A1 Dec. 8, 2016

(30) **Foreign Application Priority Data**

Jun. 8, 2015 (KR) 10-2015-0080381

(51) **Int. Cl.**

G02F 1/1343 (2006.01)

G02F 1/1362 (2006.01)

(52) **U.S. Cl.**

CPC **G02F 1/136227** (2013.01); **G02F 2001/134372** (2013.01); **G02F 2001/136222** (2013.01)

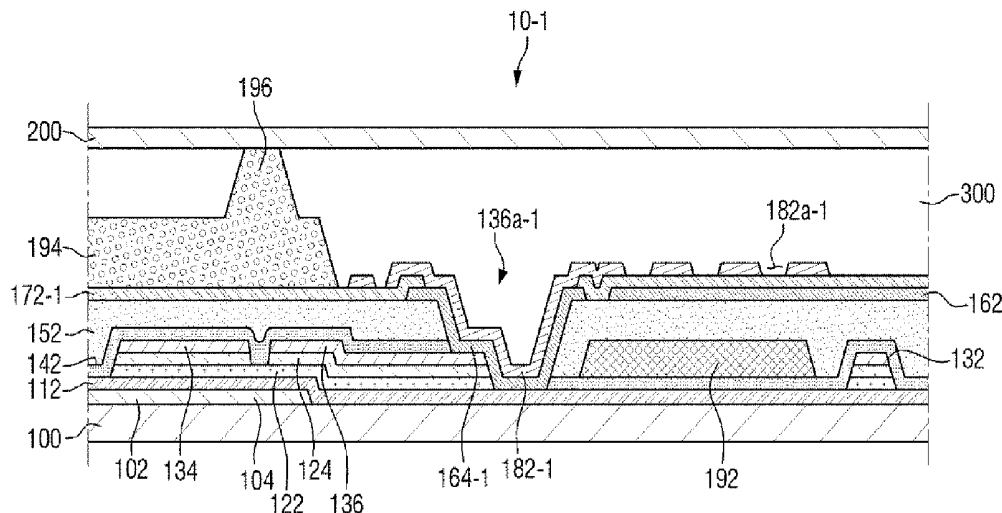
(58) **Field of Classification Search**

CPC ... **G02F 1/136227**; **G02F 2001/134372**; **G02F 2001/136222**

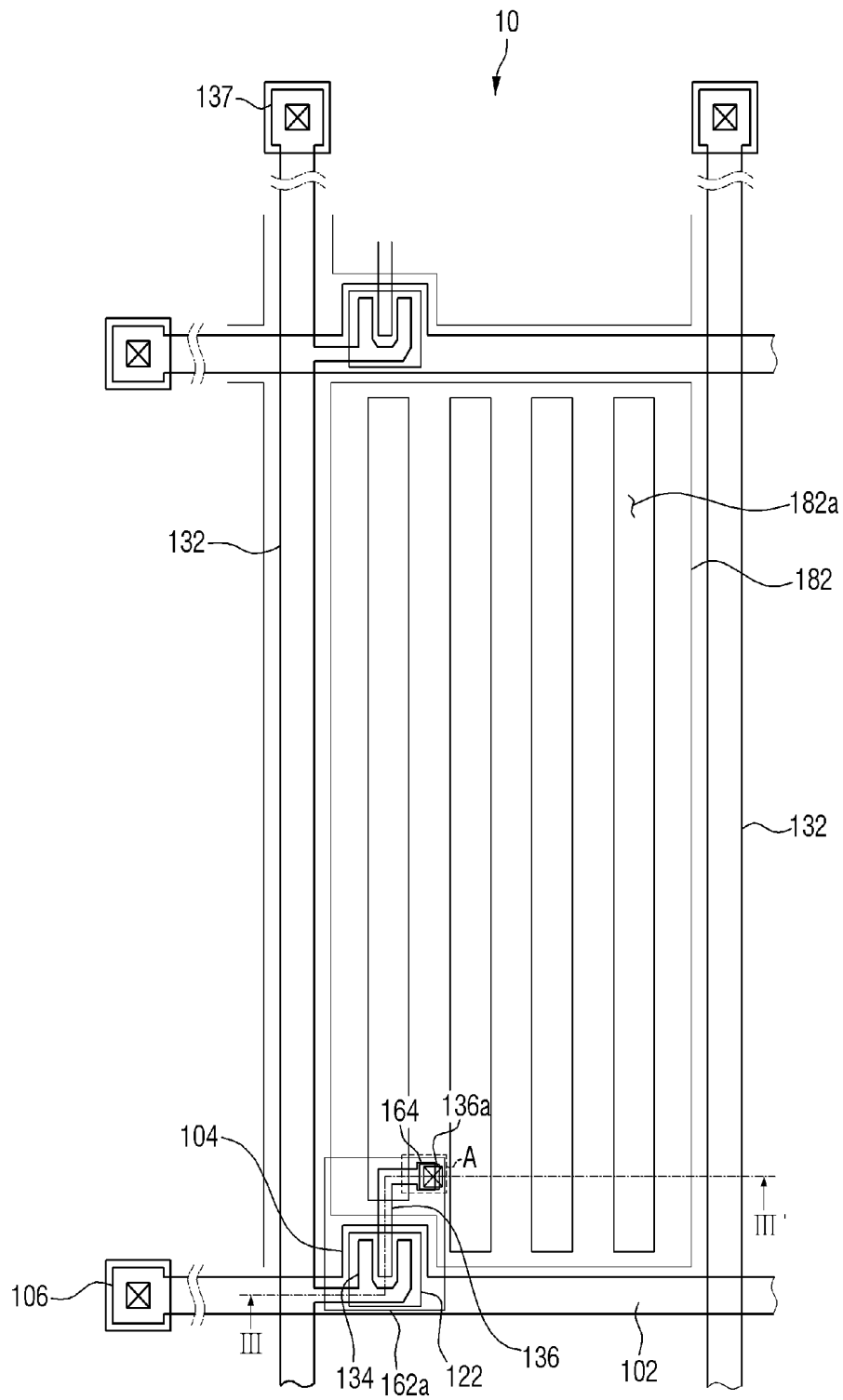
(57) **ABSTRACT**

A liquid crystal display device includes first and second substrates facing each other; a liquid crystal layer between the first and second substrates; a thin-film transistor ("TFT") on the first substrate and including a semiconductor layer and a gate, source and drain electrodes; an organic layer on the TFT and defining a contact hole therein which exposes a portion of the drain electrode; a conductive layer on the organic layer and contacting the exposed portion of the drain electrode at the contact hole; a common electrode which is on the organic layer and isolated from the conductive layer; a passivation layer on the conductive layer and the common electrode and defining an opening therein which exposes a portion of the conductive layer; and a pixel electrode on the passivation layer and the conductive layer and contacting the exposed portion of the conductive layer at the opening.

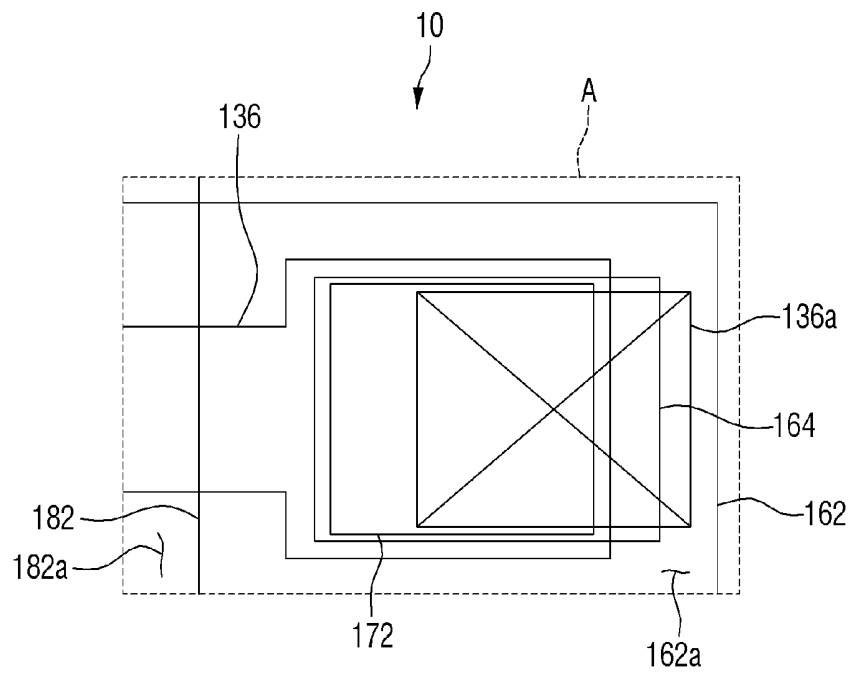
18 Claims, 7 Drawing Sheets



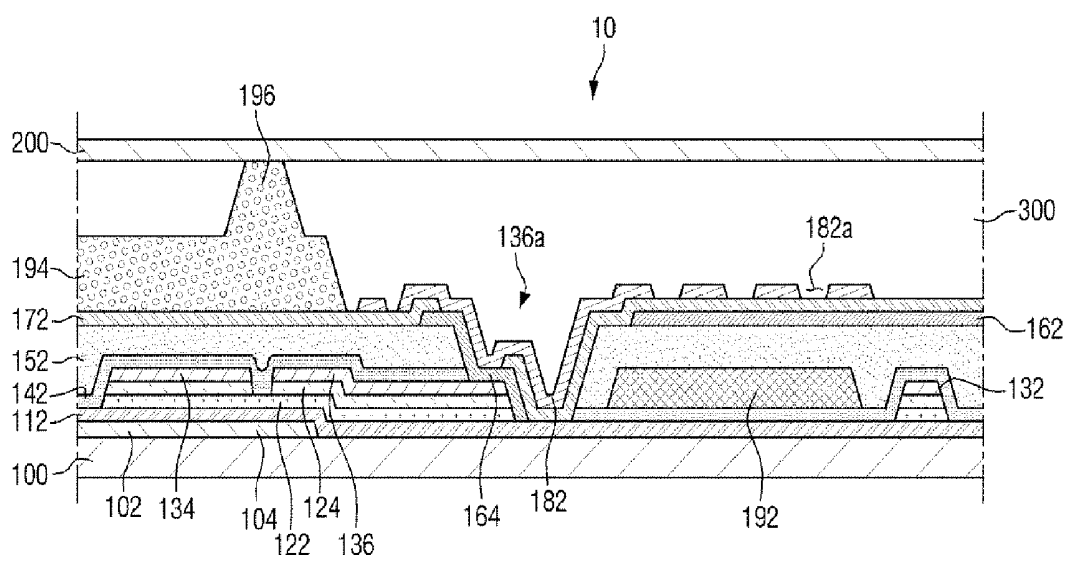
【FIG. 1】



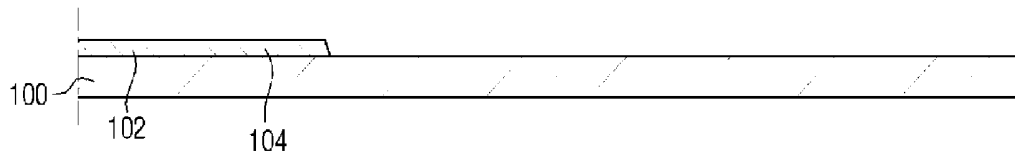
【FIG. 2】



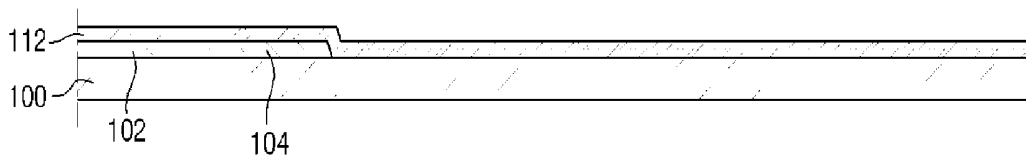
【FIG. 3】



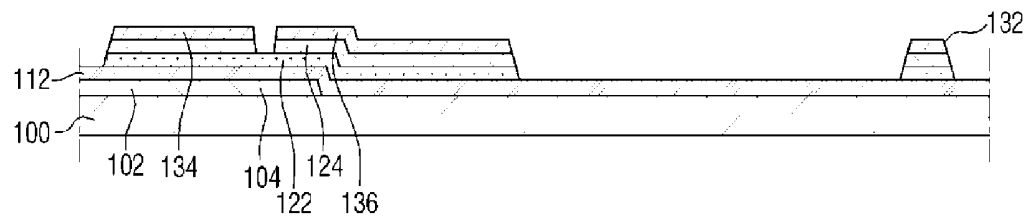
【FIG. 4】



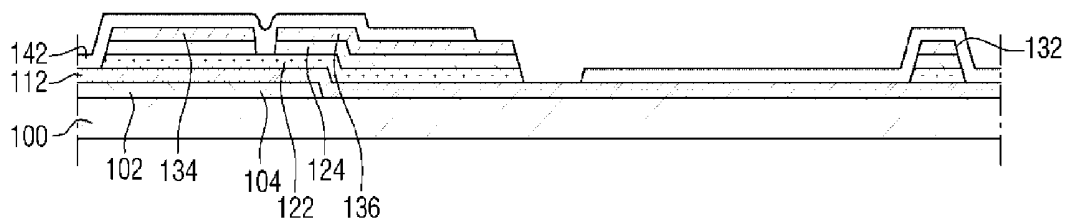
【FIG. 5】



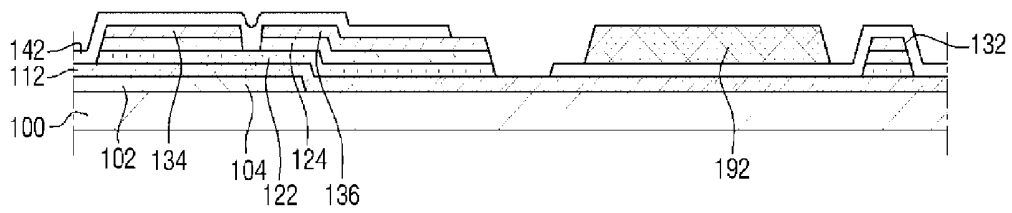
【FIG. 6】



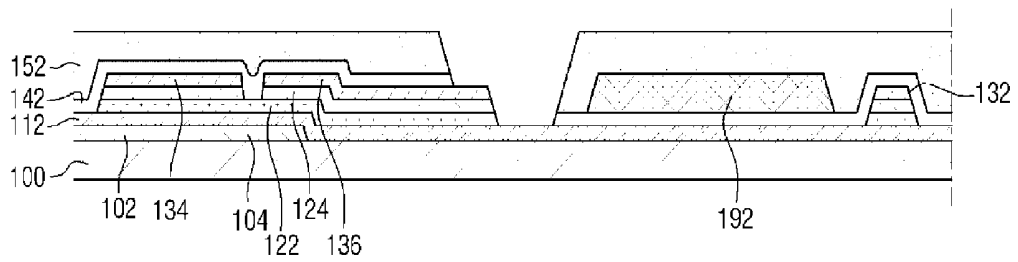
【FIG. 7】



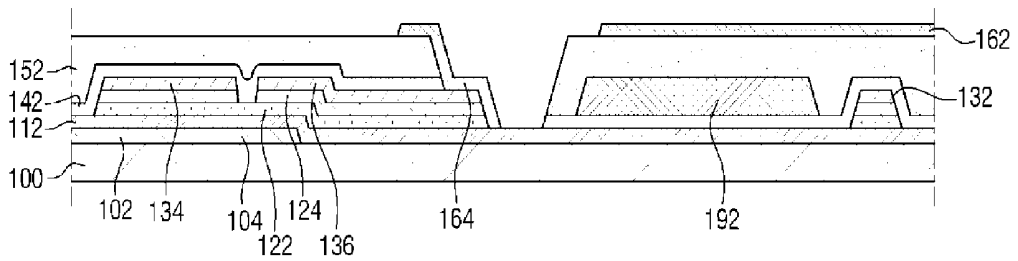
【FIG. 8】



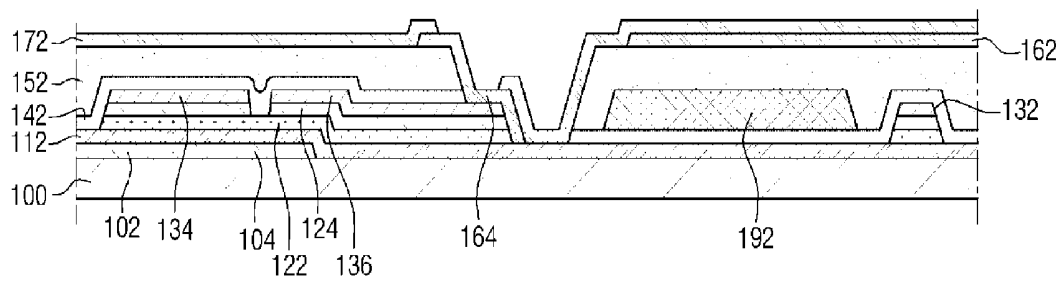
【FIG. 9】



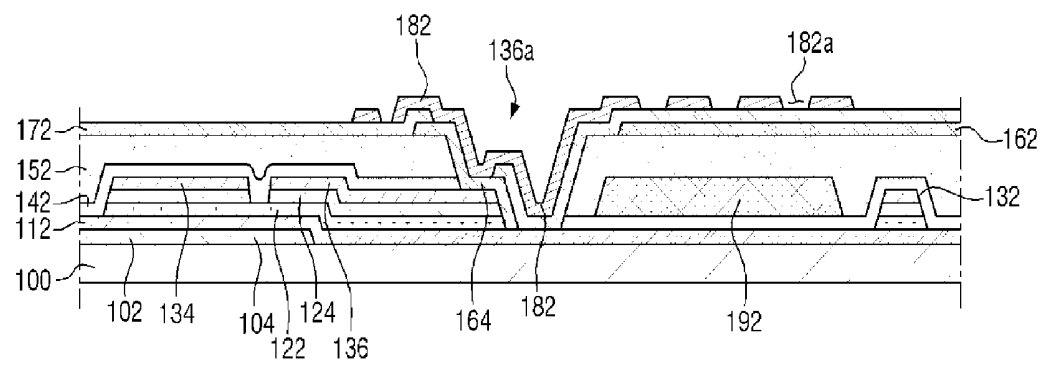
【FIG. 10】



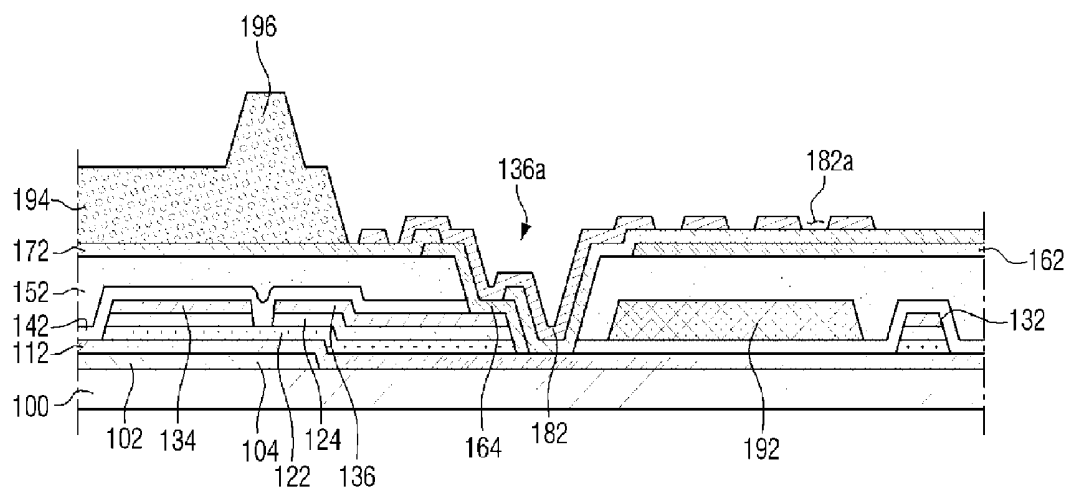
【FIG. 11】



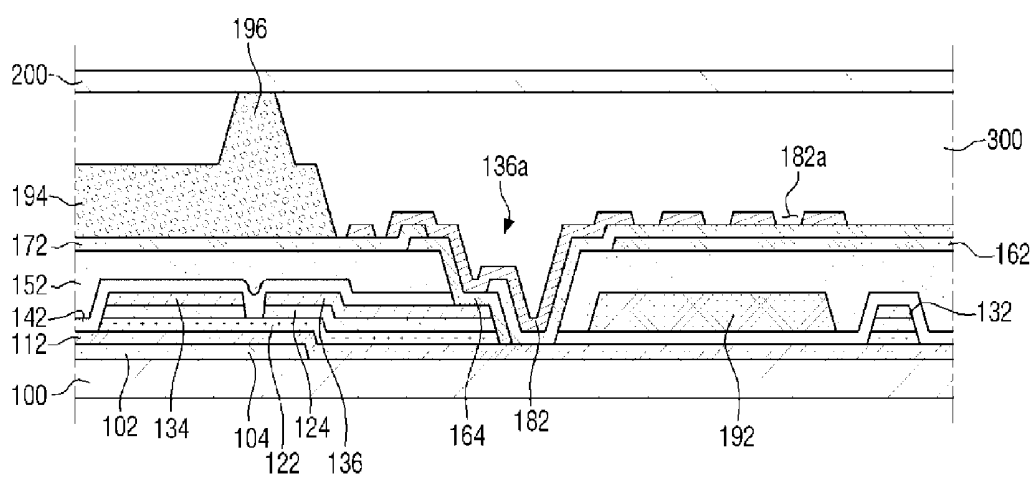
【FIG. 12】



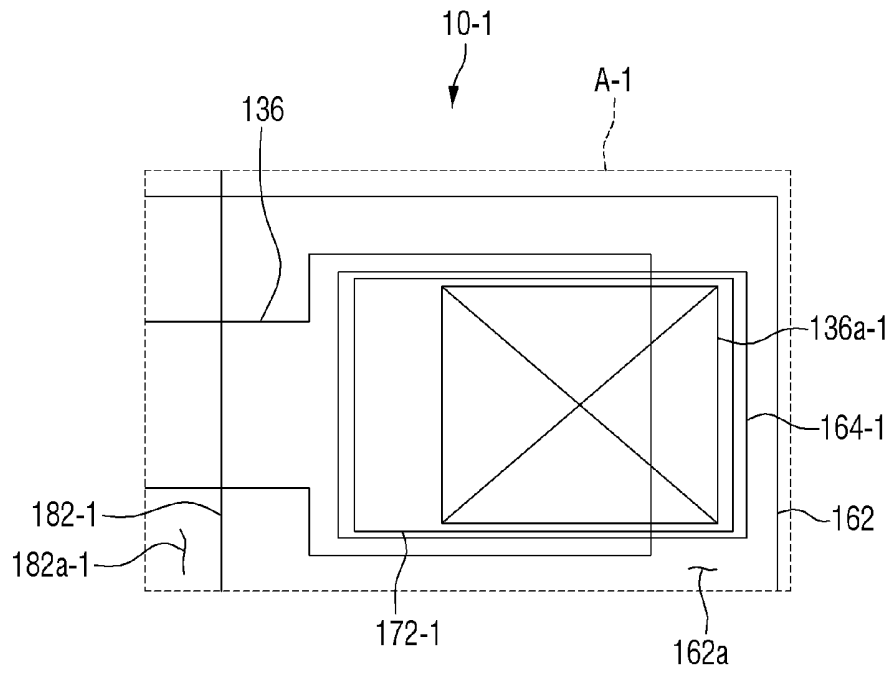
【FIG. 13】



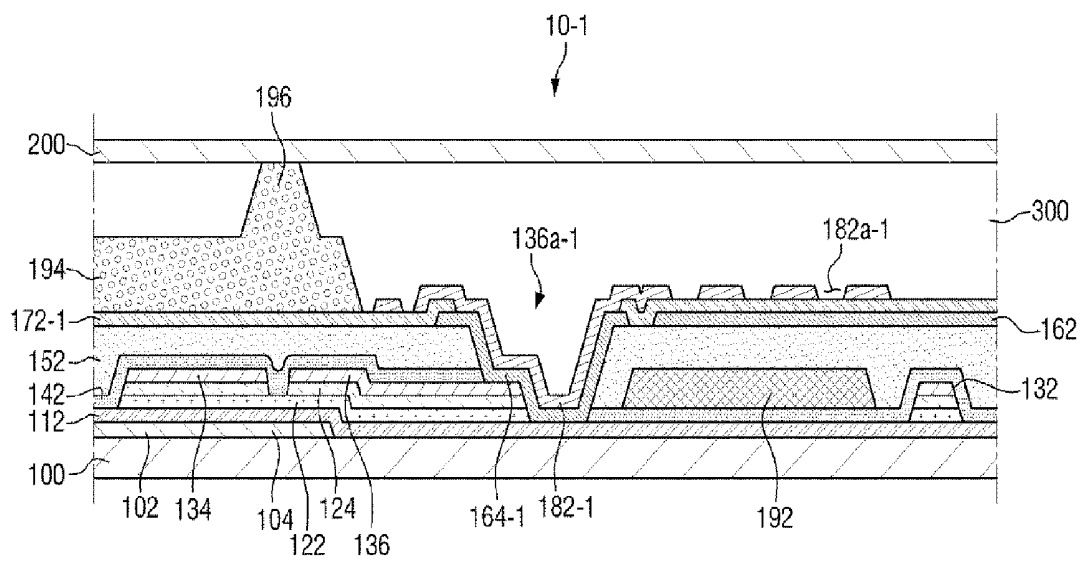
【FIG. 14】



【FIG. 15】



【FIG. 16】



LIQUID CRYSTAL DISPLAY AND METHOD OF MANUFACTURING THE SAME

This application claims priority to Korean Patent Application No. 10-2015-0080381 filed on Jun. 8, 2015, and all the benefits accruing therefrom under 35 U.S.C. § 119, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND

1. Field

The invention relates to a liquid crystal display ("LCD") and a method of manufacturing the same.

2. Description of the Related Art

A liquid crystal display ("LCD") is a display device realizing an image using the electrical and optical properties of a liquid crystal material, i.e., by varying optical transmittance according to the intensity of an electric field. The LCD includes a plurality of pixels. In each of the pixels, a pixel electrode and a color filter are disposed. The pixel electrode is driven by a thin-film transistor ("TFT").

The LCD also includes first and second display substrates, which face each other. The TFT and the pixel electrode are disposed in the first display substrate. Traditionally, the color filter is disposed in the second display substrate. However, a color filter-on-array ("COA") structure has been introduced in which the color filter is disposed in the first display substrate along with the TFT. In the COA structure, a capping layer is provided above the color filter so as to prevent the color filter from being lifted or separated.

SUMMARY

Exemplary embodiments of the invention provide a liquid crystal display ("LCD") having a structure which reduces or effectively prevents an active unfilled area ("AUA") defect.

Exemplary embodiments of the invention also provide a method of manufacturing an LCD, which reduces or effectively prevents an organic layer and a pixel electrode from contacting each other so as to prevent an AUA defect.

However, exemplary embodiments of the invention are not restricted to those set forth herein. The above and other exemplary embodiments of the invention will become more apparent to one of ordinary skill in the art to which the invention pertains by referencing the detailed description of the invention given below.

According to an exemplary embodiment of the invention, a liquid crystal display ("LCD") includes: first and second substrates facing each other; a liquid crystal layer disposed between the first and second substrates; a thin-film transistor ("TFT") disposed on the first substrate and including a semiconductor layer, a gate electrode, a source electrode and a drain electrode; an organic layer disposed on the TFT and defining a contact hole therein which exposes a portion of the drain electrode; a conductive layer disposed on the organic layer and contacting the exposed portion of the drain electrode at the contact hole; a common electrode which is disposed on the organic layer and isolated from the conductive layer; a passivation layer disposed on the conductive layer and the common electrode and defining an opening therein which exposes a portion of the conductive layer; and a pixel electrode disposed on the passivation layer and the conductive layer and contacting the exposed portion of the conductive layer at the opening.

In an exemplary embodiment, the conductive layer and the passivation layer may be disposed between the pixel

electrode and the organic layer such that the pixel electrode and the organic layer do not to contact each other.

In an exemplary embodiment, the opening may expose a central portion of the conductive layer and the passivation layer may cover edges of the conductive layer.

In an exemplary embodiment, the conductive layer may extend along a sidewall of the organic layer at the contact hole to be disposed on a top surface of the organic layer.

In an exemplary embodiment, the pixel electrode may contact an entirety of the exposed portion of the conductive layer at the opening.

In an exemplary embodiment, the LCD may further include: a gate insulating layer disposed between the gate electrode and the drain electrode, and the contact hole may expose a portion of the gate insulating layer.

In an exemplary embodiment, the passivation layer may directly contact the exposed portion of the gate insulating layer.

In an exemplary embodiment, the LCD may further include: a color filter disposed between the gate insulating layer and the organic layer.

In an exemplary embodiment, the LCD may further include: a light-blocking member disposed on the passivation layer.

According to another exemplary embodiment of the invention, a method of manufacturing an LCD includes: forming a TFT which includes a semiconductor layer, a gate electrode, a source electrode and a drain electrode, on a first substrate; forming an organic layer which defines a contact hole therein exposing a portion of the drain electrode, on the TFT; forming a conductive layer which contacts the exposed portion of the drain electrode at the contact hole, on the organic layer; forming a common electrode which is disposed on the organic layer and isolated from the conductive layer; forming a passivation layer which defines an opening therein exposing a portion of the conductive layer, on the conductive layer and the common electrode and; and forming a pixel electrode which contacts the exposed portion of the conductive layer at the opening, on the passivation layer and the conductive layer.

In an exemplary embodiment, the conductive layer and the passivation layer may be disposed between the pixel electrode and the organic layer such that the pixel electrode and the organic layer do not to contact each other.

In an exemplary embodiment, the opening may expose a central portion of the conductive layer and the passivation layer may cover edges of the conductive layer.

In an exemplary embodiment, the conductive layer may extend along a sidewall of the organic layer at the contact hole to be disposed on a top surface of the organic layer.

In an exemplary embodiment, the pixel electrode may contact an entirety of the exposed portion of the conductive layer at the opening.

In an exemplary embodiment, the method may further include: forming a gate insulating layer between the gate electrode and the drain electrode, and the contact hole may expose a portion of the gate insulating layer.

In an exemplary embodiment, the passivation layer may directly contact the exposed portion of the gate insulating layer.

In an exemplary embodiment, the method may further include: forming a color filter between the gate insulating layer and the organic layer.

In an exemplary embodiment, the method may further include: forming a light-blocking member on the passivation layer.

In an exemplary embodiment, the method may further include: forming a column spacer on the light-blocking member, and the light-blocking member and the column spacer may be integrally formed.

In an exemplary embodiment, the conductive layer and the common electrode may be formed at the same time using a single mask.

According to one or more exemplary embodiment, a structure is provided in which an organic layer and a pixel electrode do not contact each other, and thus an AUA defect is reduced or effectively prevented.

Also, one or more exemplary embodiment provides a method to manufacture an LCD in which an organic layer and a pixel electrode do not contact each other, and thus to prevent an AUA defect.

Other features and exemplary embodiments will be apparent from the following detailed description, the drawings, and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other advantages and features of this disclosure will become more apparent by describing in further detail exemplary embodiments thereof with reference to the accompanying drawings, in which:

FIG. 1 is a plan view of an exemplary embodiment of a thin-film transistor ("TFT") substrate of a liquid crystal display ("LCD") according to the invention.

FIG. 2 is an enlarged plan view of area A of FIG. 1.

FIG. 3 is a cross-sectional view taken along line III-III' of FIG. 1.

FIGS. 4 to 14 are cross-sectional views illustrating an exemplary embodiment of a method of manufacturing an LCD, according to the invention.

FIG. 15 is an enlarged plan view of another exemplary embodiment of an area of an LCD according to the invention, corresponding to area A of FIG. 1.

FIG. 16 is a cross-sectional view of an exemplary embodiment of the LCD of FIG. 15, corresponding to line III-III' of FIG. 1.

DETAILED DESCRIPTION

Reference will now be made in detail to exemplary embodiments, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. In this regard, the present exemplary embodiments may have different forms and should not be construed as being limited to the descriptions set forth herein. Accordingly, the exemplary embodiments are merely described below, by referring to the figures, to explain features of the present description.

The description that one element is connected to or coupled to another element includes both a case where the one element is directly connected to the another element or a case where further another element is interposed between the elements. However, the description that one element is directly connected or directly coupled to another element indicates that there is no further another element between the elements.

It will be understood that, although the terms "first," "second," "third" etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another element, component, region, layer or

section. Thus, "a first element," "component," "region," "layer" or "section" discussed below could be termed a second element, component, region, layer or section without departing from the teachings herein.

The term "and/or" includes any and all combinations of one or more of the associated listed items.

A singular expression in the present specification also includes a plural expression. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms, including "at least one," unless the content clearly indicates otherwise. "Or" means "and/or."

The terms "comprise" and/or "comprising" do not exclude the possibility of existence or addition of one or more other components, steps, operations, and/or devices.

Furthermore, relative terms, such as "lower" or "bottom" and "upper" or "top," may be used herein to describe one element's relationship to another element as illustrated in the Figures. It will be understood that relative terms are intended to encompass different orientations of the device in addition to the orientation depicted in the Figures. For example, if the device in one of the figures is turned over, elements described as being on the "lower" side of other elements would then be oriented on "upper" sides of the other elements. The exemplary term "lower," can therefore, encompass both an orientation of "lower" and "upper," depending on the particular orientation of the figure. Similarly, if the device in one of the figures is turned over, elements described as "below" or "beneath" other elements would then be oriented "above" the other elements. The exemplary terms "below" or "beneath" can, therefore, encompass both an orientation of above and below.

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

Exemplary embodiments are described herein with reference to cross section illustrations that are schematic illustrations of idealized embodiments. As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. Thus, embodiments described herein should not be construed as limited to the particular shapes of regions as illustrated herein but are to include deviations in shapes that result, for example, from manufacturing. For example, a region illustrated or described as flat may, typically, have rough and/or nonlinear features. Moreover, sharp angles that are illustrated may be rounded. Thus, the regions illustrated in the figures are schematic in nature and their shapes are not intended to illustrate the precise shape of a region and are not intended to limit the scope of the present claims.

In a color filter-on-array ("COA") structure, the color filter generally includes or is formed as an organic layer and has a certain level of flexibility, whereas the capping layer includes or is formed as an inorganic layer and is less flexible and less compressible than the color filter. Accordingly, in response to the capping layer, which is relatively hard and stiff, being formed on the color filter, which is soft, a relatively large amount of stress may be caused to the capping layer.

Gases such as H₂, N₂, and the like between the capping layer and the color filter may remain unreleased due to the

capping layer. As a result, in response to heat or shock being applied after the injection of a liquid crystal material between the display substrates, cracks may be readily formed near a through hole at which the thin-film transistor ("TFT") and the pixel electrode are connected to each other. With the cracks, the above-described gases may infiltrate into the liquid crystal layer through the cracks and may thus grow into bubbles, thereby undesirably causing an active unfilled area ("AUA") defect or a light leakage phenomenon.

Exemplary embodiments will hereinafter be described with reference to the accompanying drawings.

FIG. 1 is a plan view of an exemplary embodiment of a thin-film transistor ("TFT") substrate of a liquid crystal display ("LCD") according to the invention. FIG. 2 is an enlarged plan view of area A of FIG. 1. More specifically, FIG. 2 illustrates the relationship of the arrangement of a conductive layer 164, a first protective layer 172 and a drain electrode 136 of the LCD. FIG. 3 is a cross-sectional view taken along line III-III' of FIG. 1.

Referring to FIGS. 1 to 3, an LCD 10 includes first and second substrates 100 and 200, which face each other, and a liquid crystal layer 300, which is interposed between the first and second substrates 100 and 200. The first and second substrate 100 and 200 may respectively serve as base substrates of two display panel substrates of the LCD 10. The LCD 10 includes a plurality of pixels defined therein.

The first and second substrates 100 and 200 may include an insulating material such as transparent glass, quartz, ceramic, silicon or transparent plastic, and the material of the first and second substrates 100 and 200 may be appropriately selected. The first and second substrates 100 and 200 may be disposed to face each other.

Gate wiring 102, 104 and 106 is disposed on the first substrate 100. The gate wiring 102, 104 and 106 may include or be formed of an aluminum (Al)-based metal such as Al or an Al alloy, a silver (Ag)-based metal such as Ag or an Ag alloy, a copper (Cu)-based metal such as Cu or a Cu alloy, a molybdenum (Mo)-based metal such as Mo or a Mo alloy, chromium (Cr), titanium (Ti) or tantalum (Ta). The gate wiring 102, 104 and 106 may have a single layer structure, or may have a multilayer structure including two conductive layers having different physical properties from each other. In an exemplary embodiment, for example, one of the two conductive layers in the multilayer structure may include or be formed of an Al-based metal, an Ag-based metal or a Cu-based metal and the other conductive layer may be formed of a Mo-based metal, Cr, Ti or Ta. Examples of the two conductive layers in the multilayer structure also include a Cr lower layer and an Al upper layer and an Al lower layer and a Mo upper layer. However, the invention is not limited to this, and the gate wiring 102, 104 and 106 may include or be formed of various metals and conductors other than those set forth herein.

The gate wiring 102, 104 and 106 may include a gate line 102, a gate electrode 104 and a gate pad 106. The gate line 102, the gate electrode 104 and the gate pad 106 may be provided in plural.

The gate line 102 is disposed to lengthwise extend in a first direction, for example, a horizontal direction in FIG. 1. For each pixel, the gate electrode 104 is connected to the gate line 102. The gate electrode 104 may be branched off from the gate line 102 in a direction towards a TFT or may be defined as an extension of the gate line 102, but the invention is not limited thereto. That is, the gate electrode

104 may be defined in the overlapping area of the gate line 102 and the TFT on a path of the lengthwise extension of the gate line 102.

The gate pad 106 may be disposed at a distal end of the gate line 102. In order to increase the contact area of the gate pad 106 with an external circuit line (not shown), the gate pad 106 may have an expanded width compared to that of the gate line 102. In an exemplary embodiment, the gate pad 106 may not be provided such that a gate signal may be directly applied to the gate line 102. The width of the gate pad 106 and the gate line 102 may be taken in a direction perpendicular to the lengthwise extension of the gate line 102.

In an exemplary embodiment, a gate signal is applied to the gate pad 106 and transmitted along the gate line 102, which provides a gate voltage to the gate electrode 104.

A gate insulating layer 112 is disposed on the gate wiring 102, 104 and 106. The gate insulating layer 112 may include or be formed of, for example, silicon nitride (SiN_x) or silicon oxide (SiO₂). The gate insulating layer 112 may insulate the gate wiring 102, 104 and 106 from a data line 132 which is disposed above both the gate wiring 102, 104 and 106 and the gate insulating layer 112.

A semiconductor layer 122 is disposed on the gate insulating layer 112, and may include or be formed of, for example, hydrogenated amorphous silicon or polycrystalline silicon. The semiconductor layer 122 may be disposed to at least partially overlap the gate electrode 104. The semiconductor layer 122 may form a portion of the TFT together with the gate electrode 104, a source electrode 134 and a drain electrode. A portion of the semiconductor layer 122 exposed between the source electrode 134 and the drain electrode 136 to form a channel of the TFT.

The semiconductor layer 122 may have various shapes such as an island (e.g., discrete) shape or a lengthwise extended linear shape. The semiconductor layer 122 is illustrated in FIG. 3 as having a linear shape, but the invention is not limited thereto. In response to the semiconductor layer 122 having the linear shape, the semiconductor layer 122 may overlap data wiring 132, 134, 136 and 137. The semiconductor layer 122 may be provided in a space where the source electrode 134 and the drain electrode 136 are opposite to, and isolated from, each other, and may thus form a channel area of the TFT.

A resistive contact layer 124, which includes or is formed of n+ hydrogenated amorphous silicon doped with a relatively high concentration of n-type impurities, may be disposed on the semiconductor layer 122. The resistive contact layer 124 is disposed between the source electrode 134 and the drain electrode 136 and thus reduces the contact resistance between the source electrode 134 and the drain electrode 136.

The resistive contact layer 124, like the semiconductor layer 122, may have various shapes such as an island shape or a linear shape. In response to the semiconductor layer 122 having the linear shape, the resistive contact layer 124 may also be disposed in a linear shape corresponding to that of the semiconductor layer 122. The resistive contact layer 124 may overlap the data wiring 132, 134, 136 and 137 and may have substantially the same planar shape or pattern as that of the data wiring 132, 134, 136 and 137. Accordingly, the resistive contact layer 124, unlike the semiconductor layer 122, is disconnected at the space where the source electrode 134 and the drain electrode 136 are opposite to and isolated from each other, and thus exposes the semiconductor layer 122 therebelow.

The data wiring **132**, **134**, **136** and **137** is disposed on the resistive contact layer **124** and the gate insulating layer **112**. The data wiring **132**, **134**, **136** and **137**, like the gate wiring **102**, **104** and **106**, may include or be formed of Al, Cu, Ag, Mo, Cr, Ti, Ta or an alloy thereof. The data wiring **132**, **134**, **136** and **137** may have a single layer structure or may have a multilayer structure including a refractive metal lower layer (not illustrated) and a low-resistance upper layer (not illustrated), but the invention is not limited thereto.

The data wiring **132**, **134**, **136** and **137** may collectively include the data line **132**, the source electrode **134**, the drain electrode **136** and a data pad **137**. The data line **132**, the source electrode **134**, the drain electrode **136** and the data pad **137** may be provided in plural.

The data line **132** may be disposed to lengthwise extend in a second direction, for example, a vertical direction in FIG. 1, which intersects the first direction. The source electrode **134** is connected to the data line **132** for each pixel. The source electrode **134** may be branched off from the data line **132** toward the TFT or may be defined as an extension of the data line **132**, but the invention is not limited thereto. That is, the source electrode **134** may be defined at the overlapping area of the data line **132** and the TFT along a path of the lengthwise extension of the data line **132**.

The drain electrode **136** may be disposed to be isolated from the source electrode **134**. The drain electrode **136** may be electrically connected to a pixel electrode **182**. A portion of the semiconductor layer **122** may be exposed between the drain electrode **136** and the source electrode **134**.

The data pad **137** may be defined at a distal end of the data line **132**. In order to increase the contact area of the data pad **137** with an external circuit line (not shown), the data pad **137** may have an expanded width compared to that of the data line **132**. The width of the data pad **137** and the data line **132** may be taken in a direction perpendicular to the lengthwise extension of the data line **132**.

A data signal is applied to the data pad **137** and transmitted along the data line **132**, which provides a data voltage to the source electrode **134**. In response to the gate voltage provided to the gate electrode **104**, a gate-on voltage is applied to the gate electrode **104** below the source electrode **134** to turn on the TFT, and with the turned on TFT, the data voltage provided to the source electrode **134** may be transmitted to the drain electrode **136** so that the pixel electrode **182** may be charged with the data voltage.

A first passivation layer **142** is disposed on the data wiring **132**, **134**, **136** and **137** and an exposed portion of the semiconductor layer **122**. A contact hole **136a**, which exposes a portion of the drain electrode **136**, may be defined in the first passivation layer **142**.

The first passivation layer **142** may include, for example, an inorganic material, such as silicon nitride or silicon oxide, or a material which is formed by plasma enhanced chemical vapor deposition ("PECVD"), such as a-Si:C:O or a-Si:O:F.

A color filter **192** may be disposed on the first passivation layer **142**. Examples of the color filter **192** may include a red (R) filter, a green (G) filter and a blue (B) filter, but the invention is not limited thereto. Each of the R, G and B filters is disposed in a pixel, thereby forming an R, G or B pixel. The color filter **192** may be disposed to overlap the pixel electrode **182**. The color filter **192** may include a photosensitive organic composition including a pigment.

An organic layer **152** may be disposed on the color filter **192** and may thus planarize a height difference formed by the color filter **192** with other layers on the first substrate **100**. The contact hole **136a** may be defined in the organic layer **152** and expose the drain electrode **136**. More specifi-

cally, a portion of the drain electrode **136** is exposed by the contact hole **136a** which is defined extended through the first passivation layer **142** and the organic layer **152**. The organic layer **152** may include a material having excellent planarization performance and photosensitivity.

The color filter **192** may be covered by the organic layer **152**. That is, the color filter **192** may be completely covered by the organic layer **152** and thus may not be exposed, but the invention is not limited thereto.

A common electrode **162**, a conductive layer **164** and a second passivation layer **172** may be disposed on the organic layer **152**. The organic layer **152** may be completely covered by the common electrode **162**, the conductive layer **164** and the second passivation layer **172**. That is, at least one of the common electrode **162**, the conductive layer **164** and the second passivation layer **172** may be completely disposed on the organic layer **152**, and as a result, the organic layer **152** may not be exposed, but the invention is not limited thereto.

The common electrode **162** may be disposed on the organic layer **152**. The common electrode **162** receives a common voltage and thus forms an electric field together with the pixel electrode **182**. As illustrated in FIGS. 1 and 2, the common electrode **162** may include defined therein an opening **162a**, which is rectangular in the plan view and exposes an area where the TFT and the contact hole **136a** are disposed, but the invention is not limited thereto. That is, the shape and location of the opening **162a** are not limited to those set forth herein.

In the LCD, a pixel may be provided with a pixel region or may also be provided with a plurality of pixel regions. The common electrode **162** may be disposed to extend in an entire pixel region except for an area at the opening **162a**. In an exemplary embodiment, the pixel region may be surrounded by the gate line **102** and the data line **132**, but the invention is not limited thereto.

The conductive layer **164** may be disposed to be electrically connected to the drain electrode **136**, which is exposed through the contact hole **136a** defined in the first passivation layer **142** and the organic layer **152**.

In the exemplary embodiment as illustrated in FIGS. 2 and 3, the contact hole **136a** defined in the first passivation layer **142** and the organic layer **152** may expose a portion of the drain electrode **136** and portion of the gate insulating layer **112**, but the invention is not limited thereto. In an alternative exemplary embodiment, the contact hole **136a** may expose portion of the drain electrode **136**, but not the gate insulating layer **112**.

The conductive layer **164** may be disposed to contact the exposed portion of the drain electrode **136** and may thus be electrically connected to the drain electrode **136**. The conductive layer **164** may also be electrically connected to the pixel electrode **182**. The pixel electrode **182** may be electrically connected to the drain electrode **136** through the conductive layer **164**. That is, the conductive layer **164** may serve as a contact electrode or wiring mediating the electrical connection between the drain electrode **136** and the pixel electrode **182**.

The conductive layer **164** is illustrated in FIG. 2 as contacting the entire exposed portion of the drain electrode **136**, but the invention is not limited thereto. That is, the conductive layer **164** may be disposed in various other manners than that set forth herein, as long as the conductive layer **164** is electrically connected to the drain electrode **136**.

As illustrated in FIG. 3, the conductive layer **164** may contact the entire exposed portion of the drain electrode **136** and may extend along the sidewall of the contact hole **136a** to reach the top surface of the organic layer **152**. That is, a

first end of the conductive layer **164** may be disposed on the top surface of the organic layer **152**, and the conductive layer **164** may extend to dispose a second end of the conductive layer **164** opposite to the first end thereof in contact with a portion of the drain electrode **136** exposed through the contact hole **136a**, but the invention is not limited thereto. That is, the conductive layer **164** may be disposed in various other manners than that set forth herein, as long as the conductive layer **164** is electrically connected to the drain electrode **136**.

Since the conductive layer **164** receives a data voltage from the drain electrode **136**, the conductive layer **164** is not to be electrically connected to the common electrode **162**. As illustrated in FIG. 2, the conductive layer **164** may be rectangular in the plan view and may not be connected to the common electrode **162**, but the invention is not limited thereto. That is, the conductive layer **164** may be disposed in various other manners than that set forth herein, as long as the conductive layer is electrically connected to the drain electrode **136** and at the same time, can be electrically isolated from the common electrode **162**.

The conductive layer **164** is not limited to the size illustrated in FIG. 2. That is, the conductive layer **164** may be disposed in various other sizes than that set forth herein, at various other locations than that set forth herein, as long as the conductive layer is electrically connected to the drain electrode **136** and at the same time, can be electrically isolated from the common electrode **162**.

The conductive layer **164** and the common electrode **162** may include or be formed in a same layer among layers disposed on the first substrate **100** such as by using portions of a same material layer in manufacturing the LCD **10**. In an exemplary embodiment of manufacturing an LCD, for example, the conductive layer **164** and the common electrode **162** may be each be formed of a transparent conductive material such as polycrystalline, monocrystalline, or amorphous indium tin oxide ("ITO") or indium zinc oxide ("IZO"), and the conductive layer **164** and the common electrode **162** may be formed at the same time by a single patterning process.

The second passivation layer **172** may be disposed on the common electrode **162**, the organic layer **152** and the conductive layer **164**, and may expose a portion of the conductive layer **164**. That is, the second passivation layer **172** may include an opening defined therein which exposes a portion of the conductive layer **164**. The exposed portion of the conductive layer **164** in the opening of the second passivation layer **172** may contact the pixel electrode **182**. Accordingly, the conductive layer **164** and the pixel electrode **182** may be electrically connected to each other.

To prevent an AUA defect that may be caused in response to the pixel electrode **182** and the organic layer **152** being placed in contact with each other, the second passivation layer **172** and the conductive layer **164** may be disposed between the pixel electrode **182** and the organic layer **152**. Since the second passivation layer **172** and the conductive layer **164** are disposed between the pixel electrode **182** and the organic layer **152**, direct contact between the pixel electrode **182** and the organic layer **152** may be reduced or effectively prevented, and as a result, an AUA defect can be reduced or effectively prevented.

In the exemplary embodiment as illustrated in FIGS. 2 and 3, the opening defined by the second passivation layer **172** may expose a central portion of the conductive layer **164**. That is, the second passivation layer **172** may cover the edges of the conductive layer **164** while exposing the central portion thereof.

More specifically, as illustrated in FIG. 3, in response to the conductive layer **164** contacting the entire exposed portion of the drain electrode **136** and extending along the sidewalls of the contact hole **136a** to reach the top surface of the organic layer **152**, the second passivation layer **172** may overlap a first portion of the conductive layer **164** on the top surface of the organic layer **152**, and may also overlap a second portion of the conductive layer **164** in the contact hole **136a**. As is apparent from FIG. 3, the second passivation layer **172** may directly contact the gate insulating layer **112**.

As illustrated in FIG. 2, the opening defined in the second passivation layer **172** is rectangular, in the plan view, exposing the surface of the central portion of the conductive layer **164**, but the invention is not limited thereto. That is, the opening defined in the second passivation layer **172** may be formed in various other shapes than that set forth herein, as long as direct contact of the pixel electrode **182** and the organic layer **152** can be prevented by the second passivation layer **172** and the conductive layer **164**.

The second passivation layer **172** may include or be formed of an inorganic insulating material. In an exemplary embodiment, for example, the second passivation layer **172** may include silicon nitride or silicon oxide.

The pixel electrode **182** may form an electric field together with the common electrode **162** to rotate liquid crystal molecules (not illustrated) included in liquid crystal layer **300**. The pixel electrode **182** may include a conductive material such as ITO or IZO, but the invention is not limited thereto.

The pixel electrode **182** may define a plurality of cutout patterns **182a** therein. The cutout patterns **182a** may have a rectangular shape, a closed loop shape or a fishbone shape. The cutout patterns **182a** are illustrated in FIG. 1 as having a stripe shape, but the invention is not limited thereto. That is, the shape of the cutout patterns **182a** may be appropriately selected. In response to a data voltage being applied to the pixel electrode **182**, an electric field is formed in a direction from the pixel electrode **182** to the common electrode **162** which is below the pixel electrode **182**.

The pixel electrode **182** is disposed on the conductive layer **164** and on the second passivation layer **172**. More specifically, the pixel electrode **182** may contact the exposed portion of the conductive layer **164** in the opening defined in the second passivation layer **172**. As a result, the pixel electrode **182** may be electrically connected to the conductive layer **164**. Also, the pixel electrode **182** may be electrically connected to the drain electrode **136** through the conductive layer **164**. That is, the pixel electrode **182** may be electrically connected to the drain electrode **136** through the conductive layer **164**.

As illustrated in FIGS. 2 and 3, the pixel electrode **182** may cover or contact the entire exposed portion of the conductive layer **164** in the opening defined in the second passivation layer **172**.

A portion of the pixel electrode **182** may extend be disposed in the contact hole **136a**. The extended portion of the pixel electrode **182** in the contact hole **136a** may form a contact. The second passivation layer **172** is disposed between the pixel electrode **182** and the common electrode **162** and thus insulates the pixel electrode **182** and the common electrode **162** from each other.

Since the second passivation layer **172** and/or the conductive layer **164** is interposed between the organic layer **152** and the pixel electrode **182**, the pixel electrode **182** may not directly contact the organic layer **152**. Accordingly, an AUA defect may be reduced or effectively prevented.

A light-blocking member **194** may be disposed on the second passivation layer **172**. The light-blocking member **194** reduces or effectively prevents light leakage. The light-blocking member **194** may be disposed in a TFT region where the TFT is disposed and a non-pixel region (e.g., a region between pixels and/or a region where the gate line **102** and the data line **132** are disposed). The light-blocking member **194** may include a black organic polymer material including a black dye or pigment, or a metal or metal oxide such as Cr or chromium oxide.

The light-blocking member **194** is illustrated in FIG. 3 as being disposed on the second passivation layer **172**, but the invention is not limited thereto. That is, the light-blocking member **194** may be disposed on the second substrate **200**.

A column spacer **196**, which maintains a cell gap, may be disposed on the light-blocking member **194**, as illustrated in FIG. 3. The column spacer **196** may be formed in the TFT region, as illustrated in FIG. 3, but the invention is not limited thereto. That is, the location of the column spacer **196** is not particularly limited.

In some exemplary embodiments, the column spacer **196** may include or be formed of the same material as the light-blocking member **194**. The column spacer **196** may be defined as one body with the light-blocking member **194** such as being an extension of the light-blocking member **194**. In an exemplary embodiment of manufacturing an LCD, for example, the column spacer **196** and the light-blocking member **194** may include or be formed of the same material by the same patterning process such as through halftone mask exposure or slit mask exposure.

An alignment layer (not illustrated), which aligns liquid crystal molecules of the liquid crystal layer **300**, may be disposed on the pixel electrode **182**, the second passivation layer **172**, the light-blocking member **194** and the column spacer **196**.

The liquid crystal layer **300**, which includes the liquid crystal molecules (not illustrated) with positive or negative dielectric anisotropy, may be interposed between the first and second substrates **100** and **200**. The alignment layer may be disposed on a first surface of the second substrate **200**, where the first surface faces the liquid crystal layer **300**.

A distal end of the column spacer **196** may meet the second substrate **200** and may contact the second substrate **200**. An alignment layer of the first substrate **100** and/or the alignment layer of the second substrate **200** may be interposed between the column spacer **196** and the second substrate **200**.

A method of manufacturing the LCD **10** will hereinafter be described.

FIGS. 4 to 14 are cross-sectional views illustrating an exemplary embodiment of a method of manufacturing an LCD, according to the invention.

Referring to FIGS. 1, 3 and 4, the gate wiring **102**, **104** and **106** is formed on the first substrate **100**.

More specifically, a first metal layer (not illustrated) is formed on the first substrate **100**, which includes a transparent material, for example, glass and quartz. The first metal layer may include or be formed of Al, Cu, Ag, Mo, Cr, Ti, Ta or an alloy thereof, and may include two or more layers having different physical properties from each other. The first metal layer may be deposited by, for example, sputtering. Thereafter, the first metal layer is patterned such as by photolithography using a first exposure mask, thereby forming the gate line **102** and the gate electrode **104**. The gate electrode **104** may be a protrusion of the gate line **102** branched off from a main portion of the gate line **102**.

Thereafter, referring to FIG. 5, the gate insulating layer **112** is formed on the gate wiring **102**, **104** and **106**. The gate insulating layer **112** may be formed by PECVD and may include silicon nitride (SiNx) or silicon oxide (SiO₂).

Thereafter, referring to FIG. 6, the semiconductor layer **122**, the resistive contact layer **124**, and the data wiring **132**, **134**, and **136**, which includes the data line **132** intersecting the gate line **102**, the source electrode **134** and the drain electrode **136**, are formed on the gate insulating layer **112**. The data wiring **132**, **134** and **136**, like the gate wiring **102**, **104** and **106**, may include or be formed of Al, Cu, Ag, Mo, Cr, Ti, Ta or an alloy thereof.

In an exemplary embodiment, the semiconductor layer **122**, the resistive contact layer **124** and the data wiring **132**, **134** and **136** may be formed by photolithography using a single mask. In the exemplary embodiment as illustrated in FIG. 6, a portion of the semiconductor layer **122** and the resistive contact layer **124** may remain below the data line **132**. However, the invention is not limited to this exemplary embodiment. That is, in an alternative exemplary embodiment, a photolithography process for forming the semiconductor layer **122** and the resistive contact layer **124** and a photolithography process for forming the data wiring **132**, **134** and **136** may be performed separately. In this alternative exemplary embodiment, the data line **132** may be formed directly on the gate insulating layer **112**. The semiconductor layer **122** may form a TFT together with the gate electrode **104**, the source electrode **134** and the drain electrode **136**, and an exposed portion of the semiconductor layer **122** between the source electrode **134** and the drain electrode **136** may form a channel of the TFT. The semiconductor layer **122**, the resistive contact layer **124** and the data wiring **132**, **134** and **136** may be formed by various processes that are already well known in the art to which the invention pertains, and thus, a detailed description of the formation of the semiconductor layer **122**, the resistive contact layer **124** and the data wiring **132**, **134** and **136** will be omitted.

Thereafter, referring to FIG. 7, the first passivation layer **142** is formed on the first substrate **100** having the TFT thereon. The first passivation layer **142** may define an opening therein, which exposes a portion of the drain electrode **136**.

More specifically, the first passivation layer **142** may be formed by depositing an inorganic insulating material, for example, silicon nitride or silicon oxide, on the first substrate **100** having the TFT thereon and patterning the inorganic insulating material to expose a portion of the drain electrode **136**.

Thereafter, referring to FIG. 8, the color filter **192** is formed on the first passivation layer **142**. The color filter **192** may be disposed in a pixel region, and examples of the color filter **192** may include R, G and B filters. In an exemplary embodiment, for example, the color filter **192** may be one of R, G and B filters. The color filter **192** may include or be formed of a photosensitive organic material including a pigment.

The color filter **192** may be formed by photolithography, inkjet printing or various other methods.

Thereafter, referring to FIG. 9, the organic layer **152** is formed on the first passivation layer **142** and the color filter **192**. The organic layer **152** may define an opening therein, which exposes a portion of the drain electrode **136**. The organic layer **152** may be formed by providing an organic material film on the first passivation layer **142** and the color filter **192** and patterning the organic material film.

The organic layer **152** may include or be formed of a material having excellent planarization performance and

13

photosensitivity. The organic layer **152** may be formed by spin coating, slit coating or both.

The portion of the drain electrode **136** exposed through the opening in the first passivation layer **142** may substantially coincide with the exposed portion of the drain electrode **136** exposed through the opening in the organic layer **152**, as illustrated in FIG. 9, but the invention is not limited thereto. The side surfaces of the first passivation layer **142** and the organic layer **152** at the respective openings therein, may be coplanar with each other, but the invention is not limited thereto. That is, the portion of the drain electrode **136** exposed through the opening in the first passivation layer **142** and the portion of the drain electrode **136** exposed through the opening in the organic layer **152** may be formed in various shapes other than that set forth herein, as long as the conductive layer **164** can be placed in contact with the drain electrode **136**.

A portion of the gate insulating layer **112** may be exposed through the opening in the first passivation layer **142** and the opening in the organic layer **152**, as illustrated in FIG. 9, but the invention is not limited thereto. That is, in an alternative exemplary embodiment, the portion of the drain electrode **136** may be exposed through the opening in the first passivation layer **142** and the opening in the organic layer **152**, but the gate insulating layer **112** may not be exposed.

Thereafter, referring to FIG. 10, the conductive layer **164** is formed to contact the drain electrode **136** exposed through the opening in the first passivation layer **142** and the opening in the organic layer **152**. The common electrode **162**, which is electrically isolated from the conductive layer **164**, is formed on the top surface of the organic layer **152**. That is, the conductive layer **164** and the common electrode **162** are not connected to each other, but separated or isolated from each other. The conductive layer **164** and the common electrode **162** may be formed at the same time by the same photolithography process.

The conductive layer **164** may contact the entire exposed portion of the drain electrode **136**, but the invention is not limited thereto. That is, in an alternative exemplary embodiment, the conductive layer **164** may contact only a portion of the exposed portion of the drain electrode **136**.

Thereafter, referring to FIG. 11, the second passivation layer **172** is formed on the common electrode **162**, the organic layer **152** and the conductive layer **164**. The second passivation layer **172** may include an opening defined therein, which exposes a portion of the conductive layer **164**.

The second passivation layer **172** may be formed by depositing an inorganic insulating material, for example, silicon nitride or silicon oxide, on the common electrode **162** and the conductive layer **164** and patterning the inorganic insulating material to expose the portion of the conductive layer **164**.

Thereafter, referring to FIG. 12, the pixel electrode **182** is formed on the conductive layer **164** and the second passivation layer **172**. More specifically, the pixel electrode **182** may be formed to contact at least a portion of the exposed portion of the conductive layer **164** in the opening of the second passivation layer **172**. As a result, the pixel electrode **182** may be electrically connected to the conductive layer **164**. Also, the pixel electrode **182** may be electrically connected to the drain electrode **136** through the conductive layer **164**. That is, the pixel electrode **182** may be electrically connected to the drain electrode **136** through the mediation of the conductive layer **164**.

To prevent an AUA defect, the pixel electrode **182** may be formed on the conductive layer **164** and the second passivation layer **172** so as to not directly contact the organic

14

layer **152**. Since the second passivation layer **172** and the conductive layer **164** are formed between the pixel electrode **182** and the organic layer **152**, direct contact of the pixel electrode **182** and the organic layer **152** may be reduced or effectively prevented.

Thereafter, referring to FIG. 13, the light-blocking member **194** is formed on the second passivation layer **172**. The light-blocking member **194** may be formed in an area where the liquid crystal molecules included in the liquid crystal layer **300** do not operate, for example, a TFT region and a non-pixel region (e.g., a region between pixels and/or a region where the gate line **102** and the data line **132** are disposed). The light-blocking member **194** may be formed of a black organic polymer material including a black dye or pigment, or a metal or metal oxide, such as Cr or chromium oxide.

Thereafter, the column spacer **196** is formed on the light-blocking member **194**. As illustrated in FIG. 13, the column spacer **196** and the light-blocking member **194** may be integrally formed at the same time. In an exemplary embodiment, for example, the column spacer **196** and the light-blocking member **194** may be formed of the same material by the same patterning process through halftone mask exposure or slit mask exposure, but the invention is not limited thereto.

The column spacer **196** may be formed in the TFT region, as illustrated in FIG. 13, but the invention is not limited thereto. That is, the location of the column spacer **196** is not particularly limited.

Thereafter, referring to FIG. 14, an alignment layer (not illustrated) may be formed on each of the first and second substrates **100** and **200**. Thereafter, liquid crystal molecules (not illustrated) with positive or negative dielectric anisotropy are applied onto the first substrate **100**, thereby forming the liquid crystal layer **300**. Thereafter, the first substrate **100** with the liquid crystal layer **300** formed thereon is combined with the second substrate **200**.

Another exemplary embodiment of an LCD according to the invention will hereinafter be described.

FIG. 15 is an enlarged view of an exemplary embodiment of an area of an LCD **10-1** according to the invention, corresponding to area A of FIG. 1. FIG. 16 is a cross-sectional view of the LCD **10-1**, corresponding to line III-III' of FIG. 1.

The LCD **10-1** is substantially the same as the LCD **10** of FIGS. 1 to 3 except for a few elements thereof, such as a conductive layer **164-1**, a second passivation layer **172-1** and a pixel electrode **182-a**, and thus will hereinafter be described, focusing mainly on differences with the LCD **10** of FIGS. 1 to 3.

Referring to FIGS. 15 and 16, the conductive layer **164-1** may be disposed to contact a portion of the exposed portion of a drain electrode **136** exposed at a contact hole **136a-1**, which is formed in a first passivation layer **142** and an organic layer **152**. The conductive layer **164-1** may thus be electrically connected to the drain electrode **136** at the contact hole **136a-1**.

The conductive layer **164-1** may contact the entire exposed portion of the drain electrode **136** and may extend along, and cover, the entire sidewall of the contact hole **136a-1** to reach the top surface of the organic layer **152**. The conductive layer **164-1** may extend to the top surface of the organic layer **152**, but may be isolated or separated from a common electrode **162** which is also disposed on the organic layer **152**.

The second passivation layer **172-1** may be disposed on the common electrode **162**, the organic layer **152** and the

15

conductive layer **164-1**, and may expose a portion of the conductive layer **164-1**. That is, the second passivation layer **172-1** may include an opening defined therein, which exposes a portion of the conductive layer **164-1**.

The opening in the second passivation layer **172-1** may expose a central portion of the conductive layer **164-1**, as illustrated in FIGS. **15** and **16**. That is, the second passivation layer **172-1** may cover the edges of the conductive layer **164-1** while exposing the central portion thereof.

More specifically, as illustrated in FIG. **16**, in response to the conductive layer **164-1** contacting the entire exposed portion of the drain electrode **136** and being extend along, and covering, the entire sidewall of the contact hole **136a-1** to reach the top surface of the organic layer **152**, the second passivation layer **172-1** may overlap the edges of the conductive layer **164-1**, which extend over the top surface of the organic layer **152**.

The pixel electrode **182-1** may be disposed on the conductive layer **164-1** and the second passivation layer **172-1**. More specifically, the pixel electrode **182-1** may contact a portion of the exposed portion of the conductive layer **164-1** at the opening of the second passivation layer **172-1**. Accordingly, the pixel electrode **182-1** may be electrically connected to the conductive layer **164-1**. Also, the pixel electrode **182-1** may be electrically connected to the drain electrode **136** through the conductive layer **164-1**. That is, the pixel electrode **182-1** may be electrically connected to the drain electrode **136** through the mediation of the conductive layer **164-1**.

As illustrated in FIGS. **15** and **16**, the pixel electrode **182-1** may cover the entire exposed portion of the conductive layer **164-1** at the opening of the second passivation layer **172-1**.

A portion of the pixel electrode **182-1** may be disposed in the contact hole **136a-1**. The portion of the pixel electrode **182-1** in the contact hole **136a-1** may form a contact. The second passivation layer **172-1** is disposed between the pixel electrode **182-1** and the common electrode **162** and thus insulates the pixel electrode **182-1** and the common electrode **162** from each other.

Since the second passivation layer **172-1** or the conductive layer **164-1** is interposed between the organic layer **152** and the pixel electrode **182-1**, the pixel electrode **182-1** may not directly contact the organic layer **152**. Accordingly, an AUA defect may be reduced or effectively prevented.

While the invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes may be made therein without departing from the spirit and scope of the invention as defined by the following claims. The exemplary embodiments should be considered in a descriptive sense only and not for purposes of limitation.

What is claimed is:

1. A liquid crystal display, comprising:

first and second substrates facing each other;

a liquid crystal layer disposed between the first and second substrates;

a thin-film transistor disposed on the first substrate and including a semiconductor layer, a gate electrode, a source electrode and a drain electrode;

an organic layer disposed on the thin-film transistor, the organic layer defining a contact hole therein which exposes a portion of the drain electrode;

a conductive layer disposed on the organic layer and contacting the exposed portion of the drain electrode at the contact hole defined in the organic layer;

16

a common electrode which is disposed on the organic layer and isolated from the conductive layer;

a passivation layer disposed on the conductive layer and the common electrode, the passivation layer defining an opening therein which exposes a portion of the conductive layer; and

a pixel electrode disposed on the passivation layer and on the conductive layer and contacting the exposed portion of the conductive layer at the opening defined in the passivation layer,

wherein the opening defined in the passivation layer exposes a central portion of the conductive layer and the passivation layer in which the opening is defined covers edges of the conductive layer adjacent to the central portion thereof.

2. The liquid crystal display of claim 1, wherein the conductive layer and the passivation layer are each disposed between the pixel electrode and the organic layer such that the pixel electrode and the organic layer do not to contact each other.

3. The liquid crystal display of claim 1, wherein the conductive layer contacting the exposed portion of the drain electrode at the contact hole defined in the organic layer extends along a sidewall of the organic layer at the contact hole to be disposed on a top surface of the organic layer in which the contact hole is defined.

4. The liquid crystal display of claim 1, wherein the pixel electrode contacts an entirety of the exposed portion of the conductive layer at the opening defined in the passivation layer.

5. A liquid crystal display, comprising:

first and second substrates facing each other;

a liquid crystal layer disposed between the first and second substrates;

a thin-film transistor disposed on the first substrate and including a semiconductor layer, a gate electrode, a source electrode and a drain electrode;

an organic layer disposed on the thin-film transistor, the organic layer defining a contact hole therein which exposes a portion of the drain electrode;

a conductive layer disposed on the organic layer and contacting the exposed portion of the drain electrode at the contact hole defined in the organic layer;

a common electrode which is disposed on the organic layer and isolated from the conductive layer;

a passivation layer disposed on the conductive layer and the common electrode, the passivation layer defining an opening therein which exposes a portion of the conductive layer;

a pixel electrode disposed on the passivation layer and on the conductive layer; and

contacting the exposed portion of the conductive layer at the opening defined in the passivation layer, and

a gate insulating layer disposed between the gate electrode and the drain electrode,

wherein the contact hole defined in the organic layer exposes a portion of the gate insulating layer.

6. The liquid crystal display of claim 5, wherein the passivation layer in which is defined the opening directly contacts the exposed portion of the gate insulating layer at the contact hole defined in the organic layer.

7. The liquid crystal display of claim 5, further comprising:

a color filter disposed between the gate insulating layer and the organic layer in which the contact hole is defined.

17

8. The liquid crystal display of claim 1, further comprising:

a light-blocking member disposed on the passivation layer in which the opening is defined.

9. A method of manufacturing a liquid crystal display, the method comprising:

forming a thin-film transistor, which includes a semiconductor layer, a gate electrode, a source electrode and a drain electrode, on a first substrate;

forming an organic layer which defines a contact hole therein exposing a portion of the drain electrode, on the thin-film transistor;

forming a conductive layer which contacts the exposed portion of the drain electrode at the contact hole defined in the organic layer, on the organic layer;

forming a common electrode which is disposed on the organic layer and isolated from the conductive layer;

forming a passivation layer which defines an opening therein exposing a portion of the conductive layer, on the conductive layer and on the common electrode; and forming a pixel electrode which contacts the exposed portion of the conductive layer at the opening defined in the passivation layer, on the passivation layer and the conductive layer,

wherein the opening defined in the passivation layer exposes a central portion of the conductive layer and the passivation layer in which the opening is defined covers edges of the conductive layer adjacent to the central portion thereof.

10. The method of claim 9, wherein the conductive layer and the passivation layer are each disposed between the pixel electrode and the organic layer such that the pixel electrode and the organic layer do not to contact each other.

18

11. The method of claim 9, wherein the conductive layer contacting the exposed portion of the drain electrode at the contact hole defined in the organic layer extends along a sidewall of the organic layer at the contact hole to be disposed on a top surface of the organic layer in which the contact hole is defined.

12. The method of claim 9, wherein the pixel electrode contacts an entirety of the exposed portion of the conductive layer at the opening defined in the passivation layer.

13. The method of claim 9, further comprising:

forming a gate insulating layer between the gate electrode and the drain electrode,

wherein the contact hole defined in the organic layer exposes a portion of the gate insulating layer.

14. The method of claim 13, wherein the passivation layer in which is defined the opening directly contacts the exposed portion of the gate insulating layer at the contact hole defined in the organic layer.

15. The method of claim 13, further comprising:

forming a color filter between the gate insulating layer and the organic layer in which the contact hole is defined.

16. The method of claim 9, further comprising:

forming a light-blocking member on the passivation layer in which the opening is defined.

17. The method of claim 16, further comprising:

forming a column spacer on the light-blocking member, wherein the light-blocking member and the column spacer are integral.

18. The method of claim 9, wherein the conductive layer and the common electrode are formed at the same time using a single mask.

* * * * *

专利名称(译)	液晶显示器及其制造方法		
公开(公告)号	US9915844	公开(公告)日	2018-03-13
申请号	US15/096502	申请日	2016-04-12
[标]申请(专利权)人(译)	三星显示有限公司		
申请(专利权)人(译)	三星DISPLAY CO. , LTD.		
当前申请(专利权)人(译)	三星DISPLAY CO. , LTD.		
[标]发明人	SON OCK SOO KIM DONG WOOK SONG JEAN HO JANG EUN JE JUNG DO HYUN		
发明人	SON, OCK SOO KIM, DONG WOOK SONG, JEAN HO JANG, EUN JE JUNG, DO HYUN		
IPC分类号	G02F1/1343 G02F1/1362		
CPC分类号	G02F1/136227 G02F2001/136222 G02F2001/134372		
代理机构(译)	康托科尔伯恩LLP		
优先权	1020150080381 2015-06-08 KR		
其他公开文献	US20160357080A1		
外部链接	Espacenet USPTO		

摘要(译)

液晶显示装置包括彼此面对的第一和第二基板;第一和第二基板之间的液晶层;第一基板上的薄膜晶体管(“TFT”),包括半导体层和栅极,源极和漏极;TFT上的有机层,在其中形成接触孔,暴露出漏电极的一部分;有机层上的导电层,并且在接触孔处接触漏电极的暴露部分;公共电极,位于有机层上并与导电层隔离;导电层和公共电极上的钝化层,并在其中限定开口,该开口暴露导电层的一部分;钝化层和导电层上的像素电极,并且在开口处接触导电层的暴露部分。

