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(54) LIQUID CRYSTAL PANEL AND MANUFACTURING METHOD AND DISPLAY THEREOF

FLÜSSIGKRISTALLANZEIGETAFEL, ZUGEHÖRIGES HERSTELLUNGSVERFAHREN UND ZUGEHÖRIGES DISPLAY

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(73) Proprietor: **Beijing BOE Optoelectronics Technology Co., Ltd.**
Beijing 100176 (CN)

(72) Inventors:
- **ZHAO, Chengtan**
  Beijing 100176 (CN)
- **MIN, Tae Yup**
  Beijing 100176 (CN)
- **CHEN, Xu**
  Beijing 100176 (CN)
- **LIN, Haiyun**
  Beijing 100176 (CN)
- **LI, Jingpeng**
  Beijing 100176 (CN)

(74) Representative: **Brötz, Helmut et al**
Rieder & Partner mbB
Patentanwälte - Rechtsanwalt
Corneliusstrasse 45
42329 Wuppertal (DE)

(56) References cited:
WO-A1-2009/031263
CN-A- 1 752 824
CN-A- 1 892 303
CN-A- 101 034 234
CN-A- 102 650 771
JP-A- 2004 138 808
JP-A- 2008 233 720
KR-A- 20090 042 093
US-A1- 2003 179 338
US-A1- 2005 219 454
US-A1- 2009 015 779

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Description

FIELD OF THE INVENTION

[0001] Embodiments of the present invention relate to a liquid crystal panel and a fabricating method thereof and a display.

BACKGROUND OF THE INVENTION

[0002] A liquid crystal display is a flat panel display commonly used at present, in which a thin-film transistor liquid crystal display (TFT-LCD) is a mainstream product in liquid crystal displays.

[0003] A liquid crystal panel is an important component of a liquid crystal display. In the prior art, a method for fabricating a liquid crystal panel may comprise the following processes: through a liquid crystal one-drop-filling (ODF) process, dropping liquid crystal on any one of the array substrate and the color filter substrate; applying a sealant on the other substrate; then bonding the array substrate and the color filter substrate, and performing curing treatment on the sealant to make the sealant cured, so that a liquid crystal panel is formed.

[0004] During designing and fabricating a liquid crystal panel, there are very strict requirements on a cell thickness. Usually, a cell thickness of a liquid crystal panel is about 3.5um, and a cell thickness fluctuation of 0.1um will affect the optical characteristics of a product. The amount of filled liquid crystal within a cell is an important factor affecting the stability of the cell thickness. In an actual producing process, a product quality is relatively easy to be affected by an excessive amount of liquid crystal, for example, an excessive amount of liquid crystal generally causes non-uniformity of picture and other defects. Prior art document D1 (US 2005/219454) discloses all the features of the preamble of present claim 1. D1 further discloses a metal pattern (125) below the first seal pattern (115), and a method including laser irradiating the metal pattern (Fig. 10A) to form at least one path (Fig. 10B), according to the amount of liquid crystal inside the LCD panel; and flowing surplus liquid crystal to the buffer space (130, 131) through the at least one path.

[0005] Prior art document D2 (WO 2009/031263) discloses all the features of the preamble of present claim 1 and it further discloses that the two substrates of the liquid crystal display can be joined under vacuum, whereby vacuum buffer chambers are formed.

SUMMARY OF THE INVENTION

[0006] One embodiment of the present invention provides a liquid crystal panel, comprising: an array substrate; a color filter substrate, facing the array substrate; a first sealant, disposed between the array substrate and the color filter substrate for attaching the array substrate and the color filter substrate, and a region surrounded by the first sealant forming a liquid crystal panel display region; liquid crystal, disposed in the liquid crystal display region between the array substrate and the color filter substrate; a liquid crystal buffer region, located at the outer side of the first sealant and between the array substrate and the color filter substrate, the liquid crystal buffer region being one or a plurality of vacuum chambers; a liquid crystal channel, disposed on the array substrate and/or the color filter substrate, the liquid crystal buffer region and the liquid crystal panel display region being connected through the liquid crystal channel; and a covering layer, covering at least a position where the liquid crystal channel connects with the liquid crystal panel display region, so as to block off a communication between the liquid crystal channel and the liquid crystal panel display region.

[0007] Another embodiment of the present invention provides a display, the display comprising a liquid crystal panel as described in the above embodiment.

[0008] Further another embodiment of the present invention provides a method for fabricating a liquid crystal panel, comprising: fabricating a liquid crystal channel on a surface of an array substrate and/or a color filter substrate to be in contact with liquid crystal; forming a covering layer on the liquid crystal channel; on one of the array substrate and the color filter substrate, applying a first sealant at edges of a liquid crystal panel display region, and applying a second sealant in a non-display region at the periphery of the liquid crystal panel display region; and on the other of the array substrate and the color filter substrate, dropping liquid crystal within the liquid crystal panel display region, and bonding the array substrate and the color filter substrate, so that the liquid crystal is filled between the array substrate and the color filter substrate within the liquid crystal panel display region surrounded by the first sealant, and that at least one vacuum liquid crystal buffer region is formed at the periphery of the liquid crystal display region, wherein the liquid crystal buffer region and the liquid crystal panel display region are connected through the liquid crystal channel, and the covering layer covers at least a position where the liquid crystal channel connects with the liquid crystal panel display region, so as to block off a communication between the liquid crystal channel and the liquid crystal panel display region.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] In order to clearly illustrate the technical solutions of the embodiments of the invention, the drawings of the embodiments will be briefly described in the following; it is obvious that the described drawings are only related to some embodiments of the invention and thus are not limitative of the invention.

FIG. 1 is a schematic structural sectional view of a peripheral region of a liquid crystal panel in an embodiment of the present invention;

FIG. 2 is a schematic structural top view of a liquid

crystal panel in an embodiment of the present invention; and

FIG. 3 is a schematic structural view of a liquid crystal channel in an embodiment of the present invention.

DETAILED DESCRIPTION

[0010] In order to make objects, technical details and advantages of the embodiments of the invention apparent, the technical solutions of the embodiments will be described in a clearly and fully understandable way in connection with the drawings related to the embodiments of the invention. It is obvious that the described embodiments are just a part but not all of the embodiments of the invention. Based on the described embodiments herein, those skilled in the art can obtain other embodiment(s), without any inventive work, which should be within the scope of the invention.

[0011] In order to solve the existing problems of the prior art, an embodiment of the present invention provides a liquid crystal panel, as shown in FIG. 1, comprising: an array substrate 1; a color filter substrate 2 facing the array substrate 1; a first sealant 4 for attaching the array substrate 1 and the color filter substrate 2; and liquid crystal 3 located between the array substrate 1 and the color filter substrate 2. Between the array substrate 1 and the color filter substrate 2, a liquid crystal panel display region 5 is surrounded by the first sealant 4, as shown in FIG. 2. The array substrate 1 and the color filter substrate 2, by means of the first sealant 4, have the liquid crystal 3 filled within the liquid crystal panel display region 5. That is, the liquid crystal is filled within the liquid crystal panel display region 5 surrounded by the first sealant 4. The liquid crystal panel further comprises: at least one vacuum liquid crystal buffer region 7, located in a liquid crystal panel non-display region (at the outer side of the first sealant 4), and formed between the array substrate 1 and the color filter substrate 2; a liquid crystal channel 8, communicating the liquid crystal buffer region 7 and the liquid crystal panel display region 5, and disposed on the array substrate 1 and/or the color filter substrate 2; a covering layer 9, located at a position where the liquid crystal channel 8 connects with the liquid crystal panel display region 5, and blocking off a communication between the liquid crystal channel 8 and the liquid crystal panel display region 5.

[0012] When the amount of liquid crystal within the liquid crystal panel display region exceeds a predetermined threshold, it will lead to a non-uniform picture displayed by the liquid crystal panel. The liquid crystal panel provided by the embodiment of the present invention can solve this problem fairly well, and therefore improves the picture quality of the liquid crystal panel. As shown in FIG. 1, the liquid crystal panel is constituted by an array substrate 1, a color filter substrate 2 and liquid crystal 3, as well as other components. In the liquid crystal panel, the array substrate 1 and the color filter substrate 2 are connected by a first sealant 4, and a liquid crystal panel display region 5 filled with liquid crystal 3 is formed; in a non-display region, the array substrate 1 and the color filter substrate 2 are connected by a second sealant 6, thus a vacuum liquid crystal buffer region 7 (for example, one or more vacuum chambers) is formed between the array substrate 1 and the color filter substrate 2 by the first sealant 4 and the second sealant 6. The liquid crystal buffer region 7 is connected with the liquid crystal panel display region 5 through a liquid crystal channel 8, and a covering layer 9 is formed at the connecting section, so as to block off a communication between the liquid crystal channel 8 and the liquid crystal panel display region 5, so that the liquid crystal 3 within the liquid crystal panel display region 5 can not pass through the liquid crystal channel 8 to flow to the liquid crystal buffer region 7. When the amount of liquid crystal within the liquid crystal panel display region 5 exceeds a predetermined threshold, a laser-cutting process and the like can be used to cut open the covering layer 9. In addition, there may be a plurality of liquid crystal buffer regions 7; therefore, when distributing the liquid crystal, all or part of the liquid crystal buffer regions 7 may be communicatively connected according to an actual situation. Since after dropping liquid crystal and bonding the array substrate 1 and the color filter substrate 2, the liquid crystal buffer region 7 forms a vacuum chamber; thus when distributing the liquid crystal, the liquid crystal can fill up a liquid crystal buffer region communicating with the liquid crystal panel display region 5, and does not generate bubbles.

[0013] FIG. 2 is a top view of a liquid crystal panel. In the figure, between an array substrate and a color filter substrate, a liquid crystal buffer region may be surrounded by a first sealant and a second sealant, and also may be surrounded by a second sealant. A liquid crystal buffer region 71 is a space surrounded by a second sealant 6 and a first sealant 4, and a liquid crystal buffer region 72 is a separate space surrounded by the second sealant 6. Both the liquid crystal buffer region 71 and the liquid crystal buffer region 72 are connected with the liquid crystal panel display region 5 through the liquid crystal channel 8, and a covering layer 9 blocks off the communication between the liquid crystal channel 8 and the liquid crystal panel display region 5. The material of the covering layer 9 is a resin material. For example, the covering layer 9 may be formed of a material that can be fused by laser.

[0014] The above-described liquid crystal channel 8 may be located on the array substrate 1 and/or the color filter substrate 2, for example, the liquid crystal channel 8 may be at least one groove on a surface of the array substrate 1 in contact with the liquid crystal 3; the liquid crystal channel 8 may also be at least one groove on a surface of the color filter substrate 2 in contact with the liquid crystal 3. As shown in FIG. 3, strip-like grooves constituted by the broken lines are liquid crystal channels 8, and there may have a plurality of channels. A resin material may cover on the liquid crystal channels 8 to form the covering layer 9, so that it may block off a communication between the liquid crystal channel 8 and the

liquid crystal panel display region 5.

[0015] In one embodiment, the liquid crystal channel 8 extends across the first sealant 4, that is, extends from the liquid crystal panel display region 5 to the liquid crystal buffer region 7. For example, the covering layer 9 at least covers the part of the liquid crystal channel 8 locating in the liquid crystal display region 5, so as to block off the liquid crystal channel 8, and to prevent the liquid crystal in a normal state from flowing into the liquid crystal buffer region 7. In order to better prevent a communication between the liquid crystal channel 8 and the liquid crystal panel display region, the coverage area of the covering layer 9 may also be larger than the part of the liquid crystal channel 8 within the liquid crystal panel display region 5. As shown in FIG. 2, the covering layer 9 may cover a part of the liquid crystal channel 8 within the liquid crystal panel display region 5, as well as a region around the part. Specifically, the covering layer 9 may cover part of the region within the liquid crystal panel display region 5, part of the region of the first sealant 4, as well as part of the region at the outer side of the first sealant 9. When the amount of liquid crystal within the liquid crystal display region 7 exceeds a predetermined threshold, a laser-cutting process and the like can be used to cut open the covering layer 9, so that the liquid crystal channel 8 is at least partly exposed both in the liquid crystal panel display region 5 and in the liquid crystal buffer region 7, thus a fluid communication can be established between the liquid crystal panel display region 8 and liquid crystal buffer region 7. For example, the covering layer 9 may be formed of a material that can be fused by laser. That is, the liquid crystal channel 8 extends from the liquid crystal display region 5 to the liquid crystal buffer region 7, and therefore, when there is no covering layer 9 for blocking or the covering layer 9 is fused, a fluid communication can be established between the liquid crystal display region 5 and the liquid crystal buffer region 7.

[0016] In addition, although the covering layer 9 in FIG. 2 is shown as across the display region 5, the second sealant 4 and the non-display region, the technical solution of the present invention is not limited thereto. As long as the covering layer 9 covers at least a part of the liquid crystal channel 8 locating in the display region 5, so as to block off the fluid communication between the liquid crystal channel 8 and the display region 5, the region of the covering layer 9 may be provided at will according to an actual situation.

[0017] Through the above description, it can be seen that, with the liquid crystal panel provided by the embodiment of the present invention, by fabricating a liquid crystal channel on a surface of a substrate in contact with liquid crystal, and forming a covering layer, and then after bonding the array substrate and the color filter substrate with a second sealant, a vacuum liquid crystal buffer region for distributing the liquid crystal, which is connected with the liquid crystal panel display region through the liquid crystal channel, is formed. When the amount of liquid crystal within the liquid crystal panel display region exceeds a predetermined threshold, a communication is established between the liquid crystal channel and the liquid crystal display region, so that the liquid crystal can fill up the liquid crystal buffer region, and does not generate bubbles. Thus, an excessive amount of liquid crystal within the liquid crystal panel display region is reduced, and the picture uniformity is improved.

[0018] Based on the same inventive idea, an embodiment of the present invention also provides a display comprising the above-described liquid crystal panel.

[0019] Based on the same inventive idea, an embodiment of the present invention further provides a method for fabricating a liquid crystal panel, the method comprises the following steps:

Step 401, fabricating a liquid crystal channel on a surface of an array substrate and/or a color filter substrate to be in contact with liquid crystal;

Step 402, forming a covering layer on the liquid crystal channel;

Step 403, on one of the array substrate and the color filter substrate, applying a first sealant at the edges of a liquid crystal panel display region, and applying a second sealant in a non-display region at the periphery of the liquid crystal panel display region;

Step 404, on the other of the array substrate and the color filter substrate, dropping liquid crystal within the liquid crystal panel display region, and bonding the array substrate and the color filter substrate, so that the liquid crystal is filled between the array substrate and the color filter substrate within the liquid crystal panel display region surrounded by the first sealant, and that at least one vacuum liquid crystal buffer region is formed at the periphery of the liquid crystal display region.

[0020] In the above-described method, the liquid crystal buffer region and the liquid crystal panel display region are connected through the liquid crystal channel, and the covering layer at least covers the position where the liquid crystal channel connects with the liquid crystal panel display region, so as to block off the communication between the liquid crystal channel and the liquid crystal panel display region.

[0021] For example, the liquid crystal buffer region is composed of a region surrounded by the first sealant and the second sealant together, or composed of a region surrounded by the second sealant.

[0022] Specifically, different processes may be adopted to fabricate the liquid crystal channel on a surface of the array substrate and/or the color filter substrate in contact with liquid crystal, so as to connect the display region and the liquid crystal buffer region. For example, when fabricating a liquid crystal channel on a surface of the array substrate in contact with the liquid crystal, firstly, fabricating a gate layer, a gate insulating layer, a source-drain layer and a passivation layer in this order on a glass substrate; then, through a via-hole process, fabricating

one or more grooves as liquid crystal channels on an upper surface of the passivation layer. When fabricating a liquid crystal channel on a surface of the color filter substrate in contact with the liquid crystal, firstly, fabricating a black matrix and a color filter resin on a glass substrate; during fabricating the black matrix or the color filter resin, forming a resin for non-display region in a non-display region of the glass substrate; then, through an etching process, fabricating one or more grooves as liquid crystal channels on a surface of the black matrix or the resin in the display region or in the non-display region; alternatively, forming a planarization layer on the black matrix and the color filter resin, and then fabricating one or more grooves as liquid crystal channels on a surface of the planarization layer,.

[0023] After fabricating the liquid crystal channels, a resin material covering on at least part of the liquid crystal channels is made by a printing process to form a covering layer, so as to block off the communication between the liquid crystal channel and the liquid crystal panel display region. After both the array substrate and the color filter substrate are fabricated completely, applying a first sealant at the edges of a display region of the array substrate and/or the color filter substrate, and applying a second sealant in a non-display region of the array substrate and/or the color filter substrate. In this way, by bonding the array substrate and the color filter substrate with the first sealant, a liquid crystal panel display region for filling with liquid crystal is formed; by bonding the array substrate and the color filter substrate with the second sealant, a liquid crystal buffer region for distributing the liquid crystal is formed, the liquid crystal buffer region being connected with the liquid crystal panel display region through the liquid crystal channel. In addition, there may be a plurality of liquid crystal buffer regions; therefore, when distributing the liquid crystal, all or part of the liquid crystal buffer regions may be communicatively connected according to an actual situation. Since after bonding the array substrate and the color filter substrate, the liquid crystal buffer region is formed as a vacuum region; therefore, when the amount of liquid crystal within the liquid crystal panel display region exceeds a predetermined threshold, by cutting open the covering layer through a laser-cutting process, the liquid crystal can fill up the liquid crystal buffer region communicating with the liquid crystal panel display region, and does not generate bubbles. A specific structure of the liquid crystal buffer region may refer to FIG. 2, which will not be described repeatedly.

[0024] By taking the case of fabricating a liquid crystal channel on an array substrate as an example, a method for fabricating a liquid crystal panel provided by an embodiment of the present invention may comprise, for example, the following steps:

Step 501, fabricating a gate layer on a glass substrate;

Step 502, forming a gate insulating layer on the gate layer;

Step 503, forming a source-drain layer;

Step 504, forming a passivation layer, and forming a plurality of grooves on the passivation layer through a via-hole process;

Step 505, covering a resin on the plurality of grooves through a printing process;

Step 506, on an array substrate, applying a first sealant at the edges of a display region, and applying a second sealant in a liquid crystal panel non-display region;

Step 507, on a color filter substrate, dropping liquid crystal in the display region;

Step 508, bonding the color filter substrate and the array substrate.

[0025] After bonding the array substrate and the color filter substrate with the second sealant as described above, a liquid crystal buffer region for distributing the liquid crystal is formed, the liquid crystal buffer region being connected with the display region through the grooves. In addition, there may be a plurality of liquid crystal buffer region; therefore, when distributing the liquid crystal, all or part of the liquid crystal buffer regions may be communicatively connected according to an actual situation. Since after dropping liquid crystal and bonding the array substrate and the color filter substrate, the liquid crystal buffer region is formed as a vacuum region, when the amount of liquid crystal within the display region exceeds a predetermined threshold, by cutting open the covering layer through a laser-cutting process for distributing the liquid crystal, the communication between the liquid crystal channel communicate with the liquid crystal panel display region is established. Thus, the liquid crystal can fill up the liquid crystal buffer region, and does not generate bubbles.

[0026] Through the above description, it can be seen that, with the liquid crystal panel and the fabricating method thereof and the display provided by the embodiments of the present invention, by fabricating a liquid crystal channel on a surface of a substrate in contact with liquid crystal, and applying a covering layer, and then after bonding the array substrate and the color filter substrate with a second sealant, a vacuum liquid crystal buffer region for distributing the liquid crystal, which is connected with the liquid crystal panel display region through the liquid crystal channel, is formed. When the amount of liquid crystal within the liquid crystal panel display region is excessive, by cutting open the covering layer through a laser-cutting process, the liquid crystal can fill up the liquid crystal buffer region, and does not generate bubbles. Thus the amount of liquid crystal within the liquid crystal panel display region is reduced, and the picture uniformity is improved.

Claims

1. A liquid crystal panel, comprising:
an array substrate (1); a color filter substrate (2), facing the array substrate (1); a first sealant (4), disposed between the array substrate (1) and the color filter substrate (2) for attaching the array substrate (1) and the color filter substrate (2), and a region surrounded by the first sealant (4) forming a liquid crystal panel display region (5); liquid crystal (3), disposed in the liquid crystal panel display region (5) between the array substrate (1) and the color filter substrate (2); a liquid crystal buffer region (7), located at the outer side of the first sealant (4) and between the array substrate (1) and the color filter substrate (2), the liquid crystal buffer region (7) being one or a plurality of buffer chambers; **characterised by**:

   the buffer chambers (7) being evacuated; a liquid crystal channel (8), disposed on the array substrate (1) and/or the color filter substrate (2), the liquid crystal buffer region (7) and the liquid crystal panel display region (5) being connected through the liquid crystal channel (8); and
   a covering layer (9), covering at least a position where the liquid crystal channel (8) connects with the liquid crystal panel display region (5), so as to block off a communication between the liquid crystal channel (8) and the liquid crystal panel display region (5).

2. The liquid crystal panel according to Claim 1, wherein a second sealant is disposed at the outer side of the first sealant; the liquid crystal buffer region between the array substrate and the color filter substrate is composed of a region surrounded by the first sealant and the second sealant together, or composed of a region surrounded by the second sealant.

3. The liquid crystal panel according to Claim 1 or 2, wherein the liquid crystal channel is at least one groove on a surface of the array substrate and/or the color filter substrate in contact with the liquid crystal.

4. The liquid crystal panel according to Claim 3, wherein the groove is a strip-like groove.

5. The liquid crystal panel according to any one of Claims 1-4, wherein the liquid crystal channel extends across the first sealant, and extends from the liquid crystal panel display region to the liquid crystal buffer region.

6. The liquid crystal panel according to any one of Claims 1-5, wherein the material of the covering layer is a resin material.

7. The liquid crystal panel according to any one of Claims 1-6, wherein the covering layer is formed of a material that can be fused by laser.

8. A display, comprising: a liquid crystal panel in accordance with any one of Claims 1-7.

9. A method for fabricating a liquid crystal panel, comprising:

   fabricating a liquid crystal channel (8) on a surface of an array substrate (1) and/or a color filter substrate (2) to be in contact with liquid crystal (3); forming a covering layer (9) on the liquid crystal channel (8); on one of the array substrate (1) and the color filter substrate (2), applying a first sealant (4) at edges of a liquid crystal panel display region (5), and applying a second sealant (6) in a non-display region at the periphery of the liquid crystal panel display region (5); and on the other of the array substrate (1) and the color filter substrate (2), dropping liquid crystal within the liquid crystal panel display region (5), and bonding the array substrate (1) and the color filter substrate (2), so that the liquid crystal (3) is filled between the array substrate (1) and the color filter substrate (2) within the liquid crystal panel display region (5) surrounded by the first sealant (4), and that at least one liquid crystal buffer region (7) being one or a plurality of evacuated buffer chambers is formed at the periphery of the liquid crystal panel display region (5), wherein the liquid crystal buffer region (7) and the liquid crystal panel display region (5) are connected through the liquid crystal channel (8), and the covering layer (9) covers at least a position
   where the liquid crystal channel (8) connects with the liquid crystal panel display region (5), so as to block off a communication between the liquid crystal channel (8) and the liquid crystal panel display region (5).

10. The method according to Claim 9, wherein the liquid crystal buffer region is composed of a region surrounded by the first sealant and the second sealant together, or composed of a region surrounded by the second sealant.

11. The method according to Claim 9 or 10, wherein fabricating a liquid crystal channel on a surface of the array substrate to be in contact with liquid crystal comprises:

   fabricating a gate layer, a gate insulating layer, a source-drain layer and a passivation layer in this order on a glass substrate; and
   fabricating one or more grooves as liquid crystal

channels on an upper surface of the passivation layer through a via-hole process.

12. The method according to any one of Claims 9-11, wherein fabricating a liquid crystal channel on a surface of the color filter substrate to be in contact with liquid crystal comprises:

fabricating a black matrix and a color filter resin on a glass substrate;
during fabricating the black matrix or the color filter resin, forming a resin for a non-display region in a non-display region of the glass substrate; and
through an etching process, fabricating one or more grooves as liquid crystal channels on a surface of the black matrix or the resin in the display region and in the non-display region; or, forming a planarization layer on the black matrix and the color filter resin, and fabricating one or more grooves as liquid crystal channels on a surface of the planarization layer.

13. The method according to any one of Claims 9-12, wherein forming a covering layer on the liquid crystal channel comprises: covering a resin material on the grooves to form a covering layer, so as to block off the communication between the liquid crystal channel and the liquid crystal panel display region.

14. The method according to any one of Claims 9-13, wherein the covering layer is formed of a material that can be fused by laser.

Patentansprüche

1. Flüssigkristalltafel, umfassend:

ein Array-Substrat (1);
ein Farbfiltersubstrat (2), das dem Array-Substrat (1) zugewandt ist;
eine erste Dichtung (4), die zwischen dem Array-Substrat (1) und dem Farbfiltersubstrat (2) zur Befestigung des Array-Substrates (1) und des Farbfiltersubstrates (2) angeordnet ist, und
eine Region, die mittels der ersten Dichtung (4) umgeben ist, und die eine Flüssigkristalltafel-Anzeigeregion (5) bildet;
Flüssigkristall (3), angeordnet in der FlüssigkristalltafelAnzeigeregion (5) zwischen dem Array-Substrat (1) und dem Farbfiltersubstrat (2);
eine Flüssigkristallpufferregion (7), angeordnet an der äußeren Seite der ersten Dichtung (4) und zwischen dem Array-Substrat (1) und dem Farbfiltersubstrat (2), wobei die Flüssigkristallpufferregion (7) eine oder eine Mehrzahl von Pufferkammern ist;

dadurch gekennzeichnet:

die Pufferkammern (7) sind leer; ein Flüssigkristallkanal (8), angeordnet auf dem Array-Substrat (1) und/oder dem Farbfiltersubstrat (2), die Flüssigkristallpufferregion (7) und die Flüssigkristalltafel-Anzeige-region (5) sind durch den Flüssigkristallkanal (8) verbunden;
und eine Deckschicht (9), die zumindest eine Position bedeckt, wo der Flüssigkristallkanal (8) mit der Flüssigkristalltafel-Anzeigeregion (5) verbunden ist, um eine Verbindung zwischen dem Flüssigkristallkanal (8) und der Flüssigkristalltafel-Anzeigeregion (5) zu blockieren.

2. Flüssigkristalltafel gemäß Anspruch 1, wobei eine zweite Dichtung an der äußeren Seite der ersten Dichtung angeordnet ist; wobei die Flüssigkristallpufferregion zwischen dem Array-Substrat und dem Farbfiltersubstrat gebildet ist aus einer Region, die mittels der ersten Dichtung und der zweiten Dichtung gemeinsam umgeben ist, oder die gebildet ist aus einer mittels der zweiten Dichtung umgebenen Region.

3. Flüssigkristalltafel gemäß Anspruch 1 oder 2, wobei der Flüssigkristallkanal zumindest eine Rille auf einer Oberfläche des Array-Substrates und/oder des Farbfiltersubstrates in Kontakt mit dem Flüssigkristall ist.

4. Flüssigkristalltafel gemäß Anspruch 3, wobei die Rille eine streifenartige Rille ist.

5. Flüssigkristalltafel gemäß einem der Ansprüche 1-4, wobei der Flüssigkristallkanal sich über die erste Dichtung erstreckt und sich von der Flüssigkristalltafel-Anzeigeregion zu der Flüssigkristallpufferregion erstreckt.

6. Flüssigkristalltafel gemäß einem der Ansprüche 1-5, wobei das Material der Deckschicht ein Harzmaterial ist.

7. Flüssigkristalltafel gemäß einem der Ansprüche 1-6, wobei die Deckschicht aus einem Material, das mittels Laser geschmolzen werden kann, gebildet ist.

8. Anzeige, umfassend: eine Flüssigkristalltafel gemäß einem der Ansprüche 1-7.

9. Verfahren zu Herstellung einer Flüssigkristalltafel, umfassend:
Herstellen eines Flüssigkristallkanals (8) auf einer Oberfläche von einem Array-Substrat (1) und/oder einem Farbfiltersubstrat (2), um in Kontakt mit Flüs-

sigkristall (3) zu sein;

Bilden einer Deckschicht (9) auf dem Flüssigkristallkanal (8);
auf einem von dem Array-Substrat (1) und dem Farbfiltersubstrat (2) Aufbringen einer ersten Dichtung (4) an Rändern der Flüssigkristalltafel-Anzeigeregion (5), und
Aufbringen einer zweiten Dichtung (6) in einer Nicht-Anzeige-Region an dem Rand der Flüssigkristalltafel-Anzeigeregion (5); und
auf dem anderen von dem Array-Substrat (1) und dem Farbfiltersubstrat (2) Auftropfen von Flüssigkristall in die Flüssigkristalltafel-Anzeigeregion (5) und
Verbinden des Array-Substrates (1) und des Farbfiltersubstrates (2), so dass das Flüssigkristall (3) zwischen das Array-Substrat (1) und das Farbfiltersubstrat (2) in die mittels der ersten Dichtung (4) umgebene Flüssigkristalltafel-Anzeigeregion (5) gefüllt wird,
und das zumindest eine Flüssigkristallpufferregion (7), die eine oder eine Mehrzahl von entleerten Pufferkammern ist, an dem Rand der Flüssigkristalltafel-Anzeigeregion (5) gebildet wird,
wobei die Flüssigkristallpufferregion (7) und die Flüssigkristalltafel-Anzeigeregion (5) durch den Flüssigkristallkanal (8) verbunden sind, und wobei die Deckschicht (9) zumindest eine Position bedeckt, wo der Flüssigkristallkanal (8) mit der Flüssigkristalltafel-Anzeigeregion (5) verbunden ist, um eine Verbindung zwischen dem Flüssigkristallkanal (8) und der Flüssigkristalltafel-Anzeigeregion (5) zu blockieren.

10. Verfahren gemäß Anspruch 9, wobei die Flüssigkristallpufferregion gebildet ist aus einer mittels der ersten Dichtung umgebenen Region und der zweiten Dichtung oder gebildet ist aus einer mittels der zweiten Dichtung umgebenen Region.

11. Verfahren gemäß Anspruch 9 oder 10, wobei das Herstellen eines Flüssigkristallkanals auf einer Oberfläche des Array-Substrates, um in Kontakt mit Flüssigkristall zu sein, umfasst:

Herstellen einer Gate-Schicht, einer Gate-Isolierschicht, einer Source-Drain-Schicht und einer Passivationsschicht in dieser Reihenfolge auf einem Glassubstrat; und
Herstellen von einer oder mehreren Rillen als Flüssigkristallkanäle auf einer oberen Oberfläche der Passivationsschicht durch einen Durchgangsbohrungsprozess.

12. Verfahren gemäß einem der Ansprüche 9-11, wobei das Herstellen eines Flüssigkristallkanals auf einer Oberfläche des Farbfiltersubstrates, um in Kontakt mit Flüssigkristall zu sein, umfasst:

Herstellen einer schwarzen Matrix und eines Farbfilterharzes auf einem Glassubstrat;
während des Herstellens der schwarzen Matrix oder des Farbfilterharzes Bilden eines Harzes für eine Nicht-Anzeige-Region in einer Nicht-Anzeige-Region des Glassubstrates; und
durch einen Ätzprozess Herstellen von einer oder mehreren Rillen als Flüssigkristallkanäle auf einer Oberfläche der schwarzen Matrix oder des Harzes in der Anzeigeregion und in der Nicht-Anzeige-Region; oder, Bilden einer Planarisierungsschicht auf der schwarzen Matrix und dem Farbfilterharz, und Herstellen von einer oder mehreren Rillen als Flüssigkristallkanäle auf einer Oberfläche der Planarisierungsschicht.

13. Verfahren gemäß einem der Ansprüche 9-12, wobei das Bilden einer Deckschicht auf dem Flüssigkristallkanal umfasst: Bedecken von Harzmaterial auf die Rillen, um eine Deckschicht zu bilden, um die Verbindung zwischen dem Flüssigkristallkanal und der Flüssigkristalltafel-Anzeigeregion zu blockieren.

14. Verfahren gemäß einem der Ansprüche 9-13, wobei die Deckschicht aus einem Material, das mittels Laser geschmolzen werden kann, gebildet ist.

Revendications

1. Un panneau à cristaux liquides, comprenant :

un substrat de réseau (1) ;
un substrat de filtre de couleur (2), faisant face au substrat de réseau (1) ;
un premier matériau d'étanchéité (4), disposé entre le substrat de réseau (1) et le substrat de filtre de couleur (2) pour fixer le substrat de réseau (1) et le substrat de filtre de couleur (2), et une région entourée par le premier matériau d'étanchéité (4) formant une zone d'affichage de panneau à cristaux liquides (5) ;
du cristal liquide (3), disposé dans la région d'affichage à cristaux liquides (5) entre le substrat de réseau (1) et le substrat de filtre de couleur (2) ;
une région de tampon de cristaux liquides (7), située du côté extérieur du premier matériau d'étanchéité (4) et entre le substrat de réseau (1) et le substrat de filtre de couleur 2), la région de tampon de cristaux liquides (7) étant une ou une pluralité de chambres de tampon ;
caractérisé par :

les chambres de tampon (7) étant mises sous vide ; un canal à cristaux liquides (8), disposé sur le substrat de réseau (1) et/ou le substrat de filtre de couleur (2), la région de tampon de cristaux liquides (7) et la région d'affichage de panneau à cristaux liquides (5) étant connectées par le canal à cristaux liquides (8) ; et
une couche de recouvrement (9), recouvrant au moins une position où le canal à cristaux liquides (8) se connecte à la région d'affichage du panneau à cristaux liquides (5), de manière à bloquer une communication entre le canal à cristaux liquides (8) et la région d'affichage du panneau à cristaux liquides (5).

2. Le panneau à cristaux liquides selon la revendication 1, dans lequel un deuxième matériau d'étanchéité est disposé du côté extérieur du premier matériau d'étanchéité ; la région de tampon de cristaux liquides entre le substrat de réseau et le substrat de filtre de couleur est composée d'une région entourée par le premier matériau d'étanchéité et le deuxième matériau d'étanchéité ensemble, ou composée d'une région entourée par le deuxième matériau d'étanchéité.

3. Le panneau à cristaux liquides selon la revendication 1 ou 2, dans lequel le canal à cristaux liquides est au moins une rainure sur une surface du substrat de réseau et/ou du substrat de filtre de couleur en contact avec le cristal liquide.

4. Le panneau à cristaux liquides selon la revendication 3, dans lequel la rainure est une rainure en forme de bande.

5. Le panneau à cristaux liquides selon l'une quelconque des revendications 1 à 4, dans lequel le canal à cristaux liquides s'étend à travers le premier matériau d'étanchéité et s'étend de la région d'affichage du panneau à cristaux liquides à la région de tampon de cristaux liquides.

6. Le panneau à cristaux liquides selon l'une quelconque des revendications 1 à 5, dans lequel le matériau de la couche de recouvrement est un matériau de résine.

7. Le panneau à cristaux liquides selon l'une quelconque des revendications 1 à 6, dans lequel la couche de recouvrement est formée d'un matériau qui peut être fondu par laser.

8. Un dispositif d'affichage, comprenant : un panneau à cristaux liquides selon l'une quelconque des revendications 1 à 7.

9. Un procédé de fabrication d'un panneau à cristaux liquides, comprenant :

la fabrication d'un canal à cristaux liquides (8) sur une surface d'un substrat de réseau (1) et/ou d'un substrat de filtre de couleur (2) devant être en contact avec du cristal liquide (3) ;
la formation d'une couche de recouvrement (9) sur le canal à cristaux liquides (8) ;
sur l'un parmi le substrat de réseau (1) et le substrat de filtre de couleur (2), l'application d'un premier matériau d'étanchéité (4) sur des bords d'une région d'affichage de panneau à cristaux liquides (5) et l'application d'un deuxième matériau d'étanchéité (6) dans une région de non-affichage à la périphérie de la région d'affichage de panneau à cristaux liquides (5) ; et
sur l'autre parmi le substrat de réseau (1) et le substrat de filtre de couleur (2), la dépose de cristal liquide dans la région d'affichage de panneau à cristaux liquides (5), et la liaison du substrat de réseau (1) et du substrat de filtre de couleur (2), de manière que le cristal liquide soit rempli entre le substrat de réseau (1) et le substrat de filtre de couleur (2) dans la région d'affichage du panneau à cristaux liquides (5) entourée par le premier matériau d'étanchéité (4), et qu'au moins une région de tampon de cristaux liquides (7) qui est une ou une pluralité de chambres de tampon mises sous vide, soit formée à la périphérie de la région d'affichage du panneau à cristaux liquides (5),

dans lequel la région de tampon de cristaux liquides (7) et la région d'affichage du panneau à cristaux liquides (5) sont reliées par le canal à cristaux liquides (8), et la couche de recouvrement (9) recouvre au moins une position où le canal à cristaux liquides (8) se relie à la région d'affichage du panneau à cristaux liquides (5), de manière à bloquer une communication entre le canal à cristaux liquides (8) et la région d'affichage du panneau à cristaux liquides (5).

10. Le procédé selon la revendication 9, dans lequel la région de tampon à cristaux liquides est composée d'une région entourée par le premier matériau d'étanchéité et le deuxième matériau d'étanchéité ensemble, ou est composée d'une région entourée par le deuxième matériau d'étanchéité.

11. Le procédé selon la revendication 9 ou 10, dans lequel la fabrication d'un canal à cristaux liquides sur une surface du substrat de réseau devant être en contact avec du cristal liquide comprend :

la fabrication d'une couche de grille, d'une couche d'isolation de grille, d'une couche source-drain et d'une couche de passivation dans cet

ordre sur un substrat de verre; et
la fabrication d'une ou plusieurs rainures en tant que canaux à cristaux liquides sur une surface supérieure de la couche de passivation par un procédé de réalisation de trou de liaison.

12. Le procédé selon l'une quelconque des revendications 9 à 11, dans lequel la fabrication d'un canal à cristaux liquides sur une surface du substrat de filtre de couleur devant être en contact avec un cristal liquide comprend :

la fabrication d'une matrice noire et d'une résine de filtre de couleur sur un substrat de verre ;
pendant la fabrication de la matrice noire ou de la résine de filtre de couleur, la formation d'une résine pour une région de non-affichage dans une région de non-affichage du substrat de verre ; et
par un processus de gravure, la fabrication d'une ou plusieurs rainures en tant que canaux à cristaux liquides sur une surface de la matrice noire ou de la résine dans la région d'affichage et dans la région de non-affichage ; ou, la formation d'une couche de planarisation sur la matrice noire et la résine de filtre de couleur, et la fabrication d'une ou plusieurs rainures en tant que canaux à cristaux liquides sur une surface de la couche de planarisation.

13. Le procédé selon l'une quelconque des revendications 9 à 12, dans lequel la formation d'une couche de recouvrement sur le canal à cristaux liquides comprend : la couverture des rainures avec un matériau de résine pour former une couche de recouvrement, de manière à bloquer la communication entre le canal à cristaux liquides et la région d'affichage du panneau à cristaux liquides.

14. Le procédé selon l'une quelconque des revendications 9 à 13, dans lequel la couche de recouvrement est formée d'un matériau qui peut être fondu par laser.

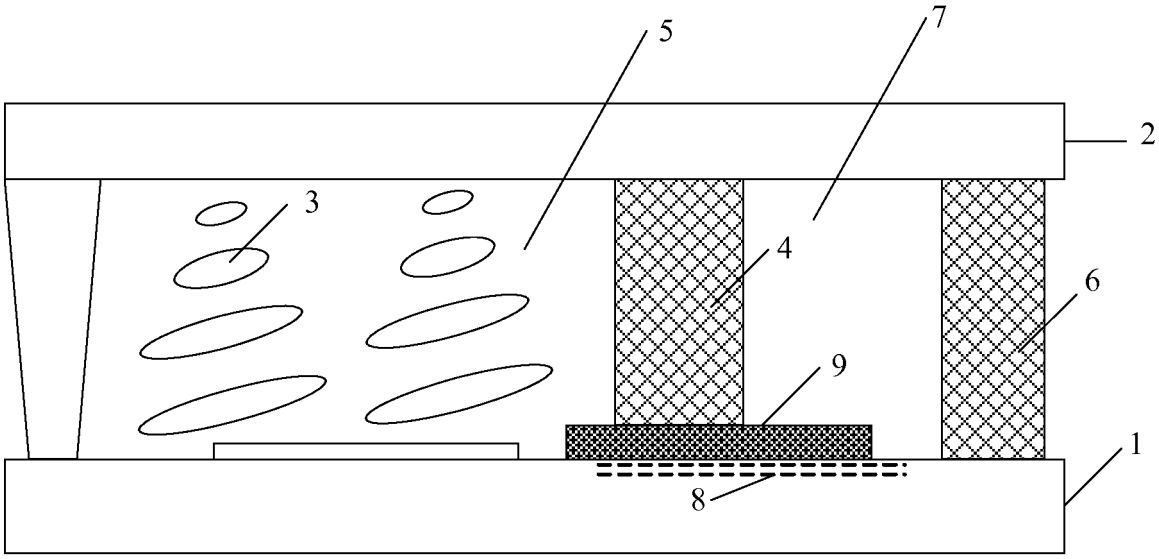

FIG. 1

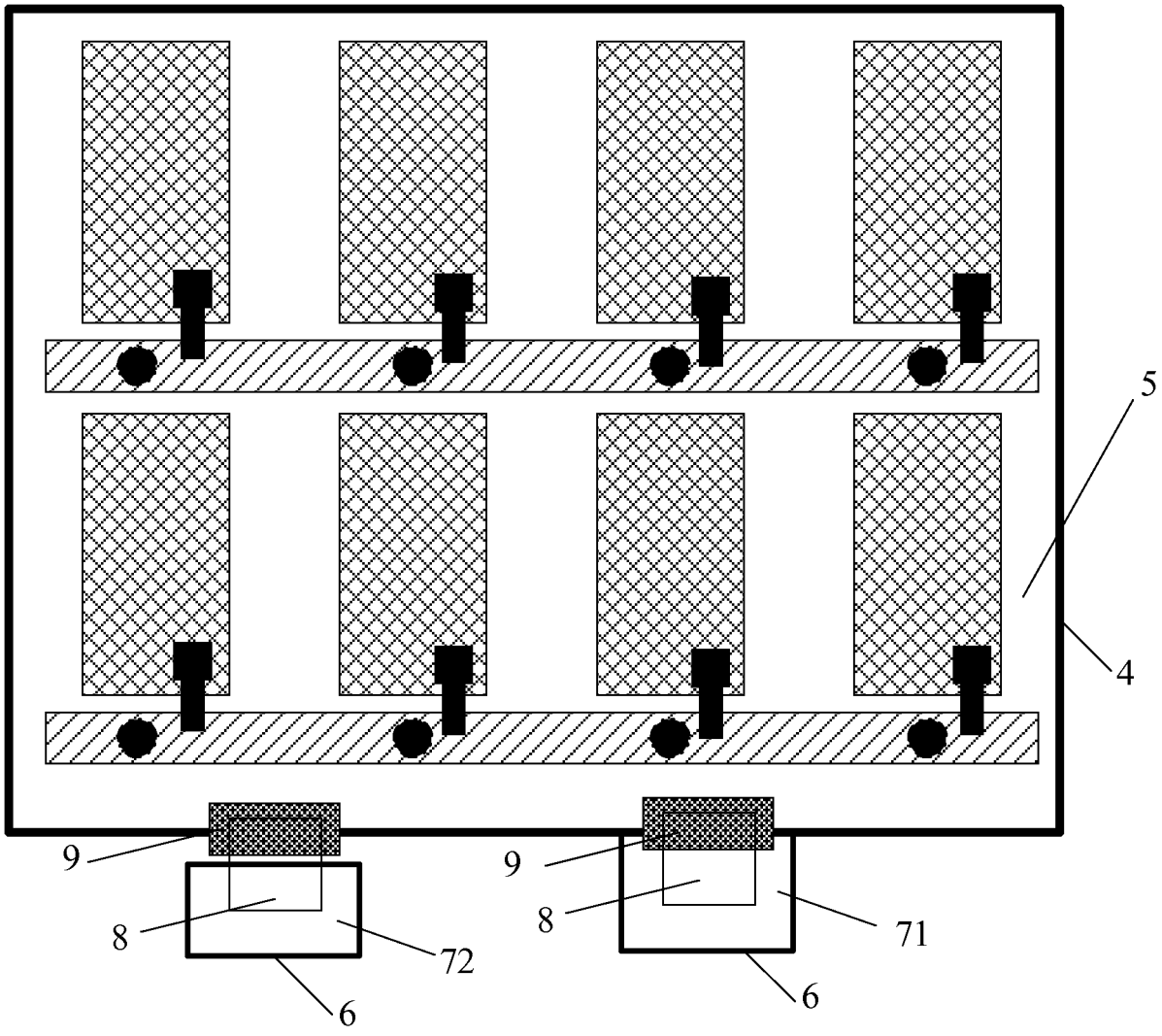

FIG. 2

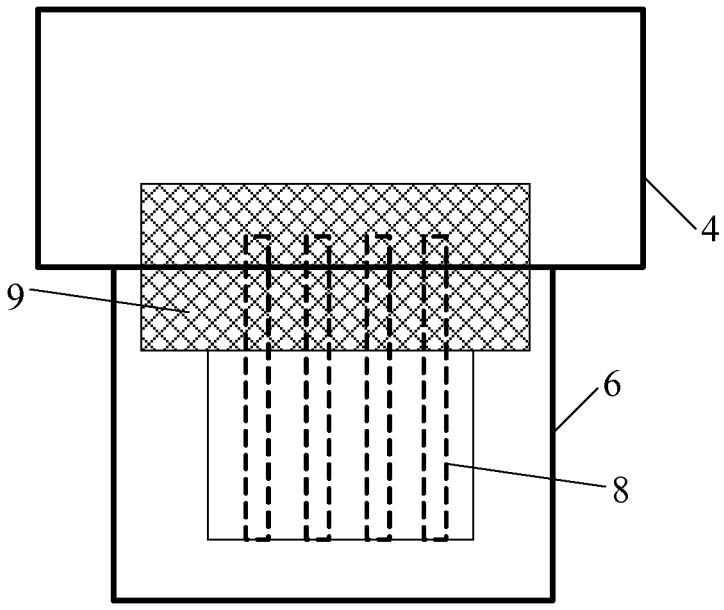

FIG. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2005219454 A **[0004]**
- WO 2009031263 A **[0005]**

专利名称(译)	液晶面板及其制造方法和显示器		
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[标]申请(专利权)人(译)	北京京东方光电科技有限公司		
申请(专利权)人(译)	北京京东方光电科技有限公司.LTD.		
当前申请(专利权)人(译)	北京京东方光电科技有限公司.		
[标]发明人	ZHAO CHENGTAN MIN TAE YUP CHEN XU LIN HAIYUN LI JINGPENG		
发明人	ZHAO, CHENGTAN MIN, TAE YUP CHEN, XU LIN, HAIYUN LI, JINGPENG		
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外部链接	Espacenet		

摘要(译)

液晶面板及其制造方法和显示器技术领域本发明的实施例涉及液晶面板及其制造方法和显示器。液晶面板包括：阵列基板和通过第一密封剂粘合的滤色器基板，在阵列基板和滤色器基板之间由第一密封剂围绕的区域形成填充有液晶的液晶面板显示区域。另外，液晶面板还包括：液晶缓冲区，位于第一密封胶的外侧;液晶通道，液晶缓冲区和液晶面板显示区通过液晶通道连接;覆盖层，至少覆盖液晶通道与液晶面板显示区域连接的位置。

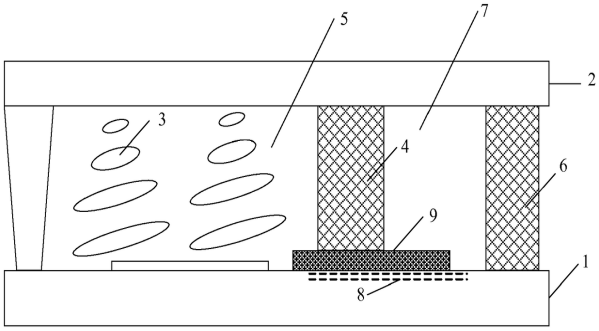

FIG. 1