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(54) DISPLAY PANEL AND DISPLAY DEVICE

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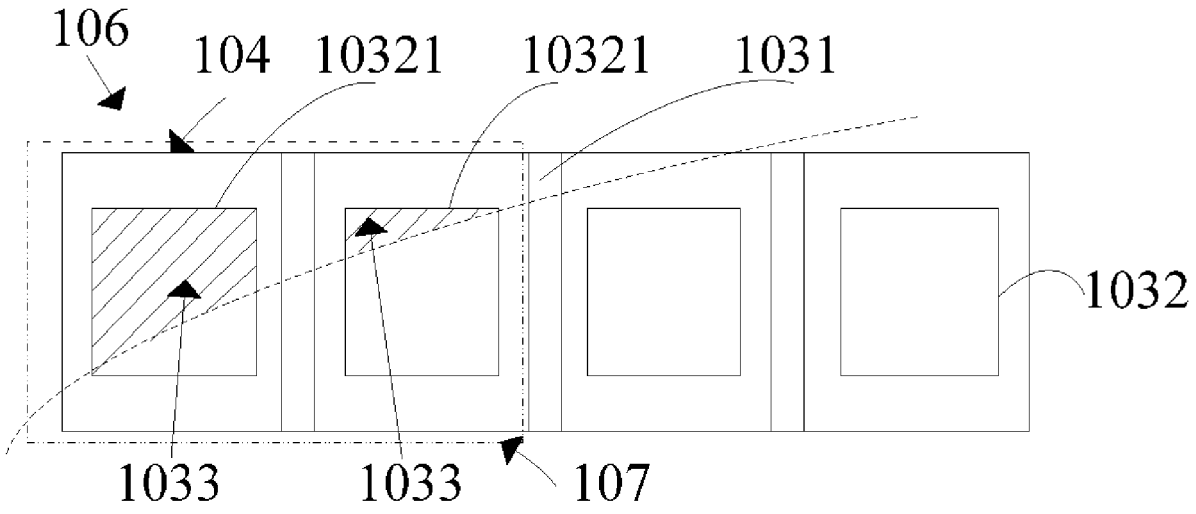
(57) **ABSTRACT**

A display panel and a display device are provided. The display panel includes a first electrode layer, a second electrode layer, and a liquid crystal layer provided between the first electrode layer and the second electrode layer. The liquid crystal layer includes liquid crystal molecules, and the second electrode layer includes a first area disposed corresponding to a non-display area of the display panel. A voltage applied to the first electrode layer is equal to a voltage applied to the first area of the second electrode layer, so that an orientation of the liquid crystal molecules located between the first electrode layer and the first area of the second electrode layer is not changed.



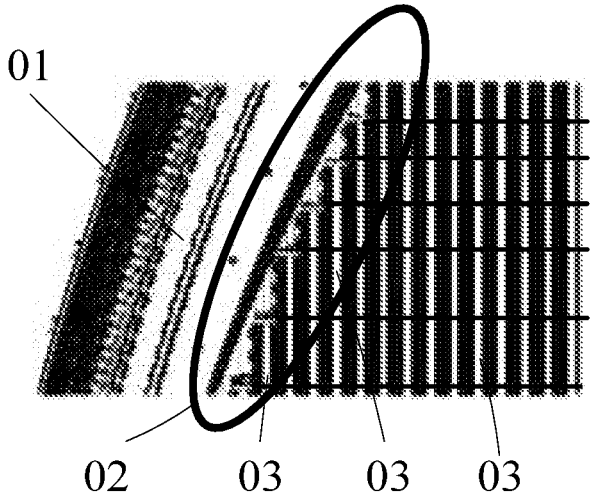


FIG. 1
PRIOR ART

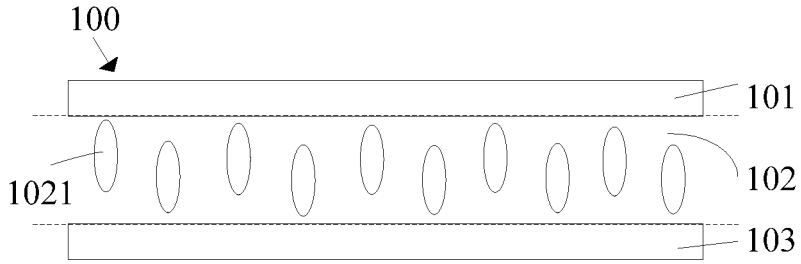


FIG. 2

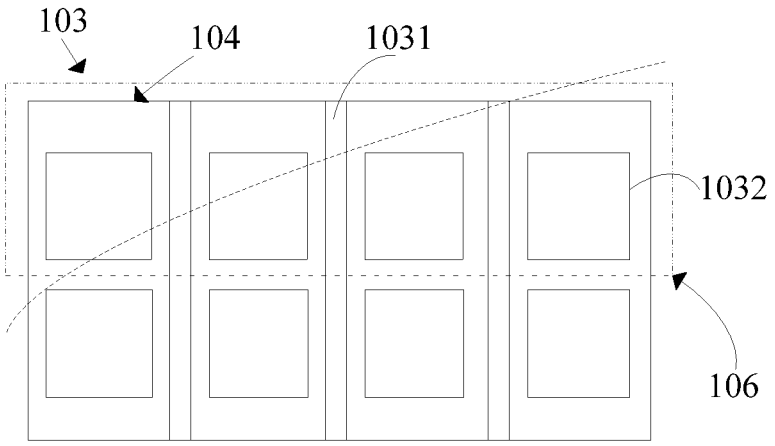

103
104
1031
1032
106

FIG. 3

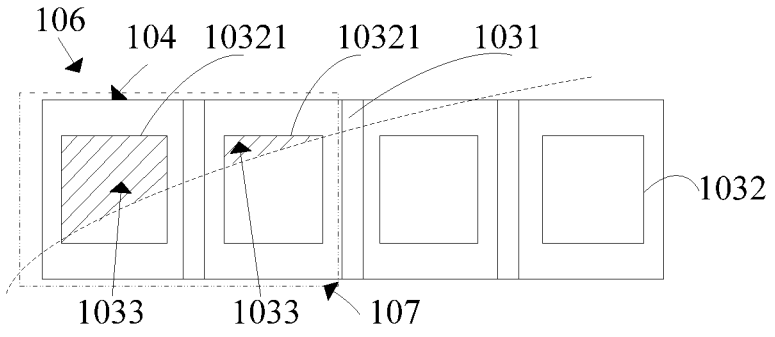

106
104
10321
10321
1031
1032
1033
1033
107

FIG. 4

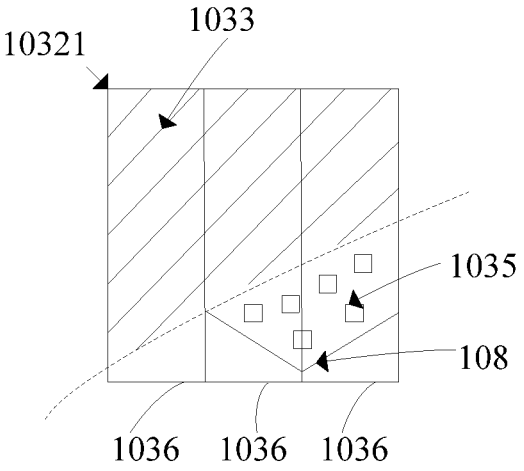

10321
1033
1035
108
1036
1036
1036

FIG. 5

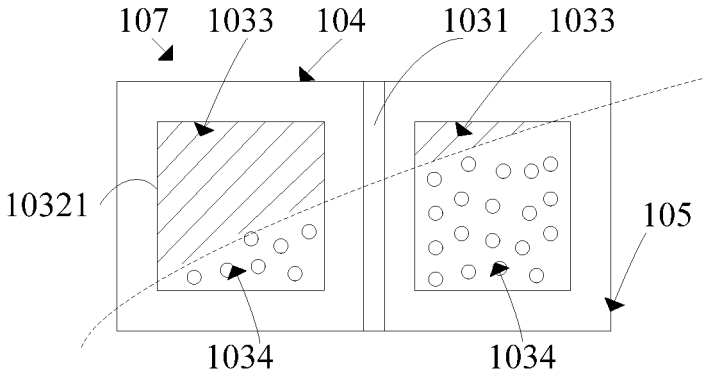

107
1033
104
1031
1033
10321
105
1034
1034

FIG. 6

DISPLAY PANEL AND DISPLAY DEVICE

FIELD OF INVENTION

[0001] The present disclosure relates to fields of display technology, in particular to the manufacture of display devices, and specifically relates to display panels and display devices.

BACKGROUND OF DISCLOSURE

[0002] Liquid crystal displays (LCDs) can display an image by switching the liquid crystals to modulate a light field intensity of a backlight, and have the characteristics, such as thin body, energy conservation, high resolution, etc.

[0003] Currently, for some abnormal shape screens, as shown in FIG. **1**, because a shape of a frame **01** is irregular, pixels **03** located in an edge area **02** near the frame **01** are generally configured to be a jaggies. Although the jaggies in the image can be attenuated after image processing, the jaggies phenomenon is relatively visible upon displaying the image, which reduces the image quality.

[0004] Therefore, it is necessary to provide a display panel and a display device that can improve the jaggies phenomenon of pixels in the edge area upon displaying an image, so as to improve the image quality.

SUMMARY OF INVENTION

Technical Problem

[0005] An object of the present disclosure are to provide a display panel and a display device. A voltage applied to a first area of a second electrode layer corresponding to the non-display area is equal to a voltage applied to a first electrode layer, so that an orientation of liquid crystal molecules located between the first electrode layer and the first area of the second electrode layer is not changed, thereby solving a problem of the existing abnormal shape screens that the jaggies is relatively visible in an edge area of a screen when displaying an image.

Technical Solution

[0006] An embodiment of the present disclosure provides a display panel, including: a display area and a non-display area, and the display panel further including: a first electrode layer, a liquid crystal layer, and a second electrode layer.

[0007] The liquid crystal layer is disposed between the first electrode layer and the second electrode layer, and the liquid crystal layer has a plurality of liquid crystal molecules.

[0008] The second electrode layer and the first electrode layer are disposed opposite to each other, the second electrode layer has a first area which is disposed corresponding to the non-display area, and a voltage applied to the first electrode layer is equal to a voltage applied to the first area of the second electrode layer, so that an orientation of the liquid crystal molecules located between the first electrode layer and the first area of the second electrode layer is not changed.

[0009] In an embodiment of the present disclosure, the second electrode layer includes:

[0010] a plurality of data electrodes disposed in parallel to each other; and

[0011] a plurality of pixel units disposed between two adjacent of the data electrodes.

[0012] In an embodiment of the present disclosure, the pixel units include a plurality of target pixel units partially located in the first area, the target pixel unit including a first target sub-area located in the first area, and a voltage applied to the first target sub-area of the target pixel unit is equal to the voltage applied to the first electrode layer.

[0013] In an embodiment of the present disclosure, the second electrode layer further includes a second area disposed corresponding to a partial area of the display area.

[0014] The target pixel unit further includes a second target sub-area located in the second area, wherein a voltage applied to the second target sub-area of the target pixel unit is equal to the voltage applied to the first electrode layer.

[0015] The target pixel unit includes a plurality of target sub-pixels, and, an overlap area of at least one of the target sub-pixels and the second target sub-area is zero in each of the target pixel units.

[0016] A proportion of each of the target sub-pixels to a total area of the first target sub-area and the second target sub-area in the same target pixel unit is same.

[0017] In an embodiment of the present disclosure, the second area is disposed adjacent to the first area, and the second electrode layer further includes a third area, and the third area is an area other than the first area and the second area in the second electrode layer.

[0018] The target pixel unit further includes a third target sub-area located in the third area, wherein a voltage applied to the third target sub-area of the target pixel unit is different from the voltage applied to the first electrode layer.

[0019] In an embodiment of the present disclosure, the second electrode layer further includes a fourth area disposed opposite to the non-display area.

[0020] The target pixel unit further includes a fourth target sub-area located in the fourth area, wherein a voltage applied to the fourth target sub-area of the target pixel unit is different from the voltage applied to the first electrode layer.

[0021] In an embodiment of the present disclosure, a voltage applied to the data electrode is equal to the voltage applied to the first electrode layer.

[0022] In an embodiment of the present disclosure, a material of the data electrodes and a material of the pixel units are the same.

[0023] In an embodiment of the present disclosure, the data electrodes and the pixel units are prepared in a same layer

[0024] In an embodiment of the present disclosure, a material of the first electrode layer and a material of the second electrode layer are the same.

[0025] An embodiment of the present disclosure further provides a display device, including a display panel, and the display panel including: a display area and a non-display area, and the display panel further including: a first electrode layer, a liquid crystal layer, and a second electrode layer.

[0026] The liquid crystal layer is disposed between the first electrode layer and the second electrode layer, and the liquid crystal layer has a plurality of liquid crystal molecules.

[0027] The second electrode layer and the first electrode layer are disposed opposite to each other, and the second electrode layer has a first area which is disposed corresponding to the non-display area, and a voltage applied to the first electrode layer is equal to a voltage applied to the first area of the second electrode layer, so that an orientation of the

liquid crystal molecules located between the first electrode layer and the first area of the second electrode layer is not changed.

[0028] In an embodiment of the present disclosure, the second electrode layer includes:

[0029] a plurality of data electrodes disposed in parallel to each other; and

[0030] a plurality of pixel units disposed between two adjacent of the data electrodes.

[0031] In an embodiment of the present disclosure, the pixel units include a plurality of target pixel units partially located in the first area, the target pixel unit including a first target sub-area located in the first area, and a voltage applied to the first target sub-area of the target pixel unit is equal to the voltage applied to the first electrode layer.

[0032] In an embodiment of the present disclosure, the second electrode layer further includes a second area disposed corresponding to a partial area of the display area.

[0033] The target pixel unit further includes a second target sub-area located in the second area, wherein a voltage applied to the second target sub-area of the target pixel unit is equal to the voltage applied to the first electrode layer,

[0034] The target pixel unit includes a plurality of target sub-pixels, and, an overlap area of at least one of the target sub-pixels and the second target sub-area is zero in each of the target pixel units.

[0035] A proportion of each of the target sub-pixels to a total area of the first target sub-area and the second target sub-area in the same target pixel unit is same.

[0036] In an embodiment of the present disclosure, the second area is disposed adjacent to the first area, and the second electrode layer further includes a third area, and the third area is an area other than the first area and the second area in the second electrode layer.

[0037] The target pixel unit further includes a third target sub-area located in the third area, wherein a voltage applied to the third target sub-area of the target pixel unit is different from the voltage applied to the first electrode layer.

[0038] In an embodiment of the present disclosure, the second electrode layer further includes a fourth area disposed opposite to the non-display area.

[0039] The target pixel unit further includes a fourth target sub-area located in the fourth area, wherein a voltage applied to the fourth target sub-area of the target pixel unit is different from the voltage applied to the first electrode layer.

[0040] In an embodiment of the present disclosure, a voltage applied to the data electrode is equal to the voltage applied to the first electrode layer.

[0041] In an embodiment of the present disclosure, a material of the data electrodes and a material of the pixel units are the same.

[0042] In an embodiment of the present disclosure, wherein a material of the first electrode layer and a material of the second electrode layer are the same.

[0043] In an embodiment of the present disclosure, a material of the first electrode layer and a material of the second electrode layer are the same.

[0044] Beneficial effect: The present disclosure provides a display panel and a display device. The display panel includes a first electrode layer, a second electrode layer, and a liquid crystal layer. An orientation of the liquid crystal molecules located between the first electrode layer and the first area of the second electrode layer is not changed by configuring a voltage applied to the first area of the second electrode layer corresponding to a non-display area and a voltage applied to the first electrode layer to be a same value, thereby improving the jaggies in the edge area of a screen upon displaying an image, so as to enhance the image quality of the display panel and the display device.

DRAWINGS

[0045] The disclosure is further described below with reference to the accompanying drawings. It should be noted that the drawings in the following description are only used to explain some embodiments of the present disclosure. Those skilled in the art may also obtain other drawings based on these drawings without any creative efforts.

[0046] FIG. **1** is a schematic view of an image display in the prior art.

[0047] FIG. **2** is a schematic cross-sectional view of a display panel according to an embodiment of the present disclosure.

[0048] FIG. **3** is a schematic top view of a second electrode layer of a display panel according to an embodiment of the present disclosure.

[0049] FIG. **4** is a schematic top view of a second electrode layer of another display panel according to an embodiment of the present disclosure.

[0050] FIG. **5** is a schematic top view of a target pixel unit of a display panel according to an embodiment of the present disclosure.

[0051] FIG. **6** is a schematic top view of a second electrode layer of yet another display panel according to an embodiment of the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

[0052] The technical scheme of the embodiment of the disclosure will be described clearly and completely below in combination with the accompanying drawings of the embodiment of the disclosure. It is apparent that the described embodiments are only part of the embodiments of the disclosure, not all of them. Based on the embodiments of the disclosure, other embodiments obtained by those skilled in the art without any creative work all belong to the protection scope of the disclosure.

[0053] In the description of the disclosure, it is to be understood that the direction or position relationship indicated by the terms "up", "down", etc. is based on the direction or position relationship shown in the accompanying drawings, the term "up" only means above the object, specifically referring to the over, obliquely above and on a upper surface, as long as it is above the level of the object. The above orientations or positional relationships are merely for the convenience of describing the disclosure and simplifying the description, and do not indicate or imply that the device or element referred to must have a specific orientation, be constructed and operate in a specific orientation, and therefore cannot be understood as a limitation on the present disclosure.

[0054] In addition, it should be noted that the drawings only provide structures and/or steps that are closely related to the disclosure, and omit some details that are little interest to the disclosure. The purpose is to simplify the drawings and make the disclosure clear. It does not mean that the device and/or method in practice is exactly the same as the

drawing, and is not a limitation of the device and/or method in practice. The same reference numerals indicate the same structures throughout.

[0055] The term "embodiment" herein means that a particular feature, structure, or characteristic described in connection with the embodiment may be included in at least one embodiment of the disclosure. The presence of the phrase at various locations in the specification does not necessarily mean the same embodiment, nor is it an independent or alternative embodiment mutually exclusive with other embodiments. It is explicitly and implicitly understood by those skilled in the art that the embodiments described herein may be combined with other embodiments.

[0056] The present disclosure provides a display device, which includes a display panel as shown in FIGS. **2-6**.

[0057] As shown in FIG. **2**, the display panel **100** includes a first electrode layer **101**, a liquid crystal layer **102**, and a second electrode layer **103**.

[0058] It can be understood that the display panel **100** may be divided into a display area and a non-display area.

[0059] The liquid crystal layer **102** is disposed between the first electrode layer **101** and the second electrode layer **103**. The liquid crystal layer **102** includes a plurality of liquid crystal molecules **1021**. The second electrode layer **103** and the first electrode layer **101** are disposed opposite each other. As shown in FIG. **3**, the second electrode layer **103** includes a first area **104**. The first area **104** corresponds to the non-display area, and a voltage applied to the first electrode layer **101** is equal to a voltage applied to the first area **104** of the second electrode layer **103**, so that an orientation of the liquid crystal molecules **1021** located between the first electrode layer **101** and the first area **104** of the second electrode layer **103** is not changed.

[0060] It should be noted that when there is a voltage difference between a upper side and a lower side of the liquid crystal molecules **1021**, the liquid crystal molecules **1021** can be rotated, so that the light emitted by a backlight module of the display panel **100** passes through the liquid crystal layer **102**. When there is no voltage difference between the upper side and the lower side of the liquid crystal molecules **1021**, an orientation of the liquid crystal molecules **1021** is not changed, so that the light emitted by the backlight module of the display panel **100** does not pass through the liquid crystal layer **102** and emit out.

[0061] It can be understood that, because the voltage applied to the first electrode layer **101** is equal to the voltage applied to the first area **104** of the second electrode layer **103**, when the display panel **100** is displaying images, it can be guaranteed that the orientation of the liquid crystal molecules **102** is not changed, so that no light passes through the non-display area, thereby displaying no image.

[0062] In an embodiment, the first electrode layer **101** may be a whole piece of conductive material. That is, voltage values of any area in the first electrode layer **101** may be equal.

[0063] In an embodiment, the first area **104** of the second electrode layer **103** may be directly prepared from a conductive material without being subjected to a patterning process.

[0064] In an embodiment, as shown in FIG. **3**, the second electrode layer **103** includes a plurality of data electrodes **1031** and a plurality of pixel units **1032**. An area **106** is defined by a same row of the pixel units **1032** and a surrounding association area.

[0065] The data electrodes **1031** are disposed in parallel to each other, and the pixel units **1032** are disposed between two adjacent of the data electrodes **1031**. Furthermore, multiple of the data electrodes **1031** may be disposed between two adjacent of the data electrodes **1031**, and the multiple data electrodes **1031** between the two adjacent data electrodes **1031** may be provided in an extending direction along the corresponding data electrode **1031**.

[0066] In an embodiment, as shown in FIG. **4**, in the area **106**, the pixel units **1032** includes a plurality of target pixel units **10321**, and the target pixel units **10321** are partially located in the first area **104**. The target pixel unit **10321** includes a first target sub-area **1033**. The first target sub-area **1033** is located in the first area **104**. A voltage applied to the first target sub-area **1033** of the target pixel unit **10321** is equal to the voltage applied to the first electrode layer **101**. An area **107** is defined by a same row of the target pixel units **10321** and a surrounding association area.

[0067] It can be understood that, because the first target sub-area **1033** is disposed in the first area **104**, and, that is, corresponds to the non-display area of the display panel **100**, a voltage of the first target sub-area **1033** and the voltage of the first electrode layer **101** is configured to be equal, so that the orientation of the liquid crystal molecules **1021** between the first target sub-area **1033** and the first electrode layer **101** is not changed, so that no light can pass between the first target sub-area **1033** and the first electrode layer **101**, so that no image is displayed.

[0068] In an embodiment, as shown in FIG. **5**, the second electrode layer **103** further includes a second area **108**, and the second area **108** is disposed to correspond to a partial area of the display area. The target pixel unit **10321** further includes a second target sub-area **1035**. The second target sub-area **1035** is located in the second area **105** and a voltage applied to the second target sub-area **1035** of the target pixel unit **10321** is equal to the voltage applied to the first electrode layer **101**.

[0069] Specifically, the target pixel unit **10321** includes a plurality of target sub-pixels **1036**. In each of the target pixel units **10321**, an overlapping area of at least one of the target sub-pixels **1036** and the second target sub-area **1035** is zero in each of the target pixel units **10321**. The target sub-pixel **1036** may be a red sub-pixel, a green sub-pixel, or a blue sub-pixel.

[0070] For example, an overlapping area of the leftmost target sub-pixel **1036** in the target pixel unit **10321** and the second target sub-area **1035** may be zero. An overlapping area of the other target sub-pixel **1036** in the target pixel unit **10321** and the second target sub-area **1035** may not be zero.

[0071] Furthermore, a proportion of each of the target sub-pixels **1036** to a total area of the first target sub-area **1033** and the second target sub-area **1035** in the same target pixel unit **10321** is same. For example, a proportion of an area of the first target sub-area **1033** in a leftmost target sub-pixel **1036** of the target pixel unit **10321** is equal to a proportion of a total area of the first target sub-area **1033** and the second target sub-area **1035** in a middle or a right target sub-pixel **1036** of the target pixel unit **10321**.

[0072] It should be noted that, for each of the target pixel units **10321**, in the target sub-pixels **1036**, a target sub-pixel **1036** having a highest proportion of the first target sub-region **1033** can be determined, and the proportion of this first target sub-area **1033** to the target sub-pixel **1036** is set as a standard proportion. In each of the other target sub-

pixels **1036**, a corresponding sub-area occupied by a corresponding second target sub-area **1035** is selected to form the second target sub-area **1035**, to ensure that the proportion of each of the target sub-pixels **1036** to a total area of the first target sub-area **1033** plus the second target sub-area **1035** in the same target pixel unit **10321** is same.

[0073] It can be understood that, in a case of ensuring that the voltage applied to the first target sub-region **1033** of the target pixel unit **10321** is equal to the voltage applied to the first electrode layer **101**, so that the voltage applied to the second target sub-region **1035** is equal to the voltage applied to the first electrode layer **101**. That is, for the same target pixel unit **10321**, when an image is displayed, the pixel area proportion used for image display in each of the target sub-pixels **1036** is the same. By making sub-pixels with different colors have the same contribution proportion area to the corresponding target pixel unit **10321**, the problem of color cast can be further resolved.

[0074] In an embodiment, the second area **108** may be disposed adjacent to the first area **104**. Furthermore, the second electrode layer **103** further includes a third area, and the third area is an area other than the first area **104** and the second area **108** in the second electrode layer **103**. The target pixel unit **10321** further includes a third target sub-area, the third target sub-area is located in the third area, and a voltage applied to the third target sub-area of the target pixel unit **10321** is different from the voltage applied to the first electrode layer **101**.

[0075] In an embodiment, as shown in FIG. **6**, in the area **107**, the second electrode layer **102** further includes a fourth area **105**, and the fourth area **105** is disposed opposite the display area. Furthermore, the target pixel unit **10321** further includes a fourth target sub-area **1034**, the fourth target sub-area **1034** is located in the fourth area **105**, and the first target sub-area **1033** and the corresponding fourth target sub-area **1034** may constitute a corresponding complete target pixel unit **10321**. A voltage applied to the third target sub-area **1034** of the target pixel unit **10321** is different from the voltage applied to the first electrode layer **101**.

[0076] It can be understood that, for each of the target pixel units **10321**, the voltage of the first target sub-area **1033** is set to be equal to the voltage of the first electrode layer **101**, and the voltage of the fourth target sub-area **1034** is set to be different from the voltage of the first electrode layer **101**, so an orientation of the liquid crystal molecules **1021** located in the non-display area of the target pixel unit **10321** is not changed, and an orientation of the liquid crystal molecules **1021** located in the display area of the target pixel unit **10321** is changed; so that the pixels in the non-display area may not emit light, and the pixels in the display area may emit light upon displaying the image, which has a relatively visible light emission boundary, which improves the jaggies phenomenon existing in the art.

[0077] In an embodiment, as shown in FIGS. **3-5**, a voltage applied to the data electrode **1031** is equal to the voltage applied to the first electrode layer **101**.

[0078] It can be understood that the voltage values in any area of the first electrode layer **101** are equal, and, that is, the voltage difference between different areas in the second electrode layer **103** and the first electrode layer **101** may change the orientation of the liquid crystal molecules **1021** located in corresponding areas between the first electrode layer **101** and the second electrode layer **103**, so that light is emitted out. The voltage values of the pixel units **1032** located on both sides of the data electrode **1031** are generally different, and the corresponding liquid crystal molecules are tilted to different degrees. In order to prevent the light corresponding to the two pixel units **1032** from interfering with each other, the data electrode **1031** may be provided in an area between the two pixel units **1032**, and the voltage of the data electrode **1031** and the voltage of the first electrode layer **101** may be set to the same value, so that an orientation of the liquid crystal molecules in the area between the two pixel units **1032** is not changed, so the light corresponding to the two pixel units **1032** is prevented from passing through the tilted liquid crystal molecules in the area between the two pixel units **1032**, which solves the light leakage problem in the two adjacent pixel units.

[0079] In one embodiment, a material of the data electrodes **1031** and a material of the pixel units **1032** are the same.

[0080] It should be noted that the light leakage problem is solved by applying the same voltage to the data electrode **1031** as the voltage applied to the first electrode layer **101**. Therefore, the data electrode **1031** and the pixel unit **1032** may be made of the same material. The same material should be a conductive material. For example, material of the data electrodes **1031** and the pixel units **1032** may include a transparent indium tin oxide. It can be understood that because the material of the data electrodes **1031** and the material of the pixel units **1032** are the same, the data electrodes **1031** of the second electrode layer **103** and the pixel units **1032** of the second electrode layer **103** are prepared in a same layer. For example, both can be formed by a patterning process at the same time, which simplifies the manufacturing process of the display panel.

[0081] In one embodiment, a material of the first electrode layer **101** and a material of the second electrode layer **103** are the same.

[0082] The first electrode layer **101** and the second electrode layer **103** may be plated with an oxide indium tin film by using various methods such as sputter, evaporation, etc. to prepared on a sodium-calcium-based or borosilicate substrate glass base.

[0083] The structures of a display panel and a display device including the display panel according to the embodiments of the present disclosure have been described in detail above. Specific embodiments used herein are to explain the principle and implementation of the present disclosure. The description is only used to help understand the technical solution of the present disclosure and its core concept. Those skilled in the art should understand that they can still modify the technical solutions described in the foregoing embodiments, or equivalently replace some of the technical features. These modifications or replacements do not make the essence of the corresponding technical solutions outside the scope of the technical solutions of the embodiments of the present disclosure.

1. A display panel, comprising:

a display area and a non-display area, and

the display panel further comprising:

a first electrode layer, a liquid crystal layer, and a second electrode layer,

wherein the liquid crystal layer is disposed between the first electrode layer and the second electrode layer, and the liquid crystal layer has a plurality of liquid crystal molecules; and

wherein the second electrode layer and the first electrode layer are disposed opposite to each other, the second electrode layer has a first area which is disposed corresponding to the non-display area, and a voltage applied to the first electrode layer is equal to a voltage applied to the first area of the second electrode layer, so that an orientation of the liquid crystal molecules located between the first electrode layer and the first area of the second electrode layer is not changed.

2. The display panel according to claim **1**, wherein the second electrode layer comprises:

a plurality of data electrodes disposed in parallel to each other; and

a plurality of pixel units disposed between two adjacent of the data electrodes.

3. The display panel according to claim **2**, wherein the pixel units comprise a plurality of target pixel units partially located in the first area, the target pixel unit comprising a first target sub-area located in the first area, and a voltage applied to the first target sub-area of the target pixel unit is equal to the voltage applied to the first electrode layer.

4. The display panel according to claim **3**, wherein the second electrode layer further comprises a second area disposed corresponding to a partial area of the display area; and

the target pixel unit further comprises a second target sub-area located in the second area,

wherein a voltage applied to the second target sub-area of the target pixel unit is equal to the voltage applied to the first electrode layer,

the target pixel unit comprises a plurality of target sub-pixels, and, an overlap area of at least one of the target sub-pixels and the second target sub-area is zero in each of the target pixel units; and

a proportion of each of the target sub-pixels to a total area of the first target sub-area and the second target sub-area in the same target pixel unit is same.

5. The display panel according to claim **4**, wherein the second area is disposed adjacent to the first area, and the second electrode layer further comprises a third area, and the third area is an area other than the first area and the second area in the second electrode layer; and

the target pixel unit further comprises a third target sub-area located in the third area, wherein a voltage applied to the third target sub-area of the target pixel unit is different from the voltage applied to the first electrode layer.

6. The display panel according to claim **3**, wherein the second electrode layer further comprises a fourth area disposed opposite to the non-display area; and

the target pixel unit further comprises a fourth target sub-area located in the fourth area, wherein a voltage applied to the fourth target sub-area of the target pixel unit is different from the voltage applied to the first electrode layer.

7. The display panel according to claim **2**, wherein a voltage applied to the data electrode is equal to the voltage applied to the first electrode layer.

8. The display panel according to claim **2**, wherein a material of the data electrodes and a material of the pixel units are the same.

9. The display panel according to claim **8**, wherein the data electrodes and the pixel units are prepared in a same layer

10. The display panel according to claim **1**, wherein a material of the first electrode layer and a material of the second electrode layer are the same.

11. A display device, comprising a display panel, and the display panel comprising:

a display area and a non-display area, and

the display panel further comprising:

a first electrode layer, a liquid crystal layer, and a second electrode layer,

wherein the liquid crystal layer is disposed between the first electrode layer and the second electrode layer, and the liquid crystal layer has a plurality of liquid crystal molecules; and

wherein the second electrode layer and the first electrode layer are disposed opposite to each other, and the second electrode layer has a first area which is disposed corresponding to the non-display area, and a voltage applied to the first electrode layer is equal to a voltage applied to the first area of the second electrode layer, so that an orientation of the liquid crystal molecules located between the first electrode layer and the first area of the second electrode layer is not changed.

12. The display device according to claim **11**, wherein the second electrode layer comprises:

a plurality of data electrodes disposed in parallel to each other; and

a plurality of pixel units disposed between two adjacent of the data electrodes.

13. The display device according to claim **12**, wherein the pixel units comprise a plurality of target pixel units partially located in the first area, the target pixel unit comprising a first target sub-area located in the first area, and a voltage applied to the first target sub-area of the target pixel unit is equal to the voltage applied to the first electrode layer.

14. The display device according to claim **13**, wherein the second electrode layer further comprises a second area disposed corresponding to a partial area of the display area; and

the target pixel unit further comprises a second target sub-area located in the second area, wherein a voltage applied to the second target sub-area of the target pixel unit is equal to the voltage applied to the first electrode layer,

wherein the target pixel unit comprises a plurality of target sub-pixels, and, an overlap area of at least one of the target sub-pixels and the second target sub-area is zero in each of the target pixel units; and

a proportion of each of the target sub-pixels to a total area of the first target sub-area and the second target sub-area in the same target pixel unit is same.

15. The display device according to claim **14**, wherein the second area is disposed adjacent to the first area, and the second electrode layer further comprises a third area, and the third area is an area other than the first area and the second area in the second electrode layer; and

the target pixel unit further comprises a third target sub-area located in the third area, wherein a voltage applied to the third target sub-area of the target pixel unit is different from the voltage applied to the first electrode layer.

16. The display device according to claim **13**, wherein the second electrode layer further comprises a fourth area disposed opposite to the non-display area; and

the target pixel unit further comprises a fourth target sub-area located in the fourth area, wherein a voltage applied to the fourth target sub-area of the target pixel unit is different from the voltage applied to the first electrode layer.

17. The display device according to claim **12**, wherein a voltage applied to the data electrode is equal to the voltage applied to the first electrode layer.

18. The display device according to claim **12**, wherein a material of the data electrodes and a material of the pixel units are the same.

19. The display device according to claim **18**, wherein the data electrodes and the pixel units are prepared in a same layer.

20. The display device according to claim **11**, wherein a material of the first electrode layer and a material of the second electrode layer are the same.

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