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(54) **DISPLAY PANEL, METHOD FOR MANUFACTURING SAME, AND DISPLAY APPARATUS USING SAME**

(71) Applicants: **HKC Corporation Limited**, Shenzhen City, Guangdong (CN); **Chongqing HKC Optoelectronics Technology Co., Ltd.**, Chongqing (CN)

(72) Inventor: **Chung-Kuang CHIEN**, Chongqing (CN)

(73) Assignees: **HKC Corporation Limited**, Shenzhen City, Guangdong (CN); **Chongqing HKC Optoelectronics Technology Co., Ltd.**, Chongqing (CN)

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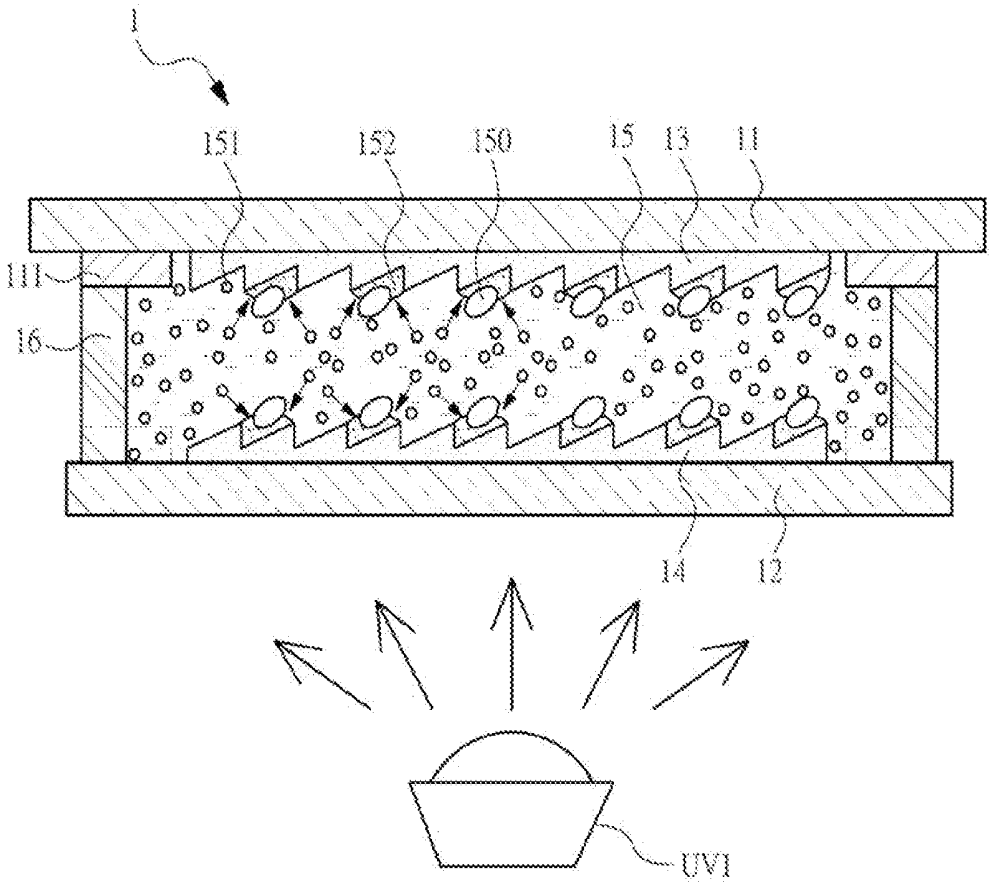
(57) **ABSTRACT**

This application relates to a display panel. The display panel includes: a first substrate, including a display area and an edge area, where the edge area surrounds the display area; a light shield layer, disposed on the edge area of the first substrate; a first alignment film, disposed on the first substrate; a second substrate, including a display area and an edge area, and disposed opposite to the first substrate; a second alignment film, disposed on the second substrate; a liquid crystal layer, disposed between the first substrate and the second substrate, and doped with a liquid crystal reactive monomer generating a polymeric effect upon light; and a plurality of spacing units, disposed on the first substrate, where a light permeable layer is disposed on the edge area of the second substrate, and the light permeable layer is disposed opposite to the light shield layer of the first substrate.



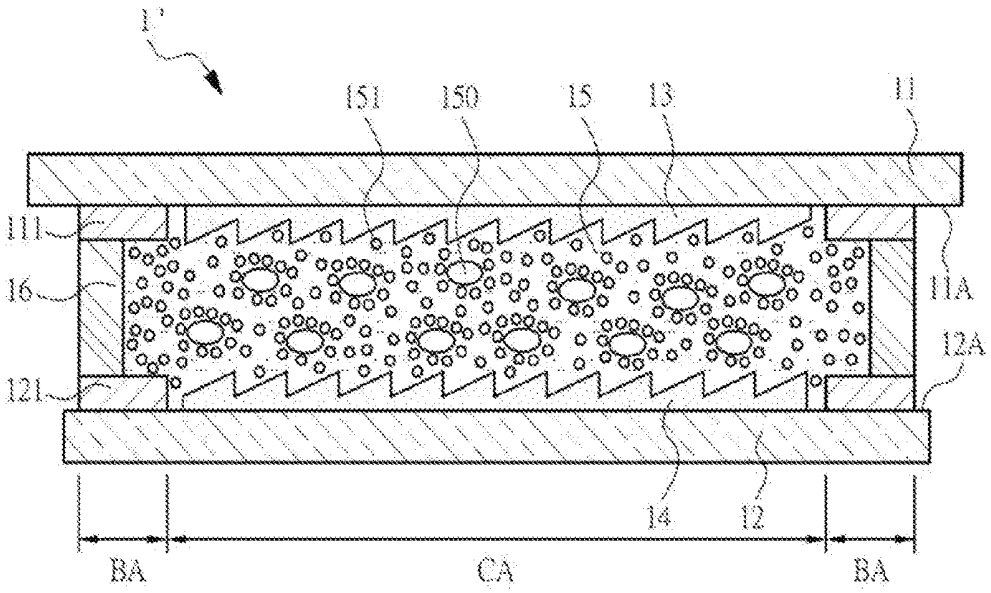


FIG. 1A

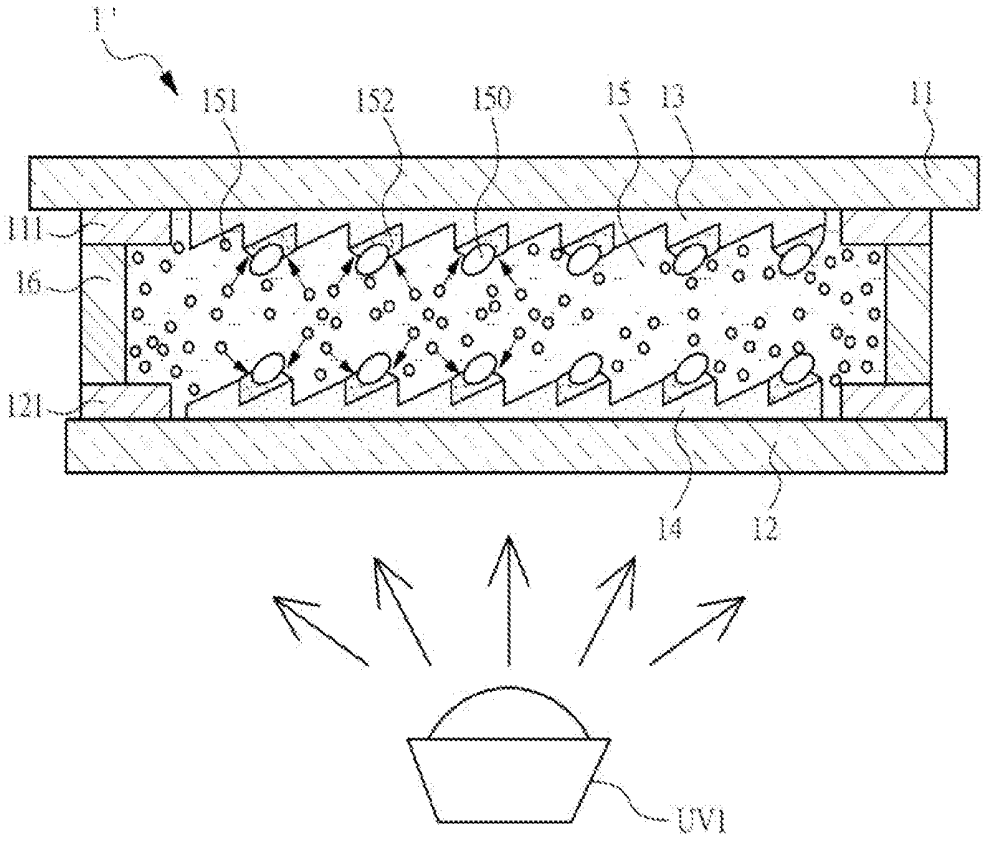


FIG. 1B

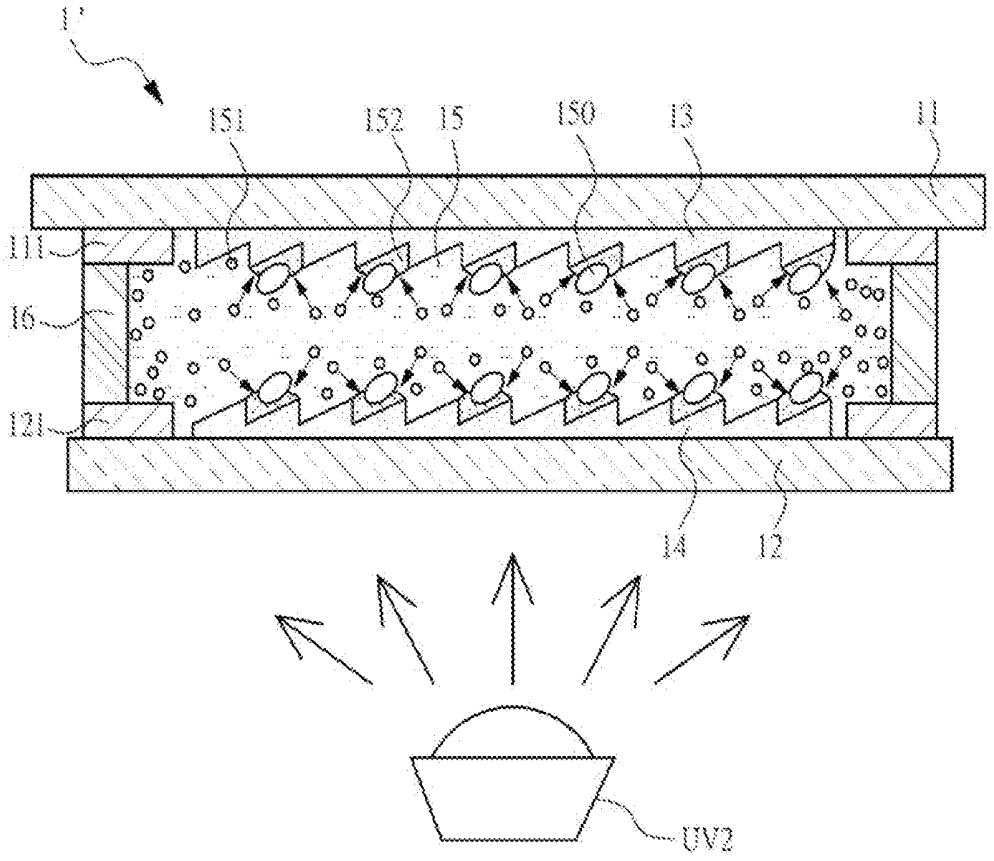


FIG. 1C

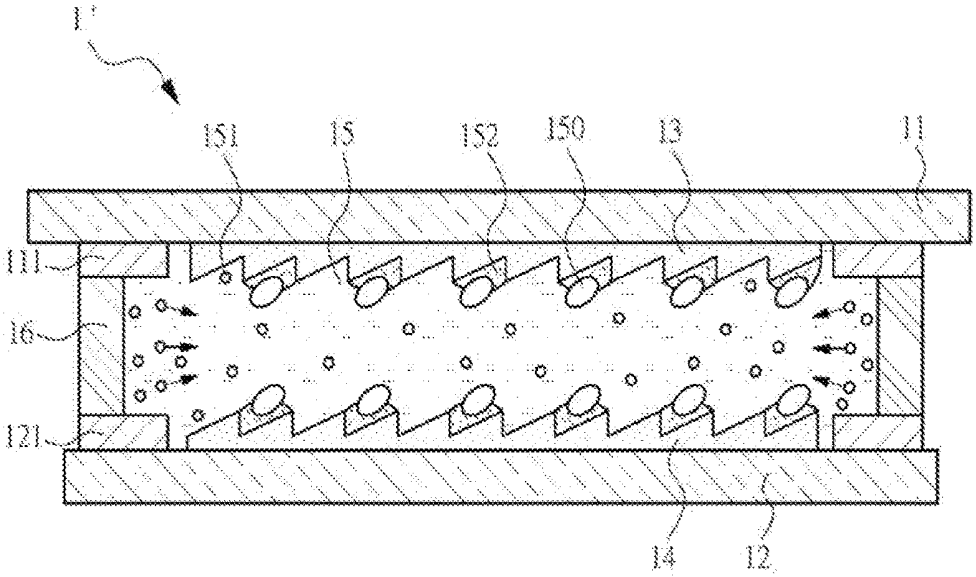


FIG. 1D

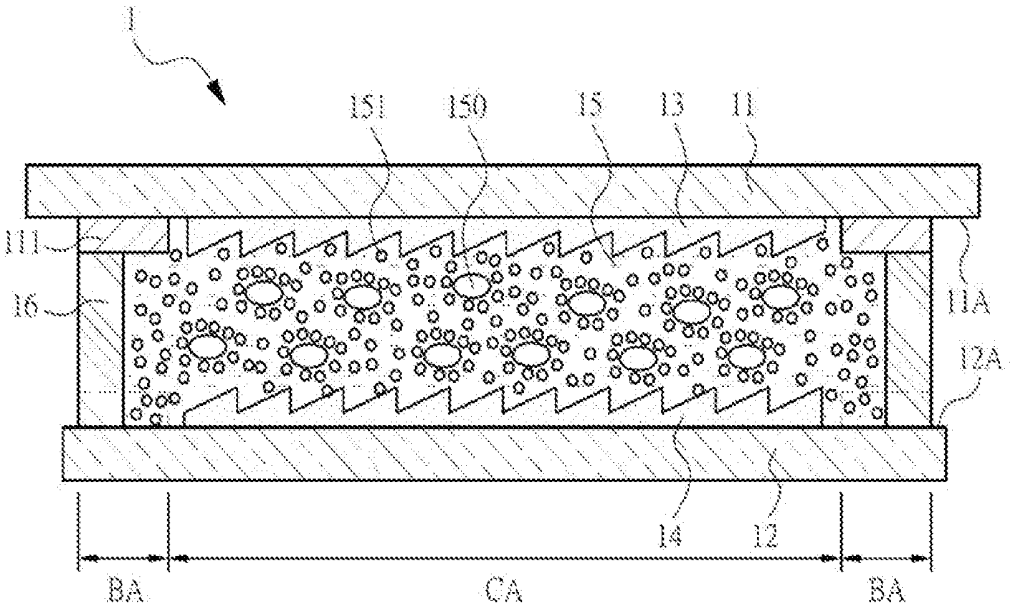


FIG. 2A

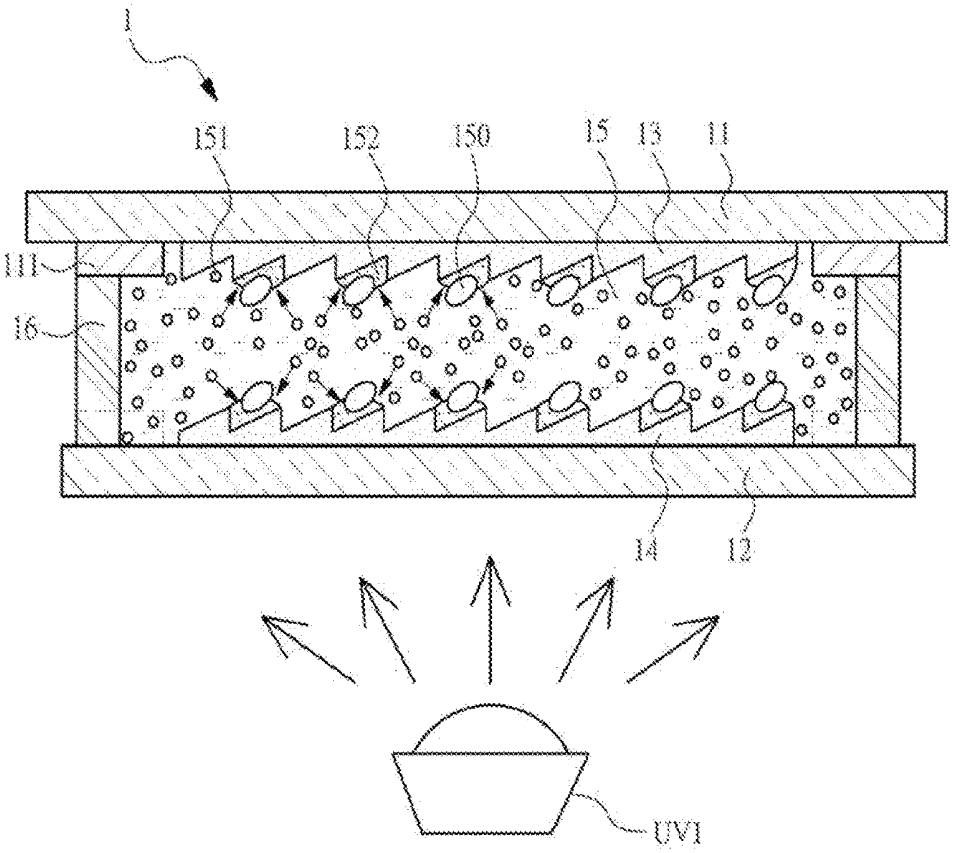


FIG. 2B

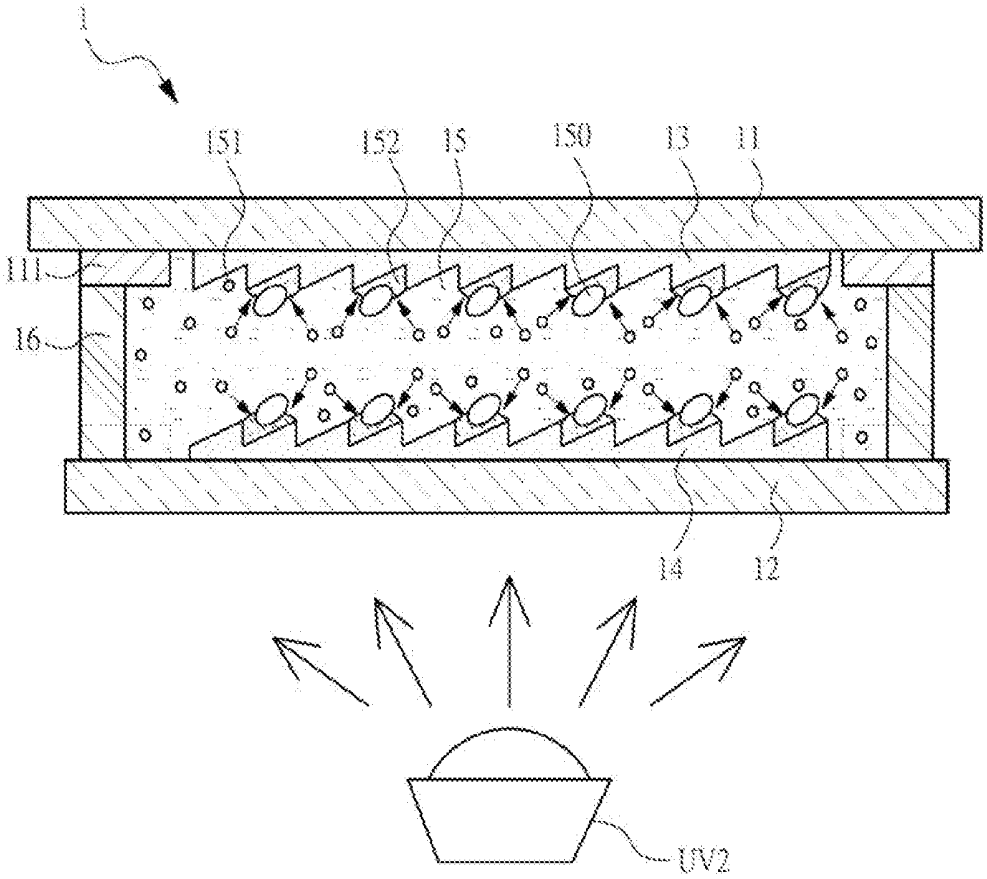


FIG. 2C

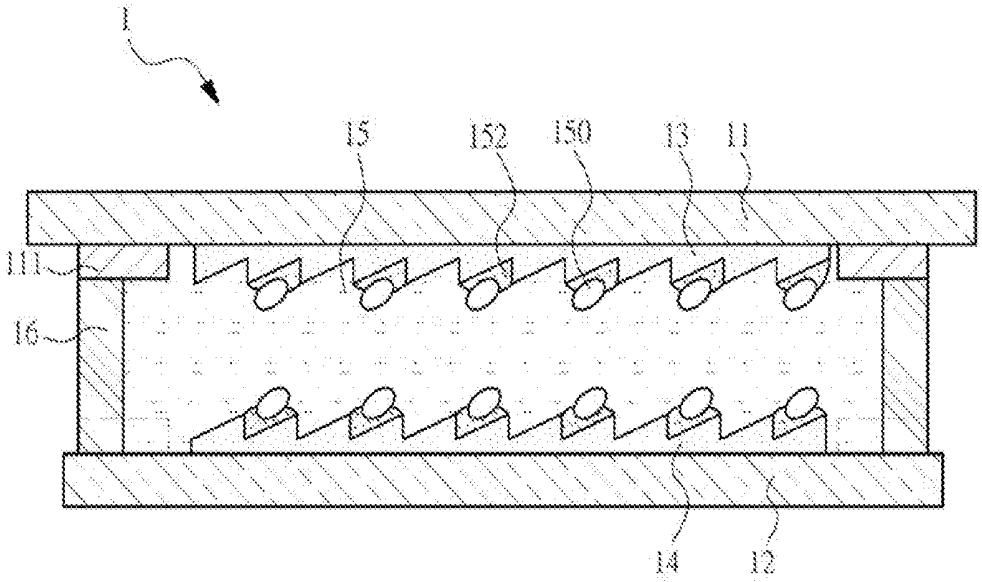


FIG. 2D

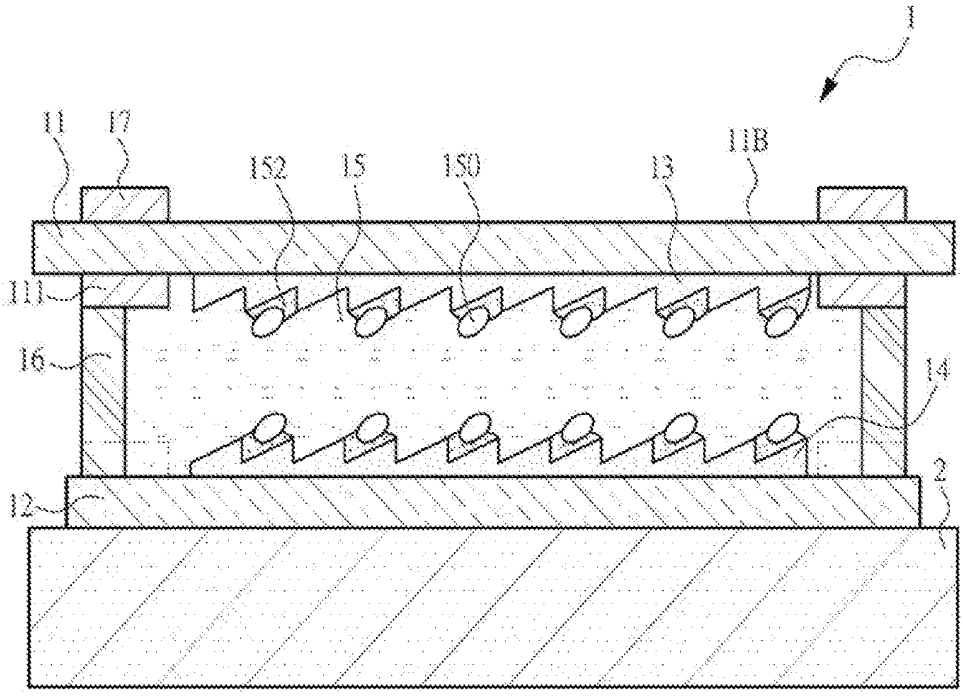


FIG. 3A

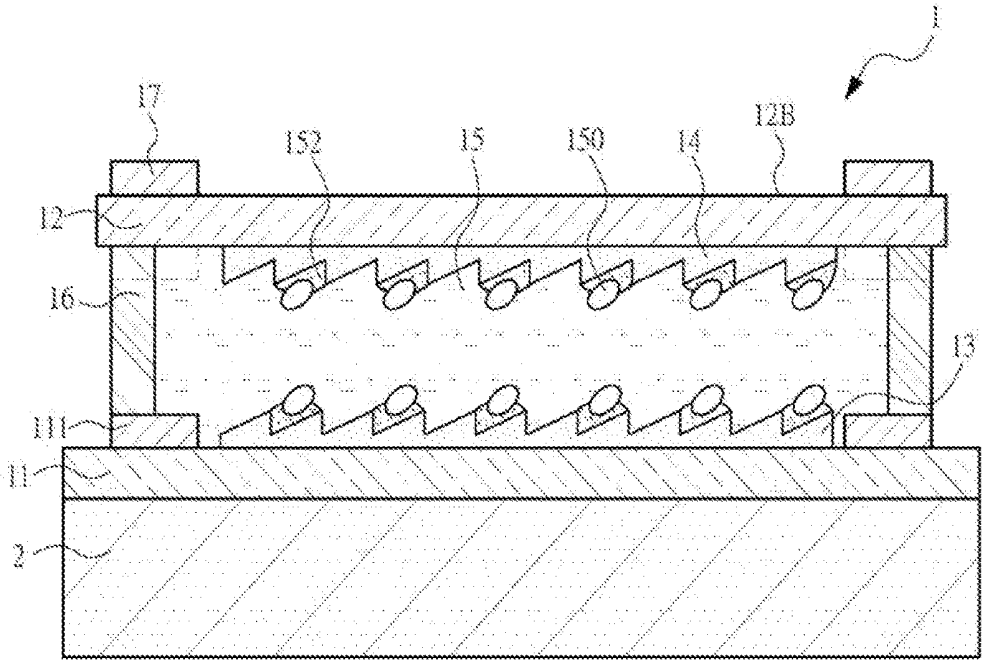


FIG. 3B

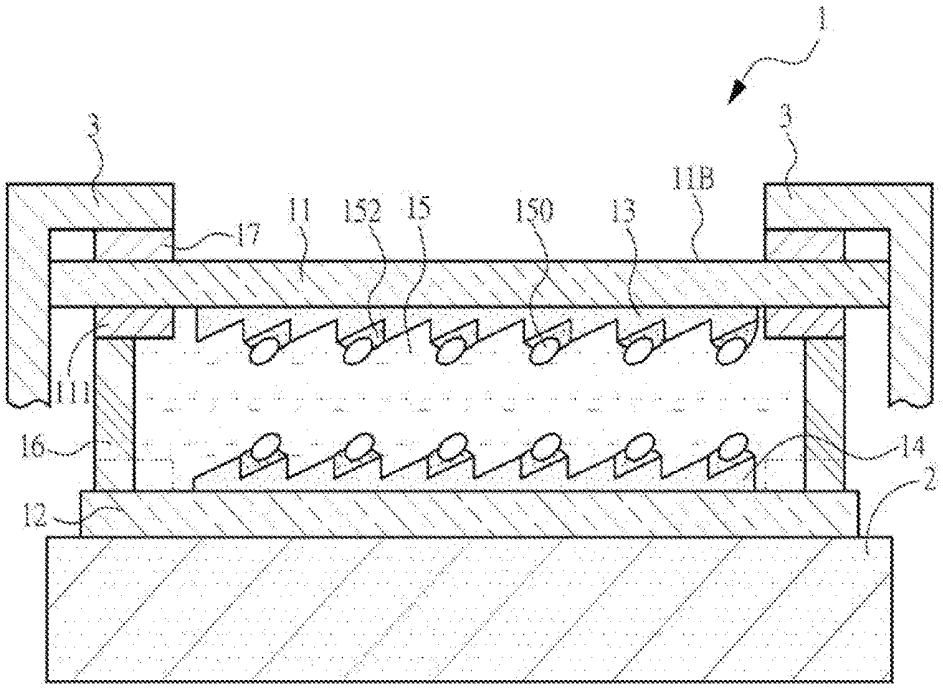


FIG. 4A

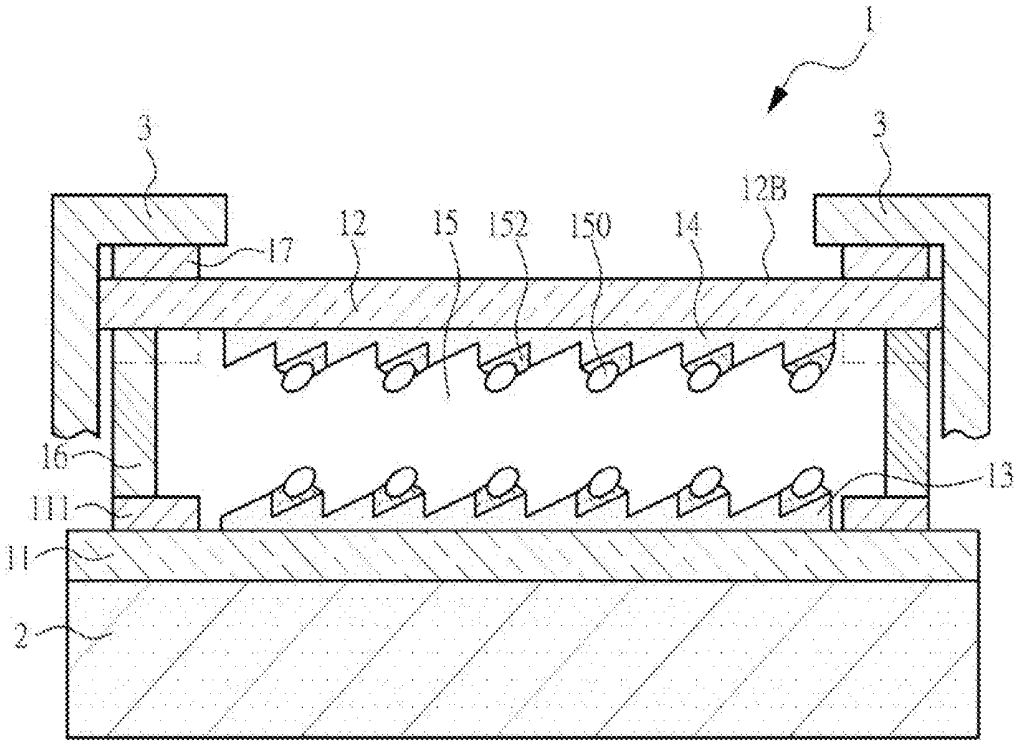


FIG. 4B

DISPLAY PANEL, METHOD FOR MANUFACTURING SAME, AND DISPLAY APPARATUS USING SAME

BACKGROUND

Technical Field

[0001] This application relates to a display panel, a method for manufacturing same, and a display apparatus using same, and in particular, to a display panel, in which no light shield layer is formed on an edge area of an inner surface of a substrate.

Related Art

[0002] A liquid crystal display (Liquid Crystal Display, LCD) is a flat panel display apparatus displaying an image by using attributes of a liquid crystal material. Compared with other display apparatuses, the liquid crystal display has advantages such as a light and thin design, a low drive voltage, and low power consumption, and has become the mainstream on the entire consumption market. A liquid crystal panel is a most important component of the liquid crystal display, and includes an active switch array (TFT) array substrate, a color filter (CF) substrate, and a liquid crystal layer and alignment films disposed between the two substrates, where the active switch array (TFT) array substrate, the color filter (CF) substrate, the liquid crystal layer and the alignment films are laminated in a vacuum manner. The alignment films are disposed on the TFT array substrate and the CF substrate, and are used to control liquid crystal cells of the liquid crystal layer to be arranged in a preset initial state, so as to affect the display attribute of the liquid crystal panel. A polymer stabilized vertical alignment (Polymer Stabilized Vertical Alignment, PSVA) technology in a manufacturing process of an alignment film has gradually become the mainstream due to features such as a high penetration rate, a high contrast ratio, and a fast response. In an exemplary PSVA technology, first, a liquid crystal reactive monomer (RM) is doped in a liquid crystal, and then power is supplied to enable a liquid crystal cell to generate a pretilt angle to make the RM linked to polyimide (PI) of an alignment film, and finally ultraviolet light is irradiated to make a polymer monomer reacted into a polymer, so that the pretilt angle of the liquid crystal cell is fixed.

[0003] However, at the stage of irradiating the ultraviolet light to make the polymer monomer reacted into polymer, due to a light shield layer (such as a black matrix) on a substrate, the ultraviolet light usually fails to be irradiated on the liquid crystal reactive monomer in a part shielded by the light shield layer. Consequently, the liquid crystal reactive monomer near the light shield layer performs incomplete polymerization reaction, leading to the case of image sticking fail on a panel. To resolve this problem, and to conform to the trend in recent years towards a bezel-less design of a TFT-LCD to highlight the integration of a displayed image, the foregoing problem needs to be resolved by using a configuration for adjusting a light shield layer.

SUMMARY

[0004] To resolve the foregoing technical problem, an objective of this application is to provide a display panel, a method for manufacturing same, and a display apparatus using same, and this application particularly relates to a display panel, in which no light shield layer is formed on an inner surface of a substrate. According to this application, not only a manufacturing process of forming a light shield layer on a substrate can be omitted, but also cases of irradiating ultraviolet light on a shielded polymer monomer can be greatly reduced, to sufficiently irradiate the ultraviolet light, so that a liquid crystal reactive monomer can perform complete polymerization reaction, thereby reducing image sticking.

[0005] The objective of this application is achieved and the technical problem of this application is resolved by using the following technical solution. A display panel provided according to this application comprises: a first substrate, comprising a display area and an edge area, wherein the edge area surrounds the display area; a light shield layer, disposed on the edge area of the first substrate; a first alignment film, disposed on the first substrate; a second substrate, comprising a display area and an edge area, and disposed opposite to the first substrate; a second alignment film, disposed on the second substrate; a liquid crystal layer, disposed between the first substrate and the second substrate, and doped with a liquid crystal reactive monomer generating a polymeric effect upon light; and a plurality of spacing units, disposed on the first substrate, wherein a light permeable layer is disposed on the edge area of the second substrate, and the light permeable layer is disposed opposite to the light shield layer of the first substrate.

[0006] In an embodiment of this application, some of the spacing units located on the edge area of the first substrate are in contact with the second substrate.

[0007] In an embodiment of this application, the spacing units are made from photoresist materials.

[0008] In an embodiment of this application, the light permeable layer is disposed on the edge area of the second substrate, and the light permeable layer is disposed opposite to the light shield layer.

[0009] In an embodiment of this application, a material of the first alignment film is polyimide.

[0010] In an embodiment of this application, a material of the second alignment film is polyimide.

[0011] The objective of this application may further be achieved and the technical problem of this application may further be resolved by using the following technical solution.

[0012] Another objective of this application is a display apparatus, comprising: a backlight module, and further comprising the display panel.

[0013] In an embodiment of this application, some of the spacing units located on the edge area of the first substrate are in contact with the second substrate.

[0014] In an embodiment of this application, the spacing units are made from photoresist materials.

[0015] In an embodiment of this application, a material of the first alignment film is polyimide.

[0016] In an embodiment of this application, a material of the second alignment film is polyimide.

[0017] In the foregoing embodiment, a frame-shaped light shield layer is disposed on a frame of an outer surface, back to the liquid crystal layer, of the first substrate, and a front frame is further comprised, wherein the front frame is fixed on the outer surface of the first substrate.

[0018] In the foregoing embodiment, a frame-shaped light shield layer is disposed on a frame of an outer surface, back to the liquid crystal layer, of the second substrate, and a front

frame is further comprised, wherein the front frame is fixed on the outer surface of the second substrate.

[0019] This application is implemented by using the following technical solution. A method for manufacturing a display panel provided according to this application comprises steps: providing a first substrate, comprising a display area and an edge area, wherein the edge area surrounds the display area; disposing a light shield layer, a first alignment film, and a plurality of spacing units on the edge area of the first substrate; providing a second substrate, comprising a display area and an edge area, and disposed opposite to the first substrate; disposing a light permeable layer and a second alignment film on the second substrate; disposing, between the first substrate and the second substrate, a liquid crystal layer doped with a liquid crystal reactive monomer generating a polymeric effect upon light; supplying power to enable the liquid crystal reactive monomer to be linked to alignment materials of the alignment films; performing light irradiation for a first time towards a direction of the second substrate, so that the liquid crystal reactive monomer forms a preliminary polymerization phenomenon; and performing light irradiation for a second time towards the direction of the second substrate, so that the liquid crystal reactive monomer forms a complete polymerization phenomenon, wherein the light shield layer of the first substrate is disposed opposite to the light permeable layer (the edge area) of the second substrate. Therefore, when light irradiation is performed towards the direction of the second substrate, the light shield layer does not affect the polymeric effect of the liquid crystal reactive monomer upon light.

[0020] According to this application, not only a manufacturing process of forming a light shield layer on a substrate can be omitted, but also cases of irradiating ultraviolet light on a shielded polymer monomer can be greatly reduced, to sufficiently irradiate the ultraviolet light, so that a liquid crystal reactive monomer can perform complete polymerization reaction, thereby reducing image sticking.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. **1**A is a schematic structural diagram of an exemplary display panel before light irradiation;

[0022] FIG. **1**B is a schematic diagram of a light irradiation reaction for a first time of the exemplary display panel;

[0023] FIG. **1**C is a schematic diagram of a light irradiation reaction for a second time of the exemplary display panel;

[0024] FIG. **1**D is a schematic structural diagram of the exemplary display panel after light irradiation;

[0025] FIG. **2**A is a schematic structural diagram of a display panel of this application before light irradiation;

[0026] FIG. **2**B is a schematic diagram of a light irradiation reaction for a first time of the display panel of this application;

[0027] FIG. **2**C is a schematic diagram of a light irradiation reaction for a second time of the display panel of this application;

[0028] FIG. **2**D is a schematic structural diagram of the display panel of this application after light irradiation;

[0029] FIG. **3**A is a schematic structural diagram of a light shield layer of an outer surface according to an embodiment of this application;

[0030] FIG. **3**B is a schematic structural diagram of a light shield layer of an outer surface according to another embodiment of this application;

[0031] FIG. **4**A is a schematic structural diagram of an embodiment of a display apparatus according to this application; and

[0032] FIG. **4**B is a schematic structural diagram of another embodiment of a display apparatus according to this application.

DETAILED DESCRIPTION

[0033] The following embodiments are described with reference to the accompanying drawings, used to exemplify specific embodiments for implementation of this application. Terms about directions mentioned in this application, such as "on", "below", "front", "back", "left", "right", "in", "out", and "side surface" merely refer to directions in the accompanying drawings. Therefore, the used terms about directions are used to describe and understand this application, and are not intended to limit this application.

[0034] The accompanying drawings and the description are considered to be essentially exemplary, rather than limitative. In the figures, modules with similar structures are represented by using the same reference number. In addition, for understanding and ease of description, the size and the thickness of each component shown in the accompanying drawings are arbitrarily shown, but this application is not limited thereto.

[0035] In the accompanying drawings, for clarity, thicknesses of a layer, a film, a panel, an area, and the like are enlarged. In the accompanying drawings, for understanding and ease of description, thicknesses of some layers and areas are enlarged. It should be understood that when a component such as a layer, a film, an area, or a base is described to be "on" "another component", the component may be directly on the another component, or there may be an intermediate component.

[0036] In addition, throughout this specification, unless otherwise explicitly described to have an opposite meaning, the word "include" is understood as including the component, but not excluding any other component. In addition, throughout this specification, "on" means that one is located above or below a target component and does not necessarily mean that one is located on the top based on a gravity direction.

[0037] To further describe the technical means used in this application to achieve the application objective and effects thereof, specific implementations, structures, features, and effects of a display panel, a method for manufacturing same, and a display apparatus using same provided according to this application are described in detail below with reference to the drawings and preferred embodiments.

[0038] Referring to FIG. **1**A to FIG. **1**D, FIG. **1**A to FIG. **1**D are respectively a schematic structural diagram of an exemplary display panel **1'** before light irradiation, a schematic diagram of a light irradiation reaction for a first time of the exemplary display panel **1'**, a schematic diagram of a light irradiation reaction for a second time of the exemplary display panel **1'**, and a schematic structural diagram of the exemplary display panel **1'** after light irradiation. The exemplary display panel **1'** includes a display area CA and an edge area BA. The edge area BA surrounds the display area CA. The exemplary display panel **1'** includes: a first substrate **11**, including an inner surface **11**A, where a color filter layer and a light shied layer **111** are formed on the inner surface **11**A; a first alignment film **13**, disposed on the inner surface **11**A of the first substrate **11**; a second substrate **12**, disposed

opposite to the first substrate **11**, and including an inner surface **12**A, where a light shield layer **121** (such as a black matrix) is formed on a part, corresponding to the edge area BA, of the inner surface **12**A; a second alignment film **14**, disposed on the inner surface **12**A of the second substrate; and a liquid crystal layer **15**, disposed between the first substrate **11** and the second substrate **12**, and doped with a liquid crystal reactive monomer **151** generating a polymeric effect upon light irradiation, where a plurality of spacing units **16** is disposed on the edge area BA of the inner surface. The liquid crystal layer **15** contains a liquid crystal cell **150**, and is doped with the liquid crystal reactive monomer **151** (RM). In a manufacturing process, by supplying power, the liquid crystal cell **15** is enabled to generate a pretilt angle to make the liquid crystal reactive monomer **151** linked to the alignment films (such as a material polyimide PI), and finally ultraviolet light UV**1** is irradiated for a first time, and ultraviolet light UV**2** is irradiated for a second time to make the liquid crystal reactive monomer **151** reacted into a liquid crystal polymer **152**, so that the pretilt angle of the liquid crystal cell **150** is fixed.

[0039] However, as shown in FIG. **1**B and FIG. **1**C, at the stage of irradiating the ultraviolet light UV**1** and UV**2** to make the liquid crystal reactive monomer **151** reacted into the liquid crystal polymer **152**, due to the light shield layer **121** on the second substrate **12**, the ultraviolet light usually fails to be irradiated on the liquid crystal reactive monomer **151** in a part shielded by the light shield layer **121** (as shown in FIG. **1**C). Consequently, the liquid crystal reactive monomer **151** near the light shield layer **121** (that is, the edge area BA) performs incomplete polymerization reaction, leading to the case, as shown in FIG. **1**D, of image sticking fail on the panel caused by the incompletely polymerized liquid crystal reactive monomer **151** after light irradiation is completed.

[0040] To resolve this problem, and to conform to the trend in recent years towards a bezel-less design of a TFT-LCD to highlight the integration of a displayed image, according to this application, a color filter on a color filter (CF) substrate is formed on an active switch array (TFT) array substrate by using a manufacturing process, and a light shield layer on an edge area BA of the color filter (CF) substrate is eliminated, and a light shield layer is formed on an outer surface of a substrate on a line-of-sight side of a user to prevent lateral leakage of light. In this way, the cases of irradiating ultraviolet light on the shielded liquid crystal reactive monomer can be greatly reduced, to sufficiently irradiate the ultraviolet light, so that the liquid crystal reactive monomer can perform complete polymerization reaction, thereby reducing cases of image sticking on the panel.

[0041] Refer to FIG. **2**A to FIG. **2**D for the structure of this application. FIG. **2**A to FIG. **2**D are a schematic structural diagram of a display panel **1** of this application before light irradiation, a schematic diagram of a light irradiation reaction for a first time of the display panel **1** of this application, a schematic diagram of a light irradiation reaction for a second time of the display panel **1** of this application, and a schematic structural diagram of the display panel **1** of this application after light irradiation. The structure of the display panel **1** includes: a first substrate **11**, including an inner surface **11**A, where the inner surface **11**A includes a display area CA and an edge area BA, and the edge area BA surrounds the display area CA; a light shield layer **111**, disposed on the edge area BA of the first substrate **11**; a first alignment film **13**, disposed on the inner surface **11**A of the first substrate **11**; a second substrate **12**, including an inner surface **12**A, where the inner surface **12**A includes a display area CA and an edge area BA, disposed opposite to the first substrate **11**; a second alignment film **14**, disposed on the inner surface **12**A of the second substrate **12**; a liquid crystal layer **15**, disposed between the first substrate **11** and the second substrate **12**, and doped with a liquid crystal reactive monomer (RM) **151** generating a polymeric effect upon light; and a plurality of spacing units **16**, disposed between the first substrate **11** and the second substrate **12**. The light shield layer **111** of the first substrate **11** is disposed opposite to the edge area BA of the second substrate **12**. The display area CA and the edge area BA are a display area and a non-display area of the corresponding display panel. The liquid crystal layer **15** contains a liquid crystal cell **150**, and is doped with the liquid crystal reactive monomer **151**. In a manufacturing process, by supplying power, the liquid crystal cell **15** is enabled to generate a pretilt angle to make the liquid crystal reactive monomer **151** linked to the alignment films (such as a material polyimide PI), and finally ultraviolet light UV**1** is irradiated for a first time, and ultraviolet light UV**2** is irradiated for a second time to make the liquid crystal reactive monomer **151** reacted into a liquid crystal polymer **152**, so that the pretilt angle of the liquid crystal cell **150** is fixed.

[0042] In an embodiment, the first substrate **11** is an active switch array substrate. A color filter is formed on a surface, corresponding to the display area CA, of the active switch array substrate. A light permeable layer with high transmittance rather than the light shield layer **121** shown in FIG. **1**A is disposed on the edge area BA of the second substrate **12**. The light permeable layer is disposed opposite to the light shield layer **111**.

[0043] In an embodiment, some of the spacing units **16** located on the edge area BA of the first substrate **11** are in contact with the second substrate **12**, and the spacing units **16** are made from photoresist materials.

[0044] In an embodiment, the materials of the first alignment film **13** and the second alignment film **14** are polyimide (PI).

[0045] Based on the feature of this application that no light shield layer (for example, the black matrix light shield layer **121** shown in FIG. **1**A) is formed on the edge area of the second substrate **12**, at the stage of light irradiation (for example, ultraviolet light UV**1** is irradiated for a first time as shown in FIG. **2**B, and ultraviolet light UV**2** is irradiated for a second time as shown in FIG. **2**C) on the liquid crystal reactive monomer **151** in the manufacturing process, the cases of irradiating ultraviolet light on the shielded liquid crystal reactive monomer can be greatly reduced, to sufficiently irradiate the ultraviolet light, so that the liquid crystal reactive monomer **151** near the edge area can perform complete polymerization reaction into a liquid crystal polymer **152**, thereby reducing cases of image sticking on the panel (as shown in FIG. **2**D).

[0046] However, in actual application of this application, because the foregoing display panel **1** cannot perform self-illumination, a backlight module **2** is needed to provide light rays. Therefore, another objective of this application is a display apparatus, including: a backlight module **2**, and the display panel **1**. FIG. **3**A is a schematic structural diagram of a light shield layer according to an embodiment of this

application. FIG. **3**B is a schematic structural diagram of a light shield layer according to another embodiment of this application.

[0047] FIG. **4**A is a schematic structural diagram of an embodiment of a display apparatus according to this application. Referring to FIG. **3**A and FIG. **4**A, a display apparatus includes a backlight module **2** and a display panel **1**. The structure of the display panel **1** includes: a first substrate **11**, where a light shield layer **111** is formed on a corresponding edge area BA of the first substrate **11**; a first alignment film **13**, disposed on the first substrate **11**; a second substrate **12**, disposed opposite to the first substrate **11**, and the light shield layer **121** shown in FIG. **1**A is not formed in a corresponding edge area BA of the second substrate **12**; a second alignment film **14**, disposed on the second substrate **12**; a liquid crystal layer **15**, disposed between the first substrate **11** and the second substrate **12**, and doped with a liquid crystal reactive monomer (RM) **151** generating a polymeric effect upon light irradiation; and a plurality of spacing units **16**, disposed between the first substrate **11** and the second substrate **12**. The spacing units **16** disposed on the corresponding edge area are in direct contact with an edge area of an inner surface of the second substrate **12**. The liquid crystal layer **15** contains a liquid crystal cell **150**, and is doped with the liquid crystal reactive monomer **151**. In a manufacturing process, by supplying power, the liquid crystal cell **15** is enabled to generate a pretilt angle to make the liquid crystal reactive monomer **151** linked to the alignment films (such as a material polyimide PI), and finally ultraviolet light UV**1** is irradiated for a first time, and ultraviolet light UV**2** is irradiated for a second time to make the liquid crystal reactive monomer **151** reacted into a liquid crystal polymer **152**, so that the pretilt angle of the liquid crystal cell **150** is fixed.

[0048] In an embodiment, the first substrate **11** is an active switch array substrate. A color filter is formed on a surface, corresponding to the display area CA, of the active switch array substrate. A light permeable layer with high transmittance rather than the light shield layer **121** shown in FIG. **1**A is disposed on the edge area BA of the second substrate **12**. The light permeable layer is disposed opposite to the light shield layer **111**.

[0049] In an embodiment, some of the spacing units **16** located on the edge area BA of the first substrate **11** are in contact with the second substrate **12**, and the spacing units **16** are made from photoresist materials.

[0050] In an embodiment, the materials of the first alignment film **13** and the second alignment film **14** are polyimide (PI).

[0051] In this embodiment, a frame-shaped light shield layer **17** (such as a black matrix) is disposed on a frame of an outer surface **11**B, back to the liquid crystal layer **15**, of the first substrate **11**.

[0052] In this embodiment, a front frame **3** is further included. The front frame **3** is fixed on the outer surface **11**B of the first substrate **11**, as shown in FIG. **4**A.

[0053] Based on the feature of this application that no light shield layer is formed on the edge area BA of the second substrate **12**, opposite to the case, as shown in FIG. **1**A, where the light shield layer **121** is formed on the edge area BA of the second substrate **12**, at the stage of light irradiation (for example, ultraviolet light UV**1** is irradiated for a first time as shown in FIG. **2**B, and ultraviolet light UV**2** is irradiated for a second time as shown in FIG. **2**C) on the liquid crystal reactive monomer **151** in the manufacturing process, the cases of irradiating ultraviolet light on the shielded liquid crystal reactive monomer can be greatly reduced, to sufficiently irradiate the ultraviolet light, so that the liquid crystal reactive monomer **151** can perform complete polymerization reaction into a liquid crystal polymer **152**, thereby reducing cases of image sticking on the panel (as shown in FIG. **2**D).

[0054] FIG. **4**B is a schematic structural diagram of another embodiment of a display apparatus according to this application. Referring to FIG. **3**B and FIG. **4**B, a display apparatus includes a backlight module **2** and a display panel **1**. The structure of the display panel **1** includes: a first substrate **11**, where a light shield layer **111** is formed on a corresponding edge area BA of the first substrate **11**; a first alignment film **13**, disposed on the first substrate **11**; a second substrate **12**, disposed opposite to the first substrate **11**, and the light shield layer **121** shown in FIG. **1**A is not formed in a corresponding edge area BA of the second substrate **12**; a second alignment film **14**, disposed on the second substrate **12**; a liquid crystal layer **15**, disposed between the first substrate **11** and the second substrate **12**, and doped with a liquid crystal reactive monomer (RM) **151** generating a polymeric effect upon light irradiation; and a plurality of spacing units **16**, disposed between the first substrate **11** and the second substrate **12**. The spacing units **16** disposed on the corresponding edge area are in direct contact with an edge area of an inner surface of the second substrate **12**. The liquid crystal layer **15** contains a liquid crystal cell **150**, and is doped with the liquid crystal reactive monomer **151**. In a manufacturing process, by supplying power, the liquid crystal cell **15** is enabled to generate a pretilt angle to make the liquid crystal reactive monomer **151** linked to the alignment films (such as a material polyimide PI), and finally ultraviolet light UV**1** is irradiated for a first time, and ultraviolet light UV**2** is irradiated for a second time to make the liquid crystal reactive monomer **151** reacted into a liquid crystal polymer **152**, so that the pretilt angle of the liquid crystal cell **150** is fixed.

[0055] In an embodiment, the first substrate **11** is an active switch array substrate. A color filter is formed on a surface, corresponding to the display area CA, of the active switch array substrate. A light permeable layer with high transmittance rather than the light shield layer **121** shown in FIG. **1**A is disposed on the edge area BA of the second substrate **12**. The light permeable layer is disposed opposite to the light shield layer **111**.

[0056] In an embodiment, some of the spacing units **16** located on the edge area BA of the first substrate **11** are in contact with the second substrate **12**, and the spacing units **16** are made from photoresist materials.

[0057] In an embodiment, the materials of the first alignment film **13** and the second alignment film **14** are polyimide (PI).

[0058] In this embodiment, a frame-shaped light shield layer **17** (such as a black matrix) is disposed on a frame of an outer surface **12**B, back to the liquid crystal layer **15**, of the second substrate **12**.

[0059] In this embodiment, a front frame **3** is further included. The front frame **3** is fixed on the outer surface **12**B of the second substrate **12**, as shown in FIG. **4**B.

[0060] Based on the feature of this application that no light shield layer (for example, the black matrix light shield layer **121** shown in FIG. **1**A) is formed on the edge area of the

second substrate **12**, at the stage of light irradiation (for example, ultraviolet light UV**1** is irradiated for a first time as shown in FIG. **2**B, and ultraviolet light UV**2** is irradiated for a second time as shown in FIG. **2**C) on the liquid crystal reactive monomer **151** in the manufacturing process, the cases of irradiating ultraviolet light on the shielded liquid crystal reactive monomer can be greatly reduced, to sufficiently irradiate the ultraviolet light, so that the liquid crystal reactive monomer **151** can perform complete polymerization reaction into a liquid crystal polymer **152**, thereby reducing cases of image sticking on the panel (as shown in FIG. **2**D).

[0061] The display panel of this application is manufactured by using a method for manufacturing a display panel, including steps: providing a first substrate **11**, including a display area CA and an edge area BA, where the edge area BA surrounds the display area CA; disposing a light shield layer **111**, a first alignment film **13**, and a plurality of spacing units **16** on the edge area BA of the first substrate **11**; providing a second substrate **12**, including a display area CA and an edge area BA, and disposed opposite to the first substrate **11**; disposing a second alignment film **14** on the second substrate **12**; disposing, between the first substrate **11** and the second substrate **12**, a liquid crystal layer **15** doped with a liquid crystal reactive monomer **151** generating a polymeric effect upon light; supplying power to enable the liquid crystal reactive monomer **151** to be linked to alignment materials of the alignment films **13** and **14**; performing light irradiation for a first time towards a direction of the second substrate **12**, so that the liquid crystal reactive monomer **151** forms a preliminary polymerization phenomenon; and performing light irradiation for a second time towards the direction of the second substrate **12**, so that the liquid crystal reactive monomer **151** forms a complete polymerization phenomenon. The light shield layer **111** of the first substrate **11** is disposed opposite to the edge area BA of the second substrate **12**. Therefore, when light irradiation is performed towards the direction of the second substrate **12**, the light shield layer **111** does not affect the polymeric effect of the liquid crystal reactive monomer **151** upon light. The display panel may be a TN-type, an OCB-type, a VA-type, or a curved-surface-type display panel. However, this application is not limited thereto. The display panel may use straight down backlight. A backlight source may be a white light source, an RGB three-color light source, an RGBW four-color light source, or an RGBY four-color light source. However, this application is not limited thereto.

[0062] According to this application, not only a manufacturing process of forming a light shield layer on a substrate can be omitted, but also cases of irradiating ultraviolet light on a shielded polymer monomer can be greatly reduced, to sufficiently irradiate the ultraviolet light, so that a liquid crystal reactive monomer can perform complete polymerization reaction, thereby reducing image sticking.

[0063] The wordings such as "in some embodiments" and "in various embodiments" are repeatedly used. They usually do not refer to a same embodiment; but they may refer to a same embodiment. The words, such as "comprise", "have", and "include", are synonyms, unless other meanings are indicated in the context thereof.

[0064] Descriptions above are merely preferred embodiments of this application, and are not intended to limit this application. Although this application has been disclosed above in forms of preferred embodiments, the embodiments are not intended to limit this application. A person skilled in the art can make some equivalent variations, alterations or modifications to the above disclosed technical content without departing from the scope of the technical solutions of the above disclosed technical content to obtain equivalent embodiments. Any simple alteration, equivalent change or modification made to the foregoing embodiments according to the technical essence of this application without departing from the content of the technical solutions of this application shall fall within the scope of the technical solutions of this application.

What is claimed is:

1. A display panel, comprising:

a first substrate, comprising a display area and an edge area, wherein the edge area surrounds the display area;

a light shield layer, disposed on the edge area of the first substrate;

a first alignment film, disposed on the first substrate;

a second substrate, comprising a display area and an edge area, and disposed opposite to the first substrate;

a second alignment film, disposed on the second substrate;

a liquid crystal layer, disposed between the first substrate and the second substrate, and doped with a liquid crystal reactive monomer generating a polymeric effect upon light; and

a plurality of spacing units, disposed on the first substrate, wherein

a light permeable layer is disposed on the edge area of the second substrate, and the light permeable layer is disposed opposite to the light shield layer of the first substrate.

2. The display panel according to claim **1**, wherein some of the spacing units located on the edge area of the first substrate are in contact with the second substrate.

3. The display panel according to claim **1**, wherein the spacing units are made from photoresist materials.

4. The display panel according to claim **1**, wherein a material of the first alignment film is polyimide.

5. The display panel according to claim **1**, wherein a material of the second alignment film is polyimide.

6. A display apparatus, comprising:

a backlight module; and

a display panel, comprising:

a first substrate, comprising a display area and an edge area, wherein the edge area surrounds the display area;

a light shield layer, disposed on the edge area of the first substrate;

a first alignment film, disposed on the first substrate;

a second substrate, comprising a display area and an edge area, and disposed opposite to the first substrate;

a second alignment film, disposed on the second substrate;

a liquid crystal layer, disposed between the first substrate and the second substrate, and doped with a liquid crystal reactive monomer generating a polymeric effect upon light; and

a plurality of spacing units, disposed on the first substrate, wherein

a light permeable layer is disposed on the edge area of the second substrate, and the light permeable layer is disposed opposite to the light shield layer of the first substrate.

7. The display apparatus according to claim **6**, wherein some of the spacing units located on the edge area of the first substrate are in contact with the second substrate.

8. The display apparatus according to claim **6**, wherein the spacing units are made from photoresist materials.

9. The display apparatus according to claim **6**, wherein a material of the first alignment film is polyimide.

10. The display apparatus according to claim **6**, wherein a material of the second alignment film is polyimide.

11. The display apparatus according to claim **6**, wherein a frame-shaped light shield layer is disposed on a frame of an outer surface, back to the liquid crystal layer, of the first substrate.

12. The display apparatus according to claim **11**, further comprising a front frame, wherein the front frame is fixed on the outer surface of the first substrate.

13. The display apparatus according to claim **6**, wherein a frame-shaped light shield layer is disposed on a frame of an outer surface, back to the liquid crystal layer, of the second substrate.

14. The display apparatus according to claim **13**, further comprising a front frame, wherein the front frame is fixed on the outer surface of the second substrate.

15. A method for manufacturing a display panel, comprising:

providing a first substrate, comprising a display area and an edge area, wherein the edge area surrounds the display area;

disposing a light shield layer, a first alignment film, and a plurality of spacing units on the edge area of the first substrate;

providing a second substrate, disposed opposite to the first substrate;

disposing a light permeable layer and a second alignment film on the second substrate;

disposing, between the first substrate and the second substrate, a liquid crystal layer doped with a liquid crystal reactive monomer generating a polymeric effect upon light;

supplying power to enable the liquid crystal reactive monomer to be linked to alignment materials of the alignment films;

performing light irradiation for a first time towards a direction of the second substrate, so that the liquid crystal reactive monomer forms a preliminary polymerization phenomenon; and

performing light irradiation for a second time towards the direction of the second substrate, so that the liquid crystal reactive monomer forms a complete polymerization phenomenon, wherein

the light shield layer of the first substrate is disposed opposite to the light permeable layer of the second substrate.

* * * * *

专利名称(译)	显示面板，其制造方法以及使用该显示面板的显示装置		
公开(公告)号	US20190033666A1	公开(公告)日	2019-01-31
申请号	US15/578466	申请日	2017-09-04
[标]申请(专利权)人(译)	惠科股份有限公司 重庆惠科金渝光电科技有限公司		
[标]发明人	CHIEN CHUNG KUANG		
发明人	CHIEN, CHUNG-KUANG		
IPC分类号	G02F1/1337 G02F1/1335 G02F1/137 G02F1/1339 G02F1/1333		
CPC分类号	G02F1/133788 G02F1/133512 G02F1/133723 G02F1/137 G02F1/1339 G02F1/133308 G02F1/1368 G02F2001/133715 G02F2001/13775 G02F2001/133397 G02F2001/13332 G02F2001/133334 G02F1/13394		
优先权	201710611591.X 2017-07-25 CN		
外部链接	Espacenet USPTO		

摘要(译)

本申请涉及显示面板。显示面板包括：第一基板，包括显示区域和边缘区域，边缘区域围绕显示区域;遮光层，设置在第一基板的边缘区域上;第一取向膜，设置在第一基板上;第二基板，包括显示区域和边缘区域，并与第一基板相对设置;第二取向膜，设置在第二基板上;液晶层，设置在第一基板和第二基板之间，并掺杂有液晶反应性单体，对光产生聚合效应;多个间隔单元，设置在第一基板上，其中透光层设置在第二基板的边缘区域上，并且透光层与第一基板的遮光层相对设置。