US 20200103699A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2020/0103699 A1**

Liu (43) **Pub. Date: Apr. 2, 2020**

(54) **COLOR FILTER AND LIQUID CRYSTAL PANEL**

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(21) Appl. No.: **16/257,082**

(22) Filed: **Jan. 25, 2019**

Related U.S. Application Data

(63) Continuation of application No. PCT/CN2018/114623, filed on Nov. 8, 2018.

(30) **Foreign Application Priority Data**

Sep. 30, 2018 (CN) 201811157048.8

Publication Classification

(51) **Int. Cl.**

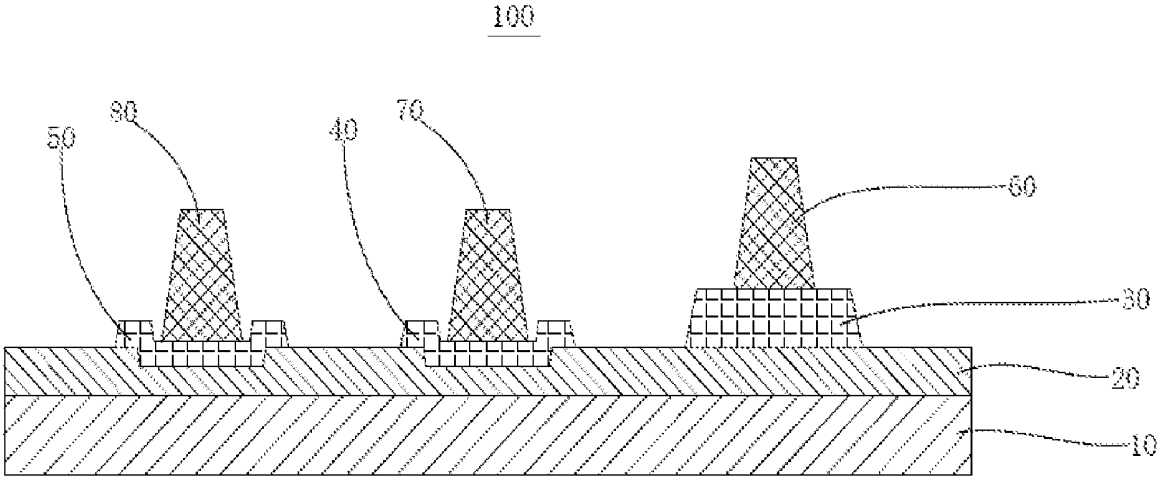
G02F 1/1335 (2006.01)
G02F 1/1339 (2006.01)
G02B 5/20 (2006.01)

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

CPC ***G02F 1/133514*** (2013.01); ***G02B 5/201*** (2013.01); ***G02F 1/133512*** (2013.01); ***G02F 1/13394*** (2013.01)

(57) **ABSTRACT**

The invention discloses a color filter and a liquid crystal panel, wherein the color filter comprises three spacers, a first spacer is defined on the surface of a first photoresist layer, a second spacer and a third spacer are defined above a black matrix, and the first spacer is higher than the second spacer and the third spacer.



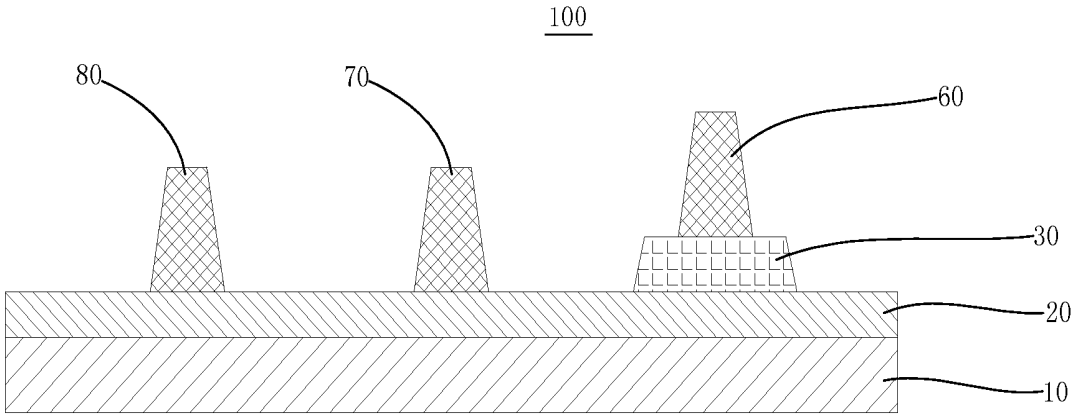


FIG. 1

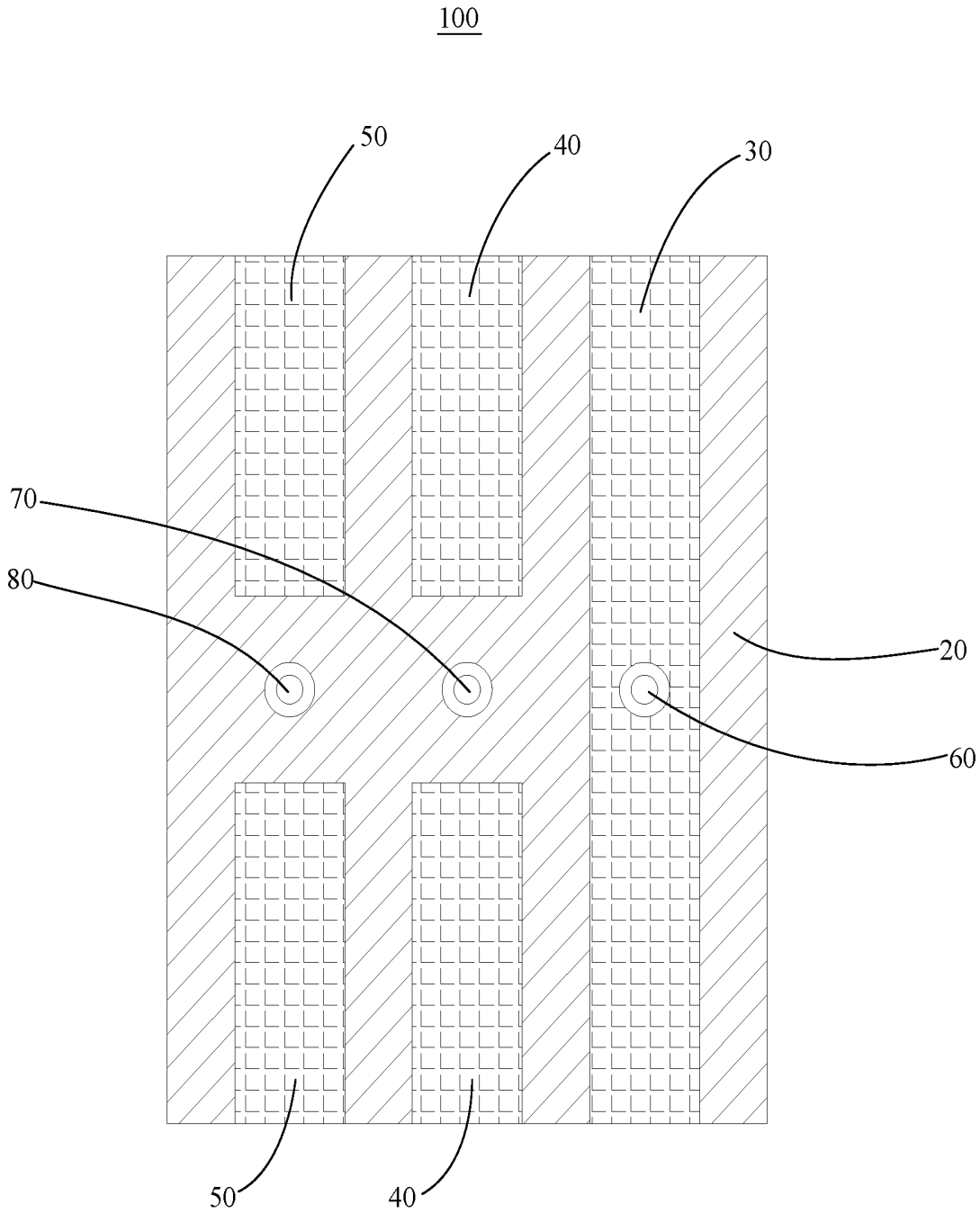


FIG. 2

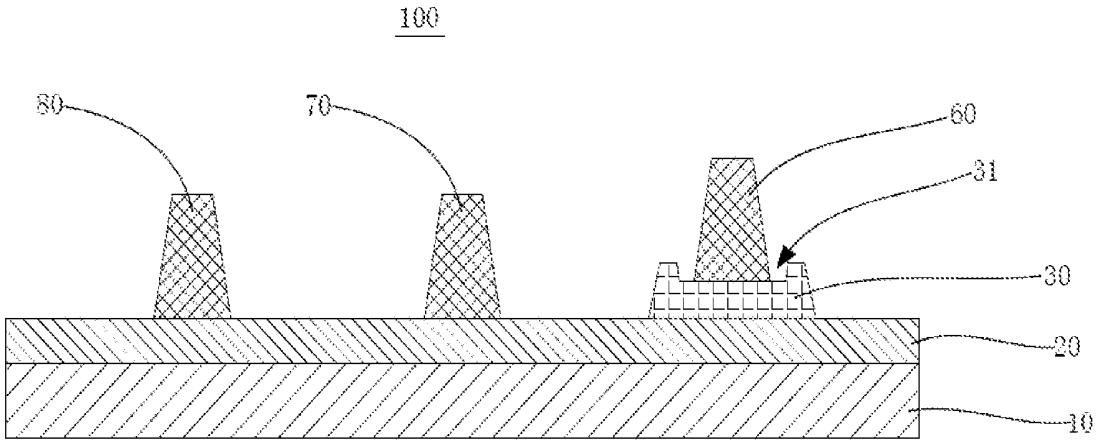


FIG. 3

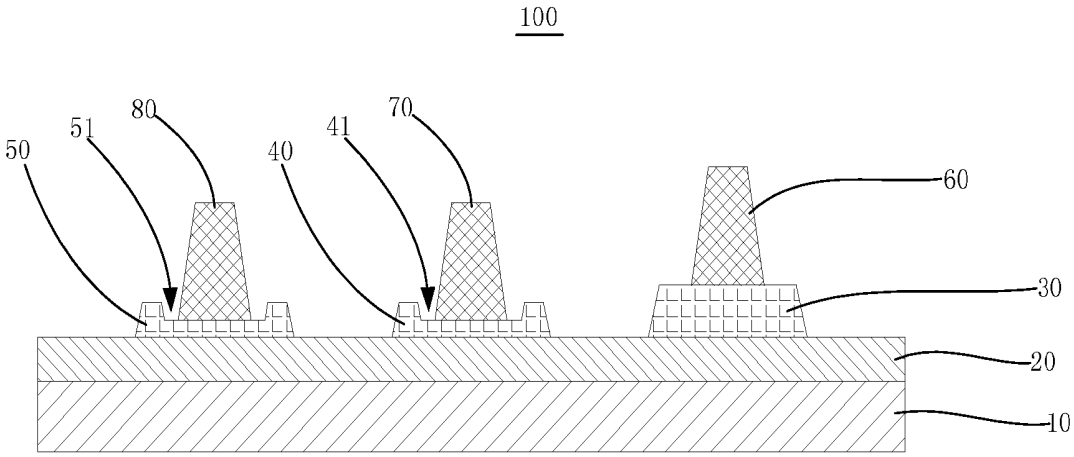


FIG. 4

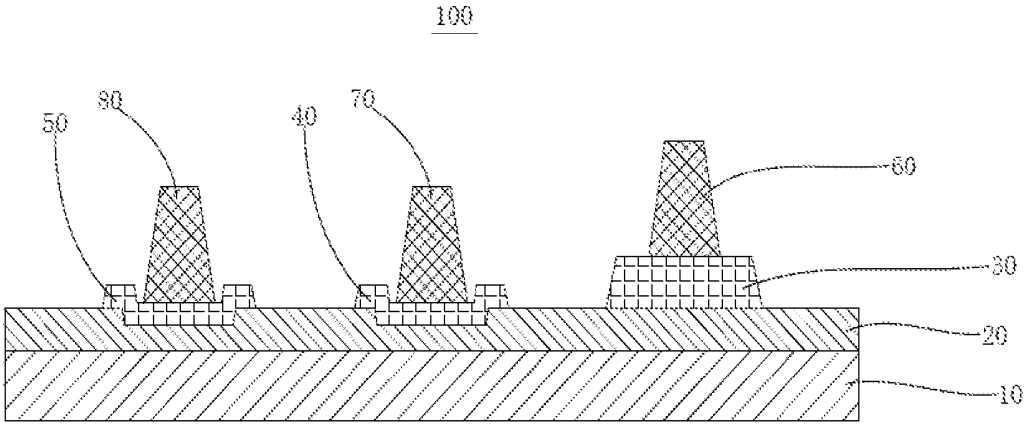


FIG. 5

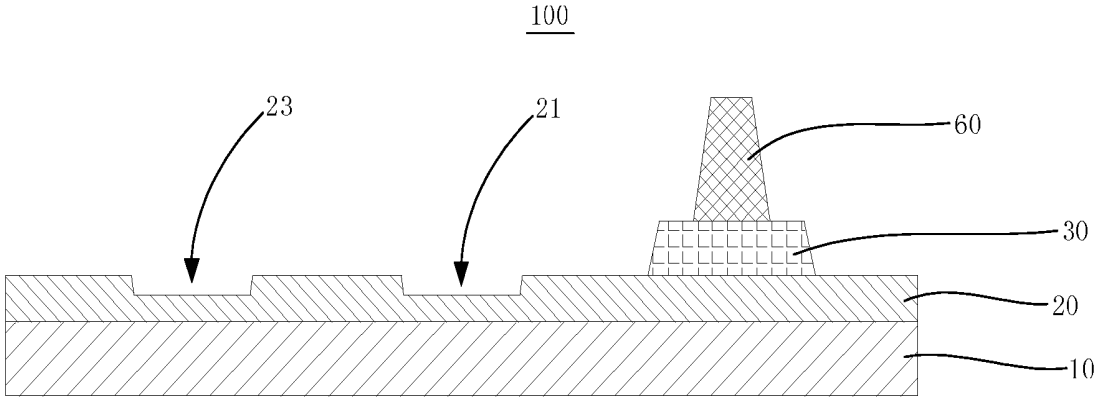


FIG. 6

COLOR FILTER AND LIQUID CRYSTAL PANEL

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a Continuation Application of PCT Application No. PCT/CN2018/114623 filed on Nov. 8, 2018, which claims the benefit of Chinese Patent Application No. 201811157048.8 filed on Sep. 30, 2018. All the above are hereby incorporated by reference.

FIELD

[0002] The present disclosure relates to the field of liquid crystal display technology, and in particular, relates to a color filter and a display panel using the color filter.

BACKGROUND

[0003] Liquid crystal panels of liquid crystal displays includes a thin film transmitter, a liquid crystal layer, and a color filter. A plurality of spacers supporting the liquid crystal cell are also defined between the color filter and the array substrate to ensure the cell thickness of the liquid crystal cell. Further, in order to ensure that the liquid crystal cell has enough liquid crystal redundancy to resist the influence of temperature change and pressure change on the liquid crystal cell, a part of several spacers may be defined as the main spacers when designing the liquid crystal panel, and the other part of several spacers may be defined as auxiliary spacers, and it is necessary to ensure sufficient segment differences between the main spacers and the auxiliary spacers. At present, the segment difference between the main spacer and the auxiliary spacer is generally formed by laying a pad layer only under a part of spacers, so that this part of spacers is higher than another part of the spacers and becomes the main spacer. However, the structure and manufacturing process of the color filter obtained in this way are complicated and costly.

SUMMARY

[0004] The main purpose of the present disclosure is to provide a color filter, aiming at simplifying the structure and manufacturing process of the color filter.

[0005] In order to achieve the above object, the color filter proposed in the present disclosure includes:

[0006] base;

[0007] a black matrix, defined on one plate surface of the base, the black matrix defining a first filling area, a second filling area and a third filling area at intervals;

[0008] a color filter layer, including a first photoresist layer, a second photoresist layer, and a third photoresist layer, the first photoresist layer is filled in the first filling area, the second photoresist layer is filled in the second filling area, the third photoresist layer is filled in the third filling area, and the edge of the first photoresist layer extends outside the first filling area and overlaps the surface of the black matrix away from the base; and

[0009] and a spacer, including a first spacer, a second spacer and a third spacer, the first spacer is defined on the surface of the first photoresist layer overlapping the black matrix, the second spacer and the third spacer are defined above the black matrix, the surface of a free end of the first spacer is higher than the surface of a free end of the second spacer, the surface of a free end of the first spacer is higher than the surface of a free end of the third spacer.

[0010] Optionally, the second spacer and the third spacer are both defined on the surface of the black matrix away from the base.

[0011] Optionally, the first photoresist layer, the second photoresist layer, and the third photoresist layer are all defined in a strip shape, the first photoresist layer comprises a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix away from the base, and the first spacer is defined on the surface of the first overlapping portion away from the black matrix.

[0012] Optionally, the edge of the second photoresist layer extends outside the second filling area and overlaps the surface of the black matrix away from the base; the surface of the second photoresist layer overlapping a surface of the black matrix recesses to form a first receiving groove, and the second spacer is defined in the first receiving groove;

[0013] and the edge of the third photoresist layer extends outside the third filling area and overlaps the surface of the black matrix away from the base; the surface of the third photoresist layer overlapping the black matrix recesses to form a second receiving groove, and the third spacer is defined in the second receiving groove.

[0014] Optionally, the first photoresist layer, the second photoresist layer, and the third photoresist layer are all defined in a strip shape, the first photoresist layer comprises a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix away from the base, and the first spacer is defined on the surface of the first overlapping portion away from the black matrix;

[0015] the second photoresist layer comprises a second overlapping portion located at one end thereof, the second overlapping portion is located outside the second filling area and overlaps the surface of the black matrix away from the base, the surface of the second overlapping portion away from the black matrix recesses to form a first receiving groove,

[0016] the third photoresist layer comprises a third overlapping portion located at one end thereof, the third overlapping portion is located outside the third filling area and overlaps the surface of the black matrix away from the base, the surface of the third overlapping portion away from the black matrix recesses to form a second receiving groove.

[0017] Optionally, the surface of the black matrix adjacent to the second filling area recesses to form a first receiving groove, the edge of the second photoresist layer extends toward the first receiving groove and is at least partially accommodated in the first receiving groove, and the second spacer is defined on the surface of the second photoresist layer accommodated in the first receiving groove;

[0018] the surface of the black matrix adjacent to the third filling area recesses to form a second receiving groove, the edge of the third photoresist layer extends toward the second receiving groove and is at least partially accommodated in the second receiving groove, and the third spacer is defined on the surface of the third photoresist layer accommodated in the second receiving groove.

[0019] Optionally, the first photoresist layer, the second photoresist layer, and the third photoresist layer are all defined in a strip shape, the first photoresist layer comprises a first overlapping portion located at one end thereof, the

first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix away from the base, and the first spacer is defined on the surface of the first overlapping portion away from the black matrix;

[0020] the second photoresist layer comprises a second overlapping portion located at one end thereof, the second overlapping portion is defined outside the second filling area and partially accommodated in the first receiving groove, and the second spacer is defined on the surface of the second overlapping portion accommodated in the first receiving groove;

[0021] the third photoresist layer comprises a third overlapping portion located at one end thereof, the third overlapping portion is defined outside the third filling area and partially accommodated in the second receiving groove, and the third spacer is defined on the surface of the third overlapping portion accommodated in the second receiving groove,

[0022] Optionally, the thickness of the first photoresist layer is greater than the thickness of the second photoresist layer. the thickness of the first photoresist layer is greater than the thickness of the third photoresist layer, the thickness of the second photoresist layer is equal to the thickness of the third photoresist layer.

[0023] Optionally, the first photoresist layer, the second photoresist layer and the third photoresist layer are respectively a blue photoresist layer, a green photoresist layer, and a red photoresist layer.

[0024] According to the technical schemes of the present disclosure, by extending the edge of the first photoresist layer outside the first filling area and overlapping the edge of the first photoresist on the surface of the black matrix away from the substrate while the first spacer is defined on the surface of the first photoresist layer overlapping the black matrix and the free end surfaces of the second and third spacers are made lower than the free end surface of the first spacer, the height of the first spacer on the surface of the first photoresist layer may be made higher than the height of the second spacer, as well as the height of the third spacer. Thus the first spacer becomes the main spacer and forms a sufficient segment difference with the rest auxiliary spacers, i.e., the second spacer and the third spacer, thereby satisfying the liquid crystal redundancy requirement.

[0025] Moreover, in the technical schemes of the present disclosure, since the first spacer is formed on the surface of the first photoresist away from the black matrix, the pad layer used to pad the first spacer is the first photoresist layer. In this condition, the pad layer for padding the first spacer may be molded together in the photolithography molding process of the first photoresist layer. Compared with the technical schemes requiring separate padding, the structure and manufacturing process of the color filter of the present disclosure are simpler, more convenient, more stable and more reliable, and the structure and manufacturing process of the color filter may be effectively simplified.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] In order to more clearly explain the embodiments of the present disclosure or the technical solutions in the prior art, the drawings that need to be used in the embodiments or the description of the prior art will be briefly introduced below. obviously, the drawings in the following description are only some embodiments of the present disclosure. for those of ordinary skill in the art, other drawings maybe obtained according to the structures shown in these drawings without paying creative labor.

[0027] FIG. **1** is a schematic structural diagram of a color filter in some embodiments of the present disclosure;

[0028] FIG. **2** is a top view of the color filter of FIG. **1**;

[0029] FIG. **3** is a schematic structural diagram of the color filter of FIG. **1** with grooves in the first photoresist layer;

[0030] FIG. **4** is a schematic structural diagram of a color filter in another embodiment of the present disclosure;

[0031] FIG. **5** is a schematic structural diagram of a color filter in still another embodiment of the present disclosure;

[0032] FIG. **6** is a schematic structural diagram of the color filter of FIG. **5** after removal of the second photoresist layer, the third photoresist layer, the second spacer, and the third spacer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033]

TABLE 1

Label	Name
100	Color filter
10	base
20	black matrix
21	first receiving groove
23	the second receiving groove
30	first photoresist layer
31	groove
40	second photoresist layer
41	first receiving groove
50	third photoresist layer
51	the second receiving groove
60	the first spacer
70	the second spacer
80	third spacer

[0034] The realization, functional features and advantages of the purpose of the present disclosure will be further described with reference to the accompanying drawings in conjunction with the embodiments.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0035] The technical solutions of the embodiments of the present disclosure will be clearly and completely described in the following with reference to the accompanying drawings. It is obvious that the embodiments to be described are only a part rather than all of the embodiments of the present disclosure. All other embodiments obtained by persons skilled in the art based on the embodiments of the present disclosure without creative efforts shall fall within the protection scope of the present disclosure.

[0036] It should be noted that all directional indications (such as up, down, left, right, front, back) is only used to explain the relative positional relationship between the components in a certain posture (as shown in the figure), and if the specific posture changes, the directional indication changes accordingly.

[0037] In addition, in the present disclosure, the descriptions such as "first" and "second" are set for the purpose of description only, and are not to be understood as indicating or implying its relative importance or implicitly indicating the number of indicated technical features. Thus, features

defining "first" and "second" may explicitly or implicitly include at least one such feature. In the description of the present disclosure, "plurality" means at least two, e.g., two, three, etc., unless expressly and specifically defined otherwise.

[0038] In the present disclosure, unless otherwise expressly specified and defined, the terms "connect", "fix" and the like shall be understood in a broad sense, for example, "fix" may be a fixed connection, a detachable connection, or an integral body; It can be a mechanical connection or an electrical connection. It can be directly connected or indirectly connected through an intermediate medium. It can be the internal communication of two elements or the interaction relationship between two elements, unless otherwise explicitly defined. For those of ordinary skill in the art, the specific meaning of the above terms in the present disclosure can be understood according to the specific circumstances.

[0039] In addition, the technical solutions between the various embodiments according to the present disclosure may be combined with each other, but must be based on what one of ordinary skill in the art can achieve. When the combination of technical solutions is contradictory or impossible to achieve, it should be considered that the combination of such technical solutions does not exist and is not within the scope of protection required by the present disclosure.

[0040] The present disclosure proposes a color filter **100**, which is applied to a liquid crystal panel and aims to simplify the structure and manufacturing process of the color filter **100**.

[0041] The specific structure of the color filter **100** will be described below.

[0042] As shown in FIGS. **1** and **2**, in some embodiments of the color filter **100** of the present disclosure, the color filter **100** includes:

[0043] a base **10**,

[0044] a black matrix **20**, defined on one plate surface of the base **10**, the black matrix **20** defining a first filling area, a second filling area and a third filling area at intervals;

[0045] a color filter layer, including a first photoresist layer **30**, a second photoresist layer **40**, and a third photoresist layer **50**, the first photoresist layer **30** is filled in the first filling area, the second photoresist layer **40** is filled in the second filling area, the third photoresist layer **50** is filled in the third filling area, and the edge of the first photoresist layer **30** extends outside the first filling area and overlaps the surface of the black matrix **20** away from the base **10**; and

[0046] a spacer, including a first spacer **60**, a second spacer **70** and a third spacer **80**, the first spacer **60** is defined on the surface of the first photoresist layer **30** overlapping the black matrix **20**, the second spacer **70** and the third spacer **80** are defined above the black matrix **20**, the surface of a free end of the first spacer **60** is higher than the surface of a free end of the second spacer **70**, the surface of a free end of the first spacer **60** is higher than the surface of a free end of the third spacer **80**.

[0047] Specifically, the second spacer **70** may be formed either directly on the upper surface of the black matrix **20** or on the surface of the second color resist layer **40** located outside the second filling area and overlapped on the black matrix **20**. The third spacer **80** may be formed directly on the upper surface of the black matrix **20** or may be formed on the surface of the third color resist layer **50** outside the third filling area and overlapped on the black matrix **20**. Moreover, if the second spacer **70** is formed outside the second filling area of the second photoresist layer **40** and is overlapped on the surface of the black matrix **20**, the thickness of the second photoresist layer **40** is lower than that of the first photoresist layer **30**. If the third spacer **80** is formed on the surface of the third photoresist layer **50** outside the third filling area and overlapped on the black matrix **20**, the thickness of the third photoresist layer **50** is lower than that of the first photoresist layer **30**. In this way, the height of the spacer formed on the first photoresist layer **30** will be higher than the height of the spacer formed on the black matrix **20** and on the second and third photoresist layers **50** after the processes of coating, exposure and development, thus forming a sufficient segment difference between the main spacer and the rest auxiliary spacer to meet the liquid crystal redundancy requirement. For example, in this embodiment, the first spacer **60** is the main spacer and the second and third spacers **80** are the auxiliary spacers.

[0048] That is, according to the technical schemes of the present disclosure, by extending the edge of the first photoresist layer **30** outside the first filling area and overlapping the edge of the first photoresist on the surface of the black matrix **20** away from the base **10**, while the first spacer **60** is defined on the surface of the first photoresist layer **30** overlapping the black matrix **20** and the free end surfaces of the second and third spacers **80** are made lower than the free end surface of the first spacer **60**, the height of the first spacer **60** on the surface of the first photoresist layer **30** may be made higher than the height of the second spacer **70**, as well as the height of the third spacer **80**, thus the first spacer **60** becomes the main spacer and forms a sufficient segment difference with the rest auxiliary spacers, i.e., the second spacer **70** and the third spacer **80**, thereby satisfying the liquid crystal redundancy requirement.

[0049] Moreover, in the technical schemes of the present disclosure, since the first spacer **60** is formed on the surface of the first photoresist **30** away from the black matrix **20**, the pad layer used to pad the first spacer **60** is the first photoresist layer **30**. In this condition, the pad layer for padding the first spacer **60** may be molded together in the photolithography molding process of the first photoresist layer **30**. Compared with the technical schemes requiring separate padding, the structure and manufacturing process of the color filter **100** of the present disclosure are simpler, more convenient, more stable and more reliable, and the structure and manufacturing process of the color filter may be effectively simplified.

[0050] In addition, it should be noted that in this embodiment, the first photoresist layer **30**, the second photoresist layer **40**, and the third photoresist layer **50** are respectively a blue photoresist layer, a green photoresist layer, and a red photoresist layer. As may be understood, the technical schemes of the present disclosure aims to simplify the structure and manufacturing process of the color filter **100** while ensuring that the segment difference between the main spacer and the auxiliary spacer meets the liquid crystal redundancy requirements, but does not limit the colors of the first photoresist layer **30**, the second photoresist layer **40**, and the third photoresist layer **50**, that is, in other embodiments, the first photoresist layer **30**, the second photoresist layer **40**, and the third photoresist layer **50** may also be photoresist layers of other colors, so that the liquid crystal panel applying the color filter **100** of the present disclosure

may meet other different display requirements. That is, it is also within the scope of the present disclosure that the first photoresist layer **30**, the second photoresist layer **40**, and the third photoresist layer **50** are different combinations of blue photoresist layer, green photoresist layer, and red photoresist layer, respectively.

[0051] As shown in FIGS. **1** and **2**, in some embodiments of the color filter **100** of the present disclosure, the second spacer **70** and the third spacer **80** are both defined on the surface of the black matrix **20** away from the base **10**.

[0052] In this condition, the thickness of the first photoresist layer **30** may bring about the height difference between the first spacer **60** and the second spacer **70**, and between the first spacer **60** and the third spacer **80**, that is, the segment difference between the main spacer and the auxiliary spacer, thereby satisfying the liquid crystal redundancy requirement. The following description takes the first spacer **60** as the main spacer, the second spacer **70** and the third spacer **80** as the auxiliary spacer, and the first photoresist layer **30**, the second photoresist layer **40**, and the third photoresist layer **50** are respectively a blue photoresist layer, a green photoresist layer, and a red photoresist layer as examples.

[0053] In this embodiment, the second spacer **70** (the auxiliary spacer) is defined on the black matrix **20** between two adjacent green pixel regions (the second filling area), the third spacer **80** (the auxiliary spacer) is defined on the black matrix **20** between two adjacent red pixel regions (the third filling area), and the first spacer **60** (the main spacer) is defined on the blue photoresist layer (the first photoresist layer **30**) between two adjacent blue pixel regions (the first filling area). In this condition, the second photoresist layer **40** (green photoresist layer) is of an isolated type, i.e., the second photoresist layer **40** exists only in the green pixel region (second filling area), and there is no photoresist between the upper and lower adjacent green pixel regions; The third photoresist layer **50** (red photoresist layer) is of an isolated type, i.e., the third photoresist layer **50** exists only in the red pixel region (third filling area), and there is no photoresist between the upper and lower adjacent red pixel regions; The first photoresist layer **30** (blue photoresist layer) is of a strip type, the first photoresist layer **30** is a continuous strip shape, and the upper and lower direction is a whole blue photoresist layer. In this condition, there is a difference between the first spacer **60** and the second spacer **70** (and the third spacer **80**) due to the thickness of the blue photoresist layer, so that the liquid crystal redundancy of the liquid crystal cell may be improved.

[0054] In addition, it should be noted that in the above embodiment, if the thickness of the blue photoresist layer is too large, the difference between the first spacer **60** and the second spacer **70** (and the third spacer **80**) is too large, that is, the difference between the main spacer and the auxiliary spacer is too large. In this condition, if the external temperature drops or the liquid crystal panel is pressed, the liquid crystal volume will shrink and the main spacer will be further compressed, but the auxiliary spacer will not contact the array substrate and will not play a supporting role due to too large a segment difference. Therefore, it is necessary to adjust the thickness of the blue photoresist layer at the bottom of the main spacer.

[0055] Therefore, the following modified example is proposed. as shown in FIG. **3**, the blue photoresist layer is formed by halftone—mask technique, and a semi-transparent mask is used above the blue photoresist layer for supporting the first spacer **60**. in this case, the light intensity received by the area under the semi-transparent mask is lower than the surrounding area, and the thickness after forming is thinner, thus groove **31** may be formed on the surface of the blue photoresist layer. In this condition, the first spacer **60** is defined in the groove **31**, which may reduce the segment difference between the main spacer and the auxiliary spacer, and may adjust the depth of the groove **31** by controlling the light transmittance of the semi-transparent mask, thereby reasonably adjusting the segment difference.

[0056] As shown in FIGS. **1** and **2**, in some embodiments of the color filter **100** of the present disclosure, the first color resist layer **30**, the second color resist layer **40**, and the third color resist layer **50** are all defined in a strip shape, the first color resist layer **30** includes a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix **20** away from the base **10**, and the first spacer **60** is located on the surface of the first overlapping portion away from the black matrix **20**.

[0057] Correspondingly, the first filling area, the second filling area and the third filling area are also defined in strips, and in the two adjacent pixels above and below, the two first filling areas are defined in strips along the vertical direction, and the arrangement of the second filling area and the third filling area is similar to the arrangement of the first filling area, which will not be described in detail here. In this condition, the second photoresist layer **40** (green photoresist layer) is of an isolated type, i.e., the second photoresist layer **40** exists only in the green pixel region (second filling area), and there is no photoresist between the upper and lower adjacent green pixel regions; The third photoresist layer **50** (red photoresist layer) is of an isolated type, i.e., the third photoresist layer **50** exists only in the red pixel region (third filling area), and there is no photoresist between the upper and lower adjacent red pixel regions; The first photoresist layer **30** (blue photoresist layer) is of a stripe type, and the first photoresist layer **30** is of a continuous strip shape with an entire blue photoresist layer in the up and down direction.

[0058] In this way, the first photoresist layer **30** may be made to be of a stripe type. In this condition, the first photoresist layer **30** may be formed into an entire photoresist layer in the up-down direction at one time, which may further simplify the structure and manufacturing process of the color filter **100**.

[0059] As shown in FIG. **4**, in some embodiments of the color filter **100** of the present disclosure, the edge of the second photoresist layer **40** extends outward of the second filling area and overlaps the surface of the black matrix **20** away from the base **10**, the second photoresist layer **40** overlaps the surface of the black matrix **20** and is recessed to form a first receiving groove **41**, and the second spacer **70** is defined in the first receiving groove **41**;

[0060] the edge of the third color resist layer **50** extends outside the third filling area and overlaps the surface of the black matrix **20** away from the base **10**, and the overlap of the third color resist layer **50** overlaps the surface of the black matrix **20**, recessing to form a second receiving groove **51**, and the third spacer **80** is defined in the second receiving groove **51**.

[0061] The following description takes the first spacer **60** as the main spacer, the second spacer **70** and the third spacer **80** as the auxiliary spacer, and the first photoresist layer **30**, the second photoresist layer **40**, and the third photoresist

layer **50** are respectively a blue photoresist layer, a green photoresist layer, and a red photoresist layer as examples.

[0062] In this embodiment, the first spacer **60** (main spacer) is defined on the blue photoresist layer (first photoresist layer **30**) between two adjacent blue pixel regions (first filling area); The second spacer **70** (auxiliary spacer) is defined on the green photoresist layer (second photoresist layer **40**) between two adjacent green pixel regions (second filling area); the third spacer **80** (the auxiliary spacer) is defined on the red photoresist layer (the third photoresist layer **50**) between two adjacent red pixel regions (the third filling area). In this condition, the first photoresist layer **30** (blue photoresist layer), the second photoresist layer **40** (green photoresist layer), and the third photoresist layer **50** (red photoresist layer) are all continuous (stripe type), each photoresist layer is a continuous strip shape, and the upper and lower direction is a whole photoresist layer. Further, the surface of the green photoresist layer (the second photoresist layer **40**) between two adjacent green pixel regions (the second filling area) is defined with a first receiving groove **41**, and the second spacer **70** (the auxiliary spacer) is defined in the first receiving groove **41**. The surface of the red photoresist layer (the third photoresist layer **50**) between two adjacent red pixel regions (the third filling area) is defined with a second receiving groove **51** in which the third spacer **80** (the auxiliary spacer) is defined.

[0063] In this condition, the thickness of the first color resist layer **30** is greater than the thickness of the second color resist layer **40**, and the difference in thickness between the two plusing the depth of the first receiving groove **41** may bring about the difference in height between the first spacer **60** and the second spacer **70**; In this condition, the thickness of the first color resist layer **30** is greater than the thickness of the third color resist layer **50**, and the difference between the thickness of the first color resist layer **30** and the thickness of the third color resist layer **50**, plusing the depth of the second receiving groove **51**, may bring about the difference in height between the first spacer **60** and the third spacer **80**, which may bring about the segment difference between the main spacer and the auxiliary spacer, thereby satisfying the liquid crystal redundancy requirement.

[0064] Therefore, it may be understood that the arrangement of the first receiving groove **41** and the second receiving groove **51** may play a role in improving the interval difference between the main spacer and the auxiliary spacer and ensuring liquid crystal redundancy.

[0065] Further, the first photoresist layer **30**, the second photoresist layer **40**, and the third photoresist layer **50** are all defined in a strip shape, and the first photoresist layer **30** includes a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix **20** away from the base **10**, and the first spacer **60** is located on the surface of the first overlapping portion away from the black matrix **20**;

[0066] The second color resist layer **40** includes a second overlapping portion located at one end thereof, the second overlapping portion is located outside the second filling area and overlaps the surface of the black matrix **20** away from the base **10**, and the surface of the second overlapping portion away from the black matrix **20** is recessed to form the first receiving groove **41**;

[0067] the third color resist layer **50** includes a third overlapping portion located at one end thereof, the third overlapping portion is located outside the third filling area and overlaps the surface of the black matrix **20** away from the base **10**, and the surface of the third overlapping portion away from the black matrix **20** is recessed to form the second receiving groove **51**.

[0068] Correspondingly, the first filling area, the second filling area and the third filling area are also defined in strips, and in the two adjacent pixels above and below, the two first filling areas are defined in strips along the vertical direction, and the arrangement of the second filling area and the third filling area is similar to the arrangement of the first filling area, which will not be described in detail here. In this condition, the first photoresist layer **30** (blue photoresist layer), the second photoresist layer **40** (green photoresist layer), and the third photoresist layer **50** (red photoresist layer) are all continuous (stripe type), each photoresist layer is a continuous strip shape, and the upper and lower direction is a whole photoresist layer.

[0069] In this way, each photoresist layer may be made to be of a stripe type, and at this time, each photoresist layer may be formed into an entire photoresist layer in the up-down direction at one time, thereby further simplifying the structure and manufacturing process of the color filter **100**.

[0070] As shown in FIG. **5** and FIG. **6**, in some embodiments of the color filter **100** of the present disclosure, the surface of the black matrix **20** adjacent to the second filling area is recessed to form a first receiving groove **21**, the edge of the second photoresist layer **40** extends toward the first receiving groove **21** and is at least partially accommodated in the first receiving groove **21**, and the second spacer **70** is defined on the surface of the second photoresist layer **40** trapped in the first receiving groove **21**;

[0071] The surface of the black matrix **20** adjacent to the third filling area is recessed to form a second receiving groove **23**, the edge of the third photoresist layer **50** extends toward the second receiving groove **23** and is at least partially accommodated in the second receiving groove **23**, and the third spacer **80** is defined on the surface of the third photoresist layer **50** accommodated in the second receiving groove **23**.

[0072] The following description takes the first spacer **60** as the main spacer, the second spacer **70** and the third spacer **80** as the auxiliary spacer, and the first photoresist layer **30**, the second photoresist layer **40**, and the third photoresist layer **50** are respectively a blue photoresist layer, a green photoresist layer, and a red photoresist layer as examples.

[0073] In this embodiment, the first spacer **60** (main spacer) is defined on the blue photoresist layer (first photoresist layer **30**) between two adjacent blue pixel regions (first filling area); The second spacer **70** (auxiliary spacer) is defined on the green photoresist layer (second photoresist layer **40**) between two adjacent green pixel regions (second filling area); the third spacer **80** (the auxiliary spacer) is defined on the red photoresist layer (the third photoresist layer **50**) between two adjacent red pixel regions (the third filling area). In this condition, the first photoresist layer **30** (blue photoresist layer), the second photoresist layer **40** (green photoresist layer), and the third photoresist layer **50** (red photoresist layer) are all continuous (stripe type), each photoresist layer is a continuous strip shape, and the upper and lower direction is a whole photoresist layer. Further, the surface of the black matrix **20** between two adjacent green pixel areas (second filling area) is defined with a first

receiving groove **21**, and the surface of the black matrix **20** between two adjacent red pixel areas (third filling area) is defined with a second receiving groove **23**. In this condition, the arrangement of the first receiving groove **21** may cause the surface of the second photoresist layer **40** to sink to the same depth as that of the first receiving groove **21**, and the second spacer **70** (auxiliary spacer) is defined on the surface of the second photoresist layer **40** accommodated in the first receiving groove **21**; The arrangement of the second accommodation groove **23** may make the surface of the third photoresist layer **50** sink to the same depth as that of the second accommodation groove **23**, and the third spacer **80** (auxiliary spacer) is defined on the surface of the third photoresist layer **50** that sinks into the second accommodation groove **23**.

[0074] In this condition, the thickness of the first color resist layer **30** is greater than the thickness of the second color resist layer **40**, and the difference in thickness between the two plusing the depth of the first receiving groove **21** may bring about the difference in height between the first spacer **60** and the second spacer **70**; In this condition, the thickness of the first color resist layer **30** is greater than the thickness of the third color resist layer **50**, and the difference between the thickness of the first color resist layer **30** and the thickness of the third color resist layer **50**, plusing the depth of the second receiving groove **23**, may bring about the difference in height between the first spacer **60** and the third spacer **80**, which may bring about the segment difference between the main spacer and the auxiliary spacer, thereby satisfying the liquid crystal redundancy requirement.

[0075] Therefore, it may be understood that the arrangement of the first receiving groove **21** and the second receiving groove **23** may play a role in improving the interval difference between the main spacer and the auxiliary spacer and ensuring liquid crystal redundancy.

[0076] Further, in the color filter **100** in some embodiments of of the present disclosure, the first color resist layer **30**, the second color resist layer **40**, and the third color resist layer **50** are all defined in a strip shape, the first color resist layer **30** includes a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix **20** away from the base **10**, and the first spacer **60** is located on the surface of the first overlapping portion away from the black matrix **20**.

[0077] The second photoresist layer **40** includes a second overlapping portion located at one end thereof, the second overlapping portion is located outside the second filling area and partially immersed in the first receiving groove **21**, and the second spacer **70** is located on the surface of the second overlapping portion immersed in the first receiving groove **21**;

[0078] the third photoresist layer **50** includes a third overlapping portion located at one end thereof, the third overlapping portion is located outside the third filling area and partially immersed in the second receiving groove **23**, and the third spacer **80** is located on the surface of the third overlapping portion immersed in the second receiving groove **23**.

[0079] Correspondingly, the first filling area, the second filling area and the third filling area are also defined in strips, and in the two adjacent pixels above and below, the two first filling areas are defined in strips along the vertical direction, and the arrangement of the second filling area and the third filling area is similar to the arrangement of the first filling area, which will not be described in detail here. In this condition, the first photoresist layer **30** (blue photoresist layer), the second photoresist layer **40** (green photoresist layer), and the third photoresist layer **50** (red photoresist layer) are all continuous (stripe type), each photoresist layer is a continuous strip shape, and the upper and lower direction is a whole photoresist layer.

[0080] In this way, each photoresist layer may be made to be of a stripe type, and at this time, each photoresist layer may be formed into an entire photoresist layer in the up-down direction at one time, thereby further simplifying the structure and manufacturing process of the color filter **100**.

[0081] As shown in FIGS. **4** and **5**, the thickness of the first photoresist layer **30** is greater than the thickness of the second photoresist layer **40**, and the thickness of the first photoresist layer **30** is greater than the thickness of the third photoresist layer **50**. In this way, it may improve the segment difference between the main spacer and the auxiliary spacer and ensure liquid crystal redundancy.

[0082] Further, the thickness of the second color resist layer **40** is equivalent to that of the third color resist layer **50**. In this way, the forming of the second photoresist layer **40** and the forming of the third photoresist layer **50** may realize the multiplexing of certain instruments, devices, instruments, parameters and the like, thereby further simplifying the structure and manufacturing process of the color filter **100**.

[0083] As shown in FIGS. **5** and **6**, the present disclosure also proposes a color filter **100**, which includes:

[0084] a base **10**,

[0085] a black matrix **20**, defined on one plate surface of the base **10**, the black matrix **20** defining a first filling area, a second filling area and a third filling area at intervals; first filling area, a second filling area and a third filling area are defined in a strip shape, the surface of the black matrix **20** adjacent to one end of the second filling area recesses to form a first receiving groove **21**, the surface of the black matrix **20** adjacent to one end the third filling area recesses to form a second receiving groove **23**,

[0086] a color filter layer, including a first photoresist layer **30**, a second photoresist layer **40**, and a third photoresist layer **50**, the first photoresist layer **30**, the second photoresist layer **40**, and the third photoresist layer **50** are all defined in strips, the first photoresist layer **30** is filled in the first filling area, the second photoresist layer **40** is filled in the second filling area, and the third photoresist layer **50** is filled in the third filling area;

[0087] the first color resist layer **30** includes a first overlapping portion at one end thereof, the first overlapping portion being outside the first filling area and overlapping the surface of the black matrix **20** away from the base **10**;

[0088] the second photoresist layer **40** includes a second overlapping portion at one end thereof, the second overlapping portion being outside the second filling area and partially accommodated in the first receiving groove **21**;

[0089] the third photoresist layer **50** includes a third overlapping portion at one end thereof, the third overlapping portion being outside the third filling area and partially accommodated in the second receiving groove **23**; and

[0090] a spacer, including a first spacer **60**, a second spacer **70**, and a third spacer **80**, and the first spacer **60** is defined on the surface of the first overlapping portion away

from the black matrix **20**; and the second spacer **70** is defined on the surface of the second overlapping portion accommodated in the first receiving groove **21**; and the third spacer **80** is defined on the surface of the third overlapping portion accommodated in the second receiving groove **23**, the surface of a free end of the first spacer **60** is higher than the surface of a free end of the second spacer **70**, the surface of a free end of the first spacer **60** is higher than the surface of a free end of the third spacer **80**.

[0091] The present disclosure also proposes a liquid crystal panel including an array substrate and a color filter **100** as described above. The specific structure of the color filter **100** refers to the above embodiments. Since this liquid crystal panel adopts all the technical solutions of all the above embodiments, it has at least all the effects brought about by all the technical solutions of all the above embodiments and will not be described here.

[0092] The array substrate and the color filter **100** are defined facing to each other, and abut against the first spacer **60**.

[0093] The present disclosure also proposes a display device including a liquid crystal panel whose specific structure refers to the above-mentioned embodiments. Since the display device adopts all the technical solutions of all the above-mentioned embodiments, it has at least all the effects brought about by all the technical solutions of all the above-mentioned embodiments and will not be described in detail here.

[0094] The above is only an alternative embodiment of the present disclosure and is not therefore limiting the scope of the patent disclosure. Any equivalent structural change made by using the contents of the specification and drawings of the present disclosure or directly/indirectly applied in other related technical fields is included in the scope of the patent protection of the present disclosure under the inventive concept of the present disclosure.

What is claimed is:

1. A color filter, comprising:

a base;

a black matrix, defined on one plate surface of the base, the black matrix defining a first filling area, a second filling area and a third filling area at intervals; a color filter layer, comprising a first photoresist layer, a second photoresist layer, and a third photoresist layer, wherein the first photoresist layer is filled in the first filling area, the second photoresist layer is filled in the second filling area, the third photoresist layer is filled in the third filling area, and the edge of the first photoresist layer extends outside the first filling area and overlaps the surface of the black matrix away from the base; and a spacer, comprising a first spacer, a second spacer and a third spacer, wherein the first spacer is defined on the surface of the first photoresist layer overlapping the black matrix, the second spacer and the third spacer are defined above the black matrix, the surface of a free end of the first spacer is higher than the surface of a free end of the second spacer, the surface of a free end of the first spacer is higher than the surface of a free end of the third spacer.

2. The color filter according to claim **1**, wherein the second spacer and the third spacer are both defined on the surface of the black matrix away from the base.

3. The color filter according to claim **2**, wherein the first photoresist layer, the second photoresist layer, and the third photoresist layer are all defined in a strip shape, the first photoresist layer comprises a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix away from the base, and the first spacer is defined on the surface of the first overlapping portion away from the black matrix.

4. The color filter according to claim **1**, wherein and the edge of the second photoresist layer extends outside the second filling area and overlaps the surface of the black matrix away from the base; the surface of the second photoresist layer overlapping a surface of the black matrix recesses to form a first receiving groove, and the second spacer is defined in the first receiving groove; and the edge of the third photoresist layer extends outside the third filling area and overlaps the surface of the black matrix away from the base; the surface of the third photoresist layer overlapping the black matrix recesses to form a second receiving groove, and the third spacer is defined in the second receiving groove.

5. The color filter according to claim **4**, wherein the first photoresist layer, the second photoresist layer, and the third photoresist layer are all defined in a strip shape, the first photoresist layer comprises a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix away from the base, and the first spacer is defined on the surface of the first overlapping portion away from the black matrix; the second photoresist layer comprises a second overlapping portion located at one end thereof, the second overlapping portion is located outside the second filling area and overlaps the surface of the black matrix away from the base, the surface of the second overlapping portion away from the black matrix recesses to form a first receiving groove, the third photoresist layer comprises a third overlapping portion located at one end thereof, the third overlapping portion is located outside the third filling area and overlaps the surface of the black matrix away from the base, the surface of the third overlapping portion away from the black matrix recesses to form a second receiving groove.

6. The color filter according to claim **1**, wherein the surface of the black matrix adjacent to the second filling area recesses to form a first receiving groove, the edge of the second photoresist layer extends toward the first receiving groove and is at least partially accommodated in the first receiving groove, and the second spacer is defined on the surface of the second photoresist layer accommodated in the first receiving groove; the surface of the black matrix adjacent to the third filling area recesses to form a second receiving groove, the edge of the third photoresist layer extends toward the second receiving groove and is at least partially accommodated in the second receiving groove, and the third spacer is defined on the surface of the third photoresist layer accommodated in the second receiving groove.

7. The color filter according to claim **6**, wherein the first photoresist layer, the second photoresist layer, and the third photoresist layer are all defined in a strip shape, the first photoresist layer comprises a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix away from the base, and the first spacer is defined on the surface of the first overlapping portion

away from the black matrix; the second photoresist layer comprises a second overlapping portion located at one end thereof, the second overlapping portion is defined outside the second filling area and partially accommodated in the first receiving groove, and the second spacer is defined on the surface of the second overlapping portion accommodated in the first receiving groove; the third photoresist layer comprises a third overlapping portion located at one end thereof, the third overlapping portion is defined outside the third filling area and partially accommodated in the second receiving groove, and the third spacer is defined on the surface of the third overlapping portion accommodated in the second receiving groove.

8. The color filter according to claim **1**, wherein the thickness of the first photoresist layer is greater than the thickness of the second photoresist layer, the thickness of the first photoresist layer is greater than the thickness of the third photoresist layer, the thickness of the second photoresist layer is equal to the thickness of the third photoresist layer.

9. The color filter according to claim **1**, wherein the first photoresist layer, the second photoresist layer and the third photoresist layer are respectively a blue photoresist layer, a green photoresist layer, and a red photoresist layer.

10. A color filter, comprising:

a base;

a black matrix, defined on one plate surface of the base, the black matrix defining a first filling area, a second filling area and a third filling area at intervals; first filling area, a second filling area and a third filling area are defined in a strip shape, the surface of the black matrix adjacent to one end of the second filling area recesses to form a first receiving groove, the surface of the black matrix adjacent to one end the third filling area recesses to form a second receiving groove, a color filter layer, comprising a first photoresist layer, a second photoresist layer, and a third photoresist layer, the first photoresist layer, the second photoresist layer, and the third photoresist layer are all defined in a strip shape, the first photoresist layer is filled in the first filling area, the second photoresist layer is filled in the second filling area, the third photoresist layer is filled in the third filling area, the first photoresist layer comprises a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix away from the base, the second photoresist layer comprises a second overlapping portion located at one end thereof, the second overlapping portion is defined outside the second filling area and partially accommodated in the first receiving groove, the third photoresist layer comprises a third overlapping portion located at one end thereof, the third overlapping portion is defined outside the third filling area and partially accommodated in the second receiving groove, and a spacer, comprising a first spacer, a second spacer and a third spacer, and the first spacer is defined on the surface of the first overlapping portion away from the black matrix; and the second spacer is defined on the surface of the second overlapping portion accommodated in the first receiving groove; and the third spacer is defined on the surface of the third overlapping portion accommodated in the second receiving groove, the surface of a free end of the first spacer is higher than the surface of a free end of the second spacer, the surface of a free end of the first spacer is higher than the surface of a free end of the third spacer.

11. The color filter according to claim **10**, wherein the first photoresist layer, the second photoresist layer and the third photoresist layer are respectively a blue photoresist layer, a green photoresist layer, and a red photoresist layer.

12. A liquid crystal panel, comprising an array substrate and a color filter, the color filter comprising: a base; a black matrix, defined on one plate surface of the base, the black matrix defining a first filling area, a second filling area and a third filling area at intervals; a color filter layer, comprising a first photoresist layer, a second photoresist layer, and a third photoresist layer, the first photoresist layer is filled in the first filling area, the second photoresist layer is filled in the second filling area, the third photoresist layer is filled in the third filling area, and the edge of the first photoresist layer extends outside the first filling area and overlaps the surface of the black matrix away from the base; and a spacer, comprising a first spacer, a second spacer and a third spacer, wherein the first spacer is defined on the surface of the first photoresist layer overlapping the black matrix, the second spacer and the third spacer are defined above the black matrix, the surface of a free end of the first spacer is higher than the surface of a free end of the second spacer, the surface of a free end of the first spacer is higher than the surface of a free end of the third spacer; the array substrate and the color filter are defined facing to each other, and abut against the first spacer.

13. The liquid crystal panel according to claim **12**, wherein the second spacer and the third spacer are both defined on the surface of the black matrix away from the base.

14. The display panel according to claim **13**, wherein the first photoresist layer, the second photoresist layer, and the third photoresist layer are all defined in a strip shape, the first photoresist layer comprises a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix away from the base, and the first spacer is defined on the surface of the first overlapping portion away from the black matrix.

15. The display panel according to claim **12**, wherein and the edge of the second photoresist layer extends outside the second filling area and overlaps the surface of the black matrix away from the base; the surface of the second photoresist layer overlapping a surface of the black matrix recesses to form a first receiving groove, and the second spacer is defined in the first receiving groove; and the edge of the third photoresist layer extends outside the third filling area and overlaps the surface of the black matrix away from the base; the surface of the third photoresist layer overlapping the black matrix recesses to form a second receiving groove, and the third spacer is defined in the second receiving groove.

16. The display panel according to claim **15**, wherein the first photoresist layer, the second photoresist layer, and the third photoresist layer are all defined in a strip shape, the first photoresist layer comprises a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix away from the base, and the first spacer is defined on the surface of the first overlapping portion away from the black matrix; the second photoresist layer

comprises a second overlapping portion located at one end thereof, the second overlapping portion is located outside the second filling area and overlaps the surface of the black matrix away from the base, the surface of the second overlapping portion away from the black matrix recesses to form a first receiving groove, the third photoresist layer comprises a third overlapping portion located at one end thereof, the third overlapping portion is located outside the third filling area and overlaps the surface of the black matrix away from the base, the surface of the third overlapping portion away from the black matrix recesses to form a second receiving groove.

17. The display panel according to claim **12**, wherein the surface of the black matrix adjacent to the second filling area recesses to form a first receiving groove, the edge of the second photoresist layer extends toward the first receiving groove and is at least partially accommodated in the first receiving groove, and the second spacer is defined on the surface of the second photoresist layer accommodated in the first receiving groove; the surface of the black matrix adjacent to the third filling area recesses to form a second receiving groove, the edge of the third photoresist layer extends toward the second receiving groove and is at least partially accommodated in the second receiving groove, and the third spacer is defined on the surface of the third photoresist layer accommodated in the second receiving groove.

18. The display panel according to claim **17**, wherein the first photoresist layer, the second photoresist layer, and the third photoresist layer are all defined in a strip shape, the first photoresist layer comprises a first overlapping portion located at one end thereof, the first overlapping portion is located outside the first filling area and overlaps the surface of the black matrix away from the base, and the first spacer is defined on the surface of the first overlapping portion away from the black matrix; the second photoresist layer comprises a second overlapping portion located at one end thereof, the second overlapping portion is defined outside the second filling area and partially accommodated in the first receiving groove, and the second spacer is defined on the surface of the second overlapping portion accommodated in the first receiving groove; the third photoresist layer comprises a third overlapping portion located at one end thereof, the third overlapping portion is defined outside the third filling area and partially accommodated in the second receiving groove, and the third spacer is defined on the surface of the third overlapping portion accommodated in the second receiving groove.

19. The display panel according to claim **12**, wherein the thickness of the first photoresist layer is greater than the thickness of the second photoresist layer, the thickness of the first photoresist layer is greater than the thickness of the third photoresist layer, the thickness of the second photoresist layer is equal to the thickness of the third photoresist layer.

20. The display panel according to claim **12**, wherein the first photoresist layer, the second photoresist layer and the third photoresist layer are respectively a blue photoresist layer, a green photoresist layer, and a red photoresist layer.

* * * * *

专利名称(译)	彩色滤光片和液晶面板		
公开(公告)号	US20200103699A1	公开(公告)日	2020-04-02
申请号	US16/257082	申请日	2019-01-25
[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		
发明人	LIU, ZHONGNIAN		
IPC分类号	G02F1/1335 G02F1/1339 G02B5/20		
CPC分类号	G02F1/133512 G02F1/13394 G02F1/133514 G02B5/201 G02F2001/13396		
优先权	201811157048.8 2018-09-30 CN		
外部链接	Espacenet USPTO		

摘要(译)

本发明公开了一种彩色滤光片和液晶面板，其中，彩色滤光片包括三个垫片，第一垫片限定在第一光刻胶层的表面上，第二垫片和第三垫片限定在黑底上方，并且 第一间隔物高于第二间隔物和第三间隔物。