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(54) **COLOR FILTER SUBSTRATE, ARRAY SUBSTRATE, DISPLAY PANEL AND DISPLAY DEVICE**

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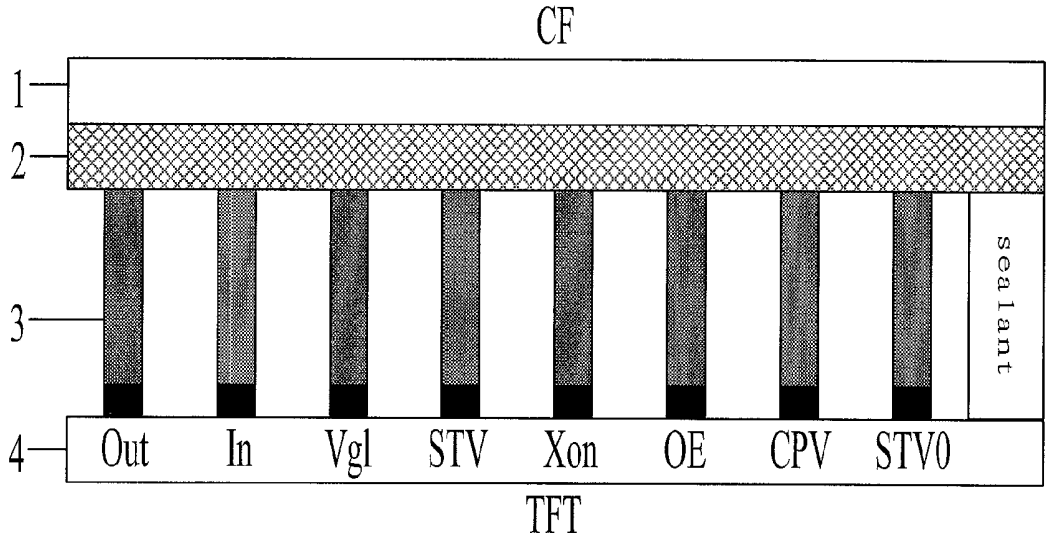
(57) **ABSTRACT**

The invention provides a color filter substrate, an array substrate, a display panel and a display device. By providing a protective layer used for protecting a peripheral circuit on the array substrate from static electricity-induced corrosion, occurrence of static electricity-induced corrosion in the peripheral circuit on the array substrate can be prevented to improve image quality of LCD device and reduce cost loss caused by a great many of defective products.



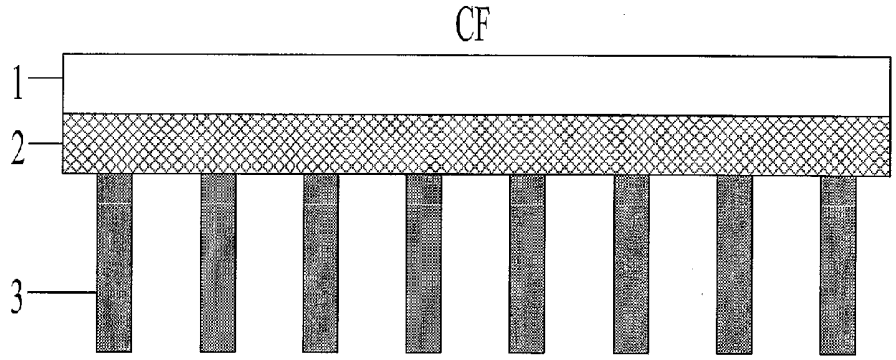


Fig.1

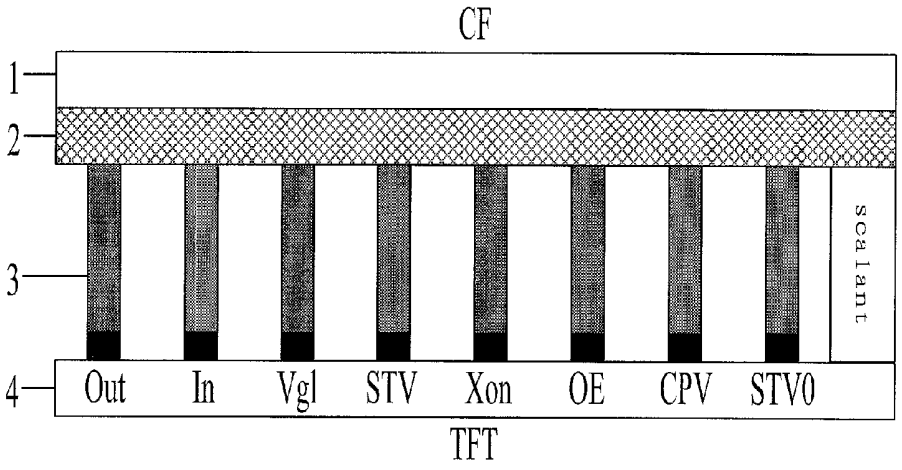


Fig.2

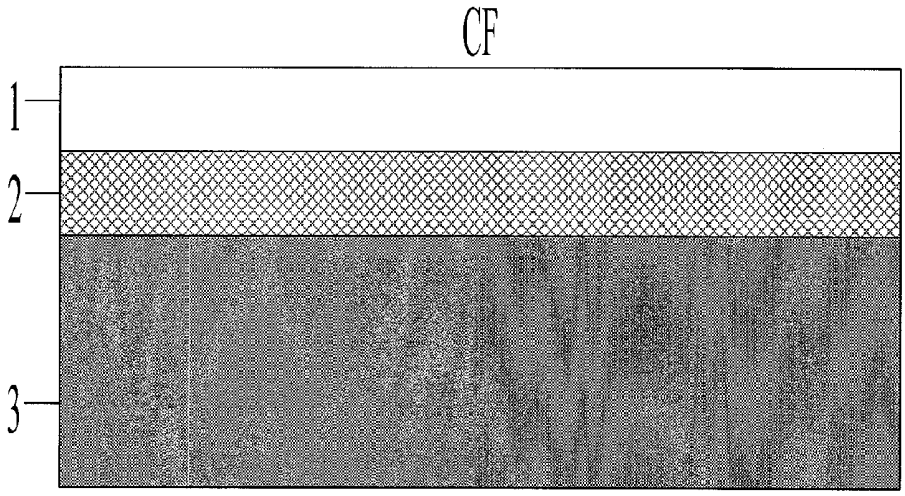


Fig.3

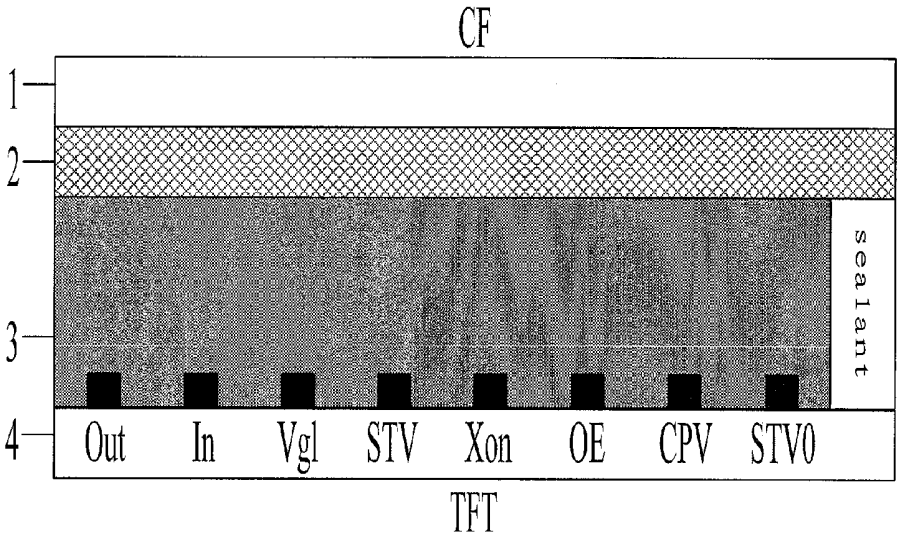
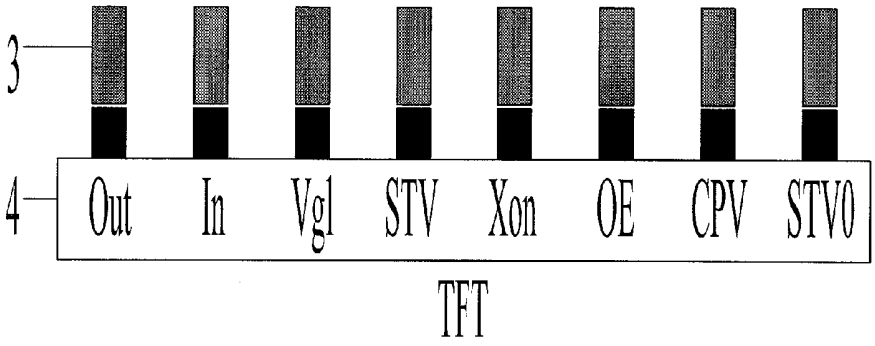


Fig.4


3
4
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Xon
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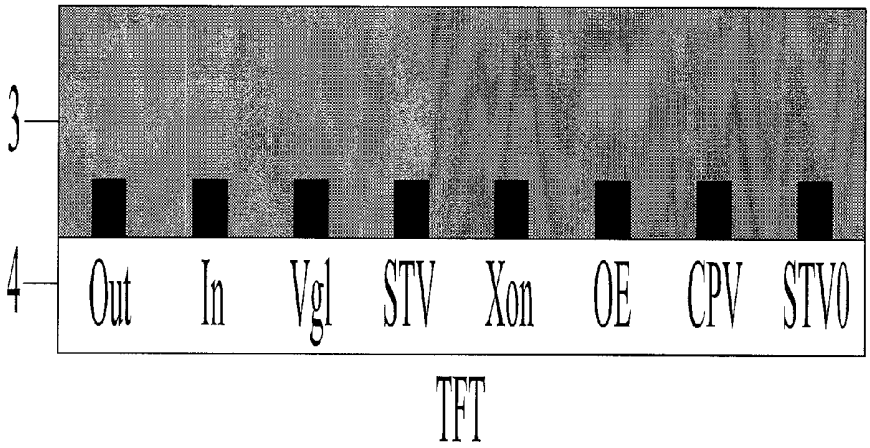
CPV
STV0
TFT

Fig.5


3
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STV0
TFT

Fig.6

COLOR FILTER SUBSTRATE, ARRAY SUBSTRATE, DISPLAY PANEL AND DISPLAY DEVICE

RELATED REFERENCE

[0001] This application claims priority from China Patent Application No.201210447704.4, filed on Nov. 9, 2012, which is also hereby incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field Of The Invention

[0003] The present invention relates to a technology field of Liquid Crystal Display, particularly relates to a color filter substrate, an array substrate, a display panel and a display device.

[0004] 2. Description Of The Prior Art

[0005] In the existing LCD devices, defective products with abnormal state display are often found. A study shows that a phenomenon of static electricity-induced corrosion exists in signal line on the array substrate (TFT) of display panels in most of the defective products. The phenomenon not only causes products defectiveness, but also more seriously, leads to products being scrapped directly.

[0006] And through analysis, it is found that the phenomenon is usually caused by that static electricity occurring between common electrode on color filter substrate (CR) and peripheral circuit on array substrate (TFT) causes signal line to be corroded.

SUMMARY OF THE INVENTION

[0007] The present invention provides a color filter substrate, an array substrate, a display panel and a display device, thereby preventing from occurrence of corrosion induced by static electricity in peripheral circuit on array substrate.

[0008] The present invention provides solution as following.

[0009] Example of the present invention provides a color filter substrate, comprising:

[0010] a protective layer used for protecting a peripheral circuit on a array substrate from static electricity-induced corrosion.

[0011] Preferably, the protective layer is provided in the area of a color filter substrate corresponding to the peripheral circuit on the array substrate.

[0012] After a liquid crystal cell is formed from the color filter substrate and the array substrate, the protective layer is located between a common electrode on the color filter substrate and the peripheral circuit on the array substrate.

[0013] Preferably, the protective layer is a spacer.

[0014] Preferably, the protective layer is formed of insulation materials.

[0015] Preferably, the protective layer comprises one or more strips, and each of strips protects one line of the peripheral circuit on the array substrate.

[0016] Example of the present invention also provides an array substrate, comprising

[0017] a protective layer used for protecting a peripheral circuit on a array substrate from static electricity-induced corrosion.

[0018] Preferably, the protective layer is located above the peripheral circuit on the array substrate.

[0019] After a liquid crystal cell is formed from the color filter substrate and the array substrate, the protective layer is located between a common electrode on the color filter substrate and the peripheral circuit on the array substrate.

[0020] Preferably, the protective layer is provided on a passivated layer or a transparent pixel electrode layer.

[0021] Preferably, the protective layer is formed of insulation materials.

[0022] Preferably, the protective layer comprises one or more strips, and each of strips protects one line of the peripheral circuit on the array substrate.

[0023] Example of the present invention also provides a display panel, wherein the display panel comprises the above color filter substrate in example of the present invention and/or the above array substrate in example of the present invention.

[0024] Example of the present invention also provides a display device, wherein the display device comprises the above display panel in example of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] FIG. **1** is a structural schematic diagram 1 of the color filter substrate in example of the present invention,

[0026] FIG. **2** is a structural schematic diagram 1 of a liquid crystal cell formed from the color filter substrate and the array substrate (i.e. display panel) in example of the present invention,

[0027] FIG. **3** is structural schematic diagram 2 of the color filter substrate in example of the present invention,

[0028] FIG. **4** is structural schematic diagram 2 of a liquid crystal cell formed from the color filter substrate and the array substrate (i.e. display panel) in example of the present invention,

[0029] FIG. **5** is structural schematic diagram 1 of the array substrate in example of the present invention;

[0030] FIG. **6** is structural schematic diagram 2 of the array substrate in example of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0031] The present invention provides a color filter substrate, particularly comprising a protective layer used for protecting a peripheral circuit of a array substrate from static electricity-induced corrosion.

[0032] The color filter substrate in example of the present invention can prevent from occurrence of static electricity-induced corrosion on the peripheral circuit of the array substrate by providing the protective layer for protecting the peripheral circuit on the array substrate from static electricity-induced corrosion, thereby improve image quality of LCD device and reduce cost loss caused by a great many of defective products.

[0033] After analysis, it is found that electrical fields are generated between a common electrode and the signal line because the common electrode (ITO) and the signal line of the peripheral circuit on the array substrate in the color filter substrate (CF) have different voltage separately, and the electrical fields triggers electrostatic breakdown of the signal line metal layer of the peripheral circuit on the array substrate, thereby causes occurrence of static electricity-induced corrosion in the peripheral circuit on the array substrate.

[0034] Therefore, to prevent from occurrence of static electricity-induced corrosion, the protective layer related in example of the present invention is preferably provided between the common electrode of the color filter substrate

and the peripheral circuit of the array substrate, thereby it can sufficiently protect the peripheral circuit of the array substrate after a liquid crystal cell is formed from a color filter substrate and the array substrate.

[0035] As described above, static electricity-induced corrosion is usually caused by static electricity, for more effectively preventing from occurrence of static electricity-induced corrosion in the peripheral circuit on the array substrate, the protective layer related in example of the present invention can be formed of insulation materials, particularly non-electrical conductive materials or materials having the permittivity of greater than 1, e.g. resin, etc. The protective layer can be formed of the same materials with the spacer of the color filter substrate in order to not increase cost.

[0036] In example of the present invention, because the protective layer can be formed of insulation materials, generation of static electricity between the common electrode of the color filter substrate and the peripheral circuit of the array substrate can be fundamentally prevented, and thereby corrosion caused by electrostatic breakdown of the peripheral circuit metal layer on the array substrate can be effectively prevented.

[0037] The protective layer related in example of the present invention can be provided in the same layer with the common electrode (ITO) of the color filter substrate or the peripheral circuit of the array substrate to achieve protection for the peripheral circuit of array substrate.

[0038] Meanwhile, the protective layer can be particularly provided in the area in the color filter substrate corresponding to the peripheral circuit of the array substrate. After the liquid crystal cell be formed from the color filter substrate and the array substrate, it is necessary that the protective layer covers the areas of the array substrate that the peripheral circuit occupies on the array substrate.

[0039] The protective layer in the color filter substrate can be located above the peripheral circuit on the array substrate, for example, an output signal line for repair, an input signal line for repair, a gate low voltage, a gate electrode start signal line (STV), an output eliminate blur signal (Xon), an output circuit of signal, a clock pulse vertical signal (CPV) and gate electrode start signal line (STV (0)), etc. Furthermore the protective layer can also be located above via holes of the passivated layer, thereby achieving to cover the peripheral circuit of the array substrate to prevent from static electricity-induced corrosion in peripheral circuit of the array substrate.

[0040] The protective layer provided in the color filter substrate can be particularly achieved by the existing layer or the new layer in the color filter substrate.

[0041] In a preferred example, the protective layer provided in the color filter substrate can be particularly a spacer provided around the panel.

[0042] In that way, the color filter substrate in example of the present invention can be particularly shown as FIG. **1**, particularly comprising:

[0043] a substrate **1**, a common electrode (ITO) **2** on the color filter substrate, a spacer **3** and other devices, such as black matrix, color filter, etc, which is not shown in FIG. **1**.

[0044] In the example shown in FIG. **1**, the spacer **3** (the protective layer) can be particularly geometric shape such as strip etc, that is, the protective layer can be particularly consisted of one or more spacers **3** with strip geometric shape.

[0045] After the liquid crystal cell is formed from the color filter substrate and the array substrate, as shown in FIG. **2** (symbol **4** indicates substrate of the array substrate, black square symbol indicates signal line of the peripheral circuit of the array substrate), each of spacers **3** (i.e. the protective layer) can cover one line of the peripheral circuit (e.g. STV, CPV, etc) of array substrate based on the contact way. Thus it is achieved to prevent electrostatic corrosion occurring on array substrate peripheral circuit.

[0046] In the other example, as shown in FIG. **3**, the spacers **3** (the protective layer) around the panel can also be an integrated structure.

[0047] In this way, after the liquid crystal cell is formed from the color filter substrate and the array substrate, as shown in FIG. **4**, the spacers **3** cover the peripheral circuit of the array substrate similarly, and also prevent from static electricity-induced corrosion in the peripheral circuit on the array substrate.

[0048] As the spacers can be used as the protective layer (or the protective layer which is provided and generated on the same layer with the spacers) in example of the present invention, the layer structure and manufacture process of the existing color filter substrate are not changed.

[0049] In example of the present invention, due to the spacers as the protective layer being regularly provided around the panel, it is possible to maintain thickness of the liquid crystal cell effectively, prevent from light leak caused by the following manufacture process.

[0050] In the example above, technical solutions in example of the present invention are illustrated in the way that the spacers **3** on the color filter substrate are used as the protective layer, but the protective layer in example of the present invention can also be provided in other layers on color filter substrate. For example, the protective layer is provided in a new layer on the color filter substrate corresponding to the peripheral circuit on the array substrate. Preferably, the new layer is provided between the common electrode on the color filter substrate and the peripheral circuit on the array substrate.

[0051] Example of the present invention also provides an array substrate, particularly comprising the protective layer **3** for protecting the peripheral circuit of the array substrate from static electricity-induced corrosion.

[0052] From the foregoing, static electricity-induced corrosion is usually caused by static electricity between the common electrode of the color filter substrate and the peripheral circuit of the array substrate. In the example of the present invention, the protective layer **3** in the array substrate can be provided between the common electrode of the color filter substrate and the peripheral circuit of the array substrate. After the liquid crystal cell is formed from the color filter substrate and the array substrate, the protective layer **3** can protect the peripheral circuit of the array substrate effectively.

[0053] Preferably, the protective layer **3** on the array substrate can be provided above the peripheral circuit of the array substrate or on the top layer of all layers on the array substrate, e.g. above the pixel electrode (ITO) or the passivated layer.

[0054] From the foregoing, static electricity-induced corrosion is usually caused by static electricity, thus the protective layer in example of the present invention can be formed of insulation materials, in order to better prevent from static electricity-induced corrosion in peripheral circuit on the array substrate. Particularly, the materials can be non electrical conductivity or have permittivity of greater than 1, e.g. resin, etc. In order to not increase the manufacture cost, the protec-

tive layer can be formed of the same materials with those of an insulating layer (e.g. the passivated layer) on the array substrate.

[0055] In example of the present invention, as the protective layer can be formed of insulation materials, the generation of static electricity between the common electrode of the color filter substrate and the peripheral circuit of the array substrate can be fundamentally prevented, and thereby corrosion caused by electrostatic breakdown of the peripheral circuit metal layer on the array substrate can have been effectively prevented.

[0056] The protective layer **3** on the array substrate can also be consisted of one or more blocks having geometric shape such as strip etc., as shown in FIG. **5**. In FIG. **5**, the protective layer **3** is provided above the peripheral circuit, symbol **4** indicates the substrate of the array substrate, and other layers of the array substrate, such as a gate metal layer, a source/drain metal layer, a passivated layer, a pixel electrode layer, alignment layer, etc, are not shown in FIG. **5**. That is, each of the protective layers **4** covers one line of the peripheral circuit on array substrate.

[0057] It's important to note that, the technical solution of example of the present invention is just illustrated by FIGS. **1-6** shown in the present invention, wherein some layers on the color filter substrate or the array substrate are omitted, and the omitted layers can be provided in the same way with the existing technology.

[0058] Similarly, the protective layer **3** on the array substrate can also be an integrated layer, as shown in FIG. **6**. In FIG. **6**, other layers such as gate metal layer on the array substrate are not shown. That is, the protective layer **3** covers overall of peripheral circuit on the array substrate.

[0059] Based on the color filter substrate and/or the array substrate in example of the present invention, example of the present invention can provide a display panel.

[0060] The display panel, particularly, can comprise the above color filter substrate and/or the above array substrate in example of the present invention.

[0061] That is, the display panel comprises the protective layer for protecting the peripheral circuit on array substrate from static electricity-induced corrosion.

[0062] The protective layer particularly can be set between color filter substrate and/or array substrate in the display panel.

[0063] Based on the above display panel in example of the present invention, example of the present invention can also provide a display device comprising the display panel in example the present invention.

[0064] The display device can be such as a liquid crystal panel, an electronic paper, an OLED panel, a LCD TV, a liquid crystal display, a DPF, a cell phone, a tablet PC and any other products or components having a display function.

[0065] From the foregoing, the color filter substrate, the array substrate, the display panel and the display device in example of the present invention can prevent from undesired static electricity-induced corrosion of the peripheral circuit on the array substrate by providing the protective layer for protecting the peripheral circuit of the array substrate from static electricity-induced corrosion static electricity-induced corrosion to improve image quality of LCD device and reduce cost loss caused by a great many of defective products.

[0066] Although the embodiments of the present invention have been described, the protection scope of the present invention is not limited thereto. Those changes or substitutions which can be realized by those skilled in the art according to the disclosure of the present invention should be included therein.

What is claimed is:

1. A color filter substrate comprising:

a protective layer used for protecting a peripheral circuit of a array substrate from static electricity-induced corrosion.

2. The color filter substrate according to claim **1**, wherein the protective layer is provided in the area of the color filter substrate corresponding to the peripheral circuit on the array substrate, and the protective layer is located between a common electrode on the color filter substrate and the peripheral circuit on the array substrate, after a liquid crystal cell is formed from the color filter substrate and the array substrate.

3. The color filter substrate according to claim **1**, wherein the protective layer is a spacer.

4. The color filter substrate according to claim **1**, wherein the protective layer is formed of insulation materials.

5. The color filter substrate according to claim **2**, wherein the protective layer is formed of insulation materials.

6. The color filter substrate according to claim **3**, wherein the protective layer is formed of insulation materials.

7. The color filter substrate according to claim **1**, wherein the protective layer compromises one or more strips, and each of strips protects one line of the peripheral circuit of the array substrate.

8. The color filter substrate according to claim **2**, wherein the protective layer compromises one or more strips, and each of strips protects one line of the peripheral circuit of the array substrate.

9. The color filter substrate according to claim **3**, wherein the protective layer compromises one or more strips, and each of strips protects one line of the peripheral circuit of the array substrate.

10. The color filter substrate according to claim **4**, wherein the protective layer compromises one or more strips, and each of strips protects one line of the peripheral circuit of the array substrate.

11. A array substrate comprising:

a protective layer used for protecting the peripheral circuit of the array substrate from static electricity-induced corrosion.

12. The array substrate according to claim **11**, wherein the protective layer is located above the peripheral circuit on the array substrate, and the protective layer is located between a common electrode on the color filter substrate and the peripheral circuit on the array substrate, after a liquid crystal cell is formed from the color filter substrate and the array substrate.

13. The array substrate according to claim **11**, wherein the protective layer is provided on a passivated layer or a transparent pixel electrode layer.

14. The array substrate according to claim **11**, wherein the protective layer is formed of insulation materials.

15. The array substrate according to claim **12**, wherein the protective layer is formed of insulation materials.

16. The array substrate according to claim **13**, wherein the protective layer is formed of insulation materials.

17. The array substrate according to claim **11**, wherein the protective layer comprises one or more strips and each of strips protects one line of the peripheral circuit on the array substrate.

18. The array substrate according to claim **12**, wherein the protective layer comprises one or more strips and each of strips protects one line of the peripheral circuit on the array substrate.

19. The array substrate according to claim **13**, wherein the protective layer comprises one or more strips and each of strips protects one line of the peripheral circuit on the array substrate.

20. The array substrate according to claim **14**, wherein the protective layer comprises one or more strips and each of strips protects one line of the peripheral circuit on the array substrate.

21. A display panel comprising the color filter substrate according to claim **1**.

22. A display panel comprising the color filter substrate according to claim **1** and the array substrate according to claim **11**.

23. A display panel comprising the color filter substrate according to claim **11**.

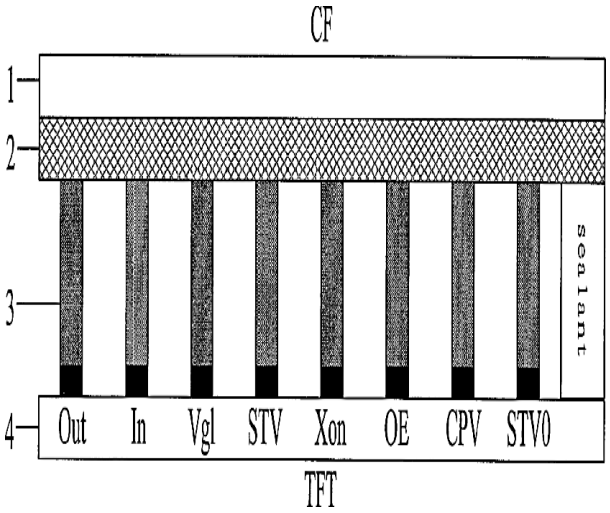
24. A display device comprising the display panel according to claim **21**.

25. A display device comprising the display panel according to claim **22**.

26. A display device comprising the display panel according to claim **23**.

* * * * *

专利名称(译)	滤色器基板，阵列基板，显示面板和显示装置		
公开(公告)号	US20140152946A1	公开(公告)日	2014-06-05
申请号	US14/074846	申请日	2013-11-08
[标]申请(专利权)人(译)	北京京东方显示技术有限公司 京东方科技集团股份有限公司		
申请(专利权)人(译)	北京京东方显示技术有限公司. 京东方科技集团股份有限公司.		
当前申请(专利权)人(译)	京东方科技集团股份有限公司. 北京京东方显示技术有限公司.		
[标]发明人	LIU SHA PARK SANG JIN		
发明人	LIU, SHA PARK, SANG JIN		
IPC分类号	G02F1/1339		
CPC分类号	G02F1/1339 G02F1/13394 G02F1/133514 G02F2201/501		
优先权	201210447704.4 2012-11-09 CN		
其他公开文献	US9977291		
外部链接	Espacenet USPTO		

摘要(译)

本发明提供一种彩色滤光基板，阵列基板，显示面板和显示装置。通过提供用于保护阵列基板上的外围电路免受静电引起的腐蚀的保护层，可以防止在阵列基板上的外围电路中发生静电引起的腐蚀，从而提高LCD装置的图像质量并降低成本许多有缺陷的产品造成的损失。