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(19) **United States**(12) **Patent Application Publication**
Xu(10) **Pub. No.: US 2017/0219891 A1**(43) **Pub. Date: Aug. 3, 2017**(54) **IPS TYPE IN CELL TOUCH DISPLAY PANEL****G06F 3/041** (2006.01)**G02F 1/1333** (2006.01)(71) Applicant: **Shenzhen China Star Optoelectronics Technology Co., Ltd., Shenzhen City (CN)**(52) **U.S. Cl.**CPC **G02F 1/134363** (2013.01); **G06F 3/0412** (2013.01); **G02F 1/13338** (2013.01); **G02F 1/136286** (2013.01); **G02F 1/133514** (2013.01); **G02F 1/13439** (2013.01); **G02F 2201/121** (2013.01); **G02F 2201/124** (2013.01); **G02F 2201/123** (2013.01); **G02F 2001/134345** (2013.01)(72) Inventor: **Xiangyang Xu, Shenzhen City (CN)**(21) Appl. No.: **14/779,003**(22) PCT Filed: **Aug. 24, 2015**(86) PCT No.: **PCT/CN2015/087890**

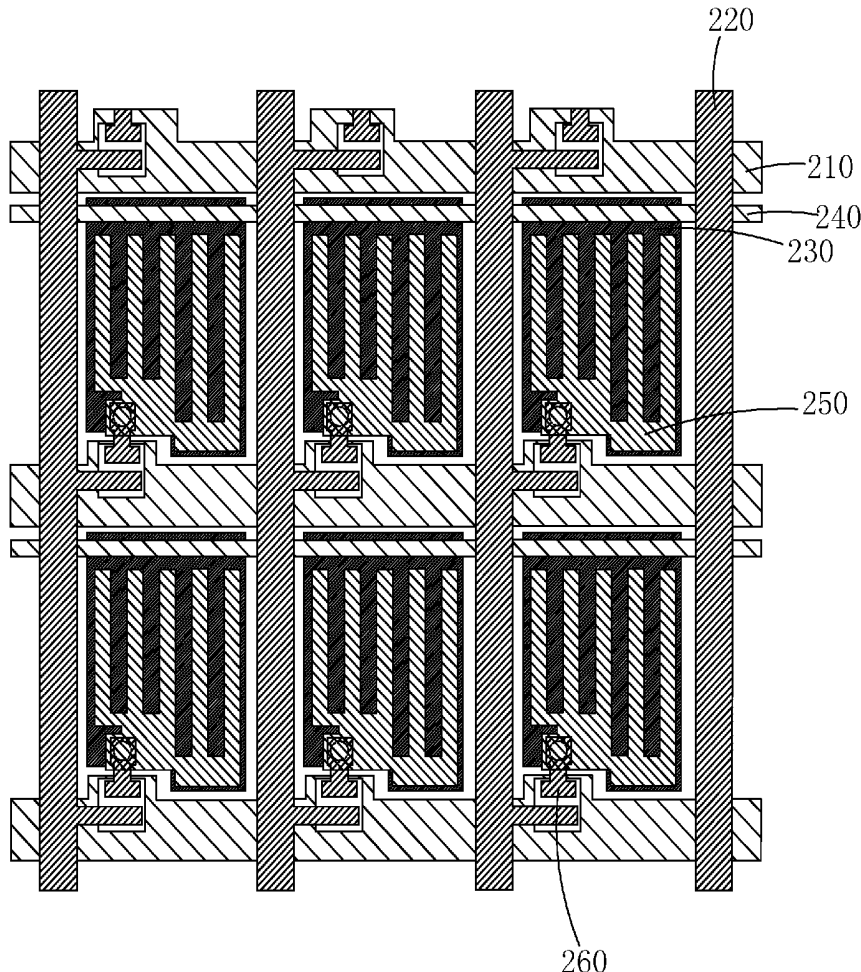
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Publication Classification(51) **Int. Cl.****G02F 1/1343** (2006.01)**G02F 1/1335** (2006.01)**G02F 1/1362** (2006.01)(57) **ABSTRACT**

The present invention provides an IPS type In Cell touch display panel, comprising an array substrate, a CF substrate and a liquid crystal layer arranged between the array substrate and the CF substrate; the array substrate comprises a plurality of gate scan lines (21) separately arranged along a horizontal direction, and the touch scan electrode is shared with the gate scan line (21); an inner side of the CF substrate is provided with a plurality of touch receiving electrodes (40), which are intersecting and perpendicular with the gate scan lines (21) in space. In comparison with the IPS type liquid crystal display panel, the IPS type In Cell touch display panel of the present invention does not require the additional process, and does not decrease the aperture of the panel but can reduce the drive cost of the panel.



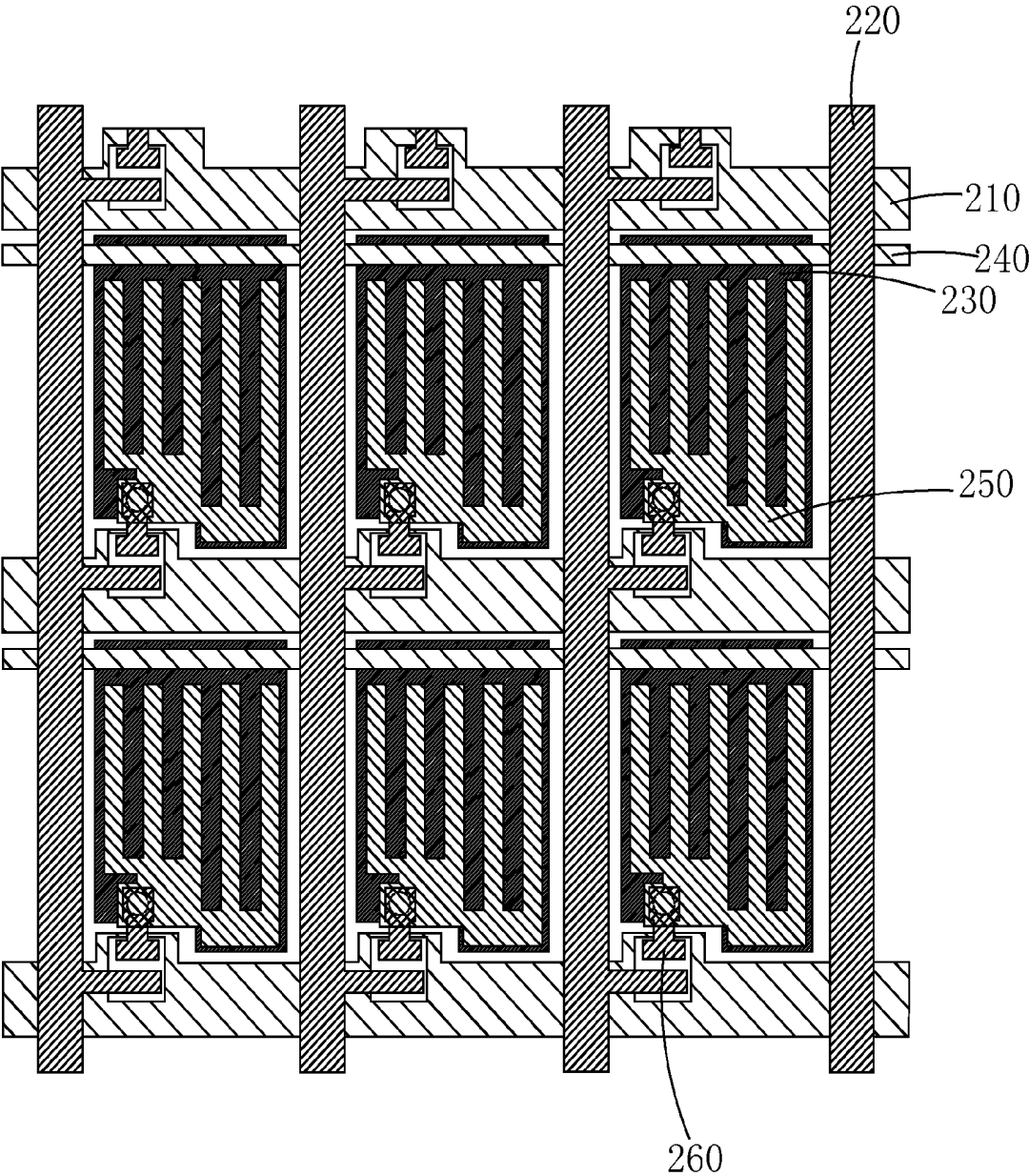


Fig. 1

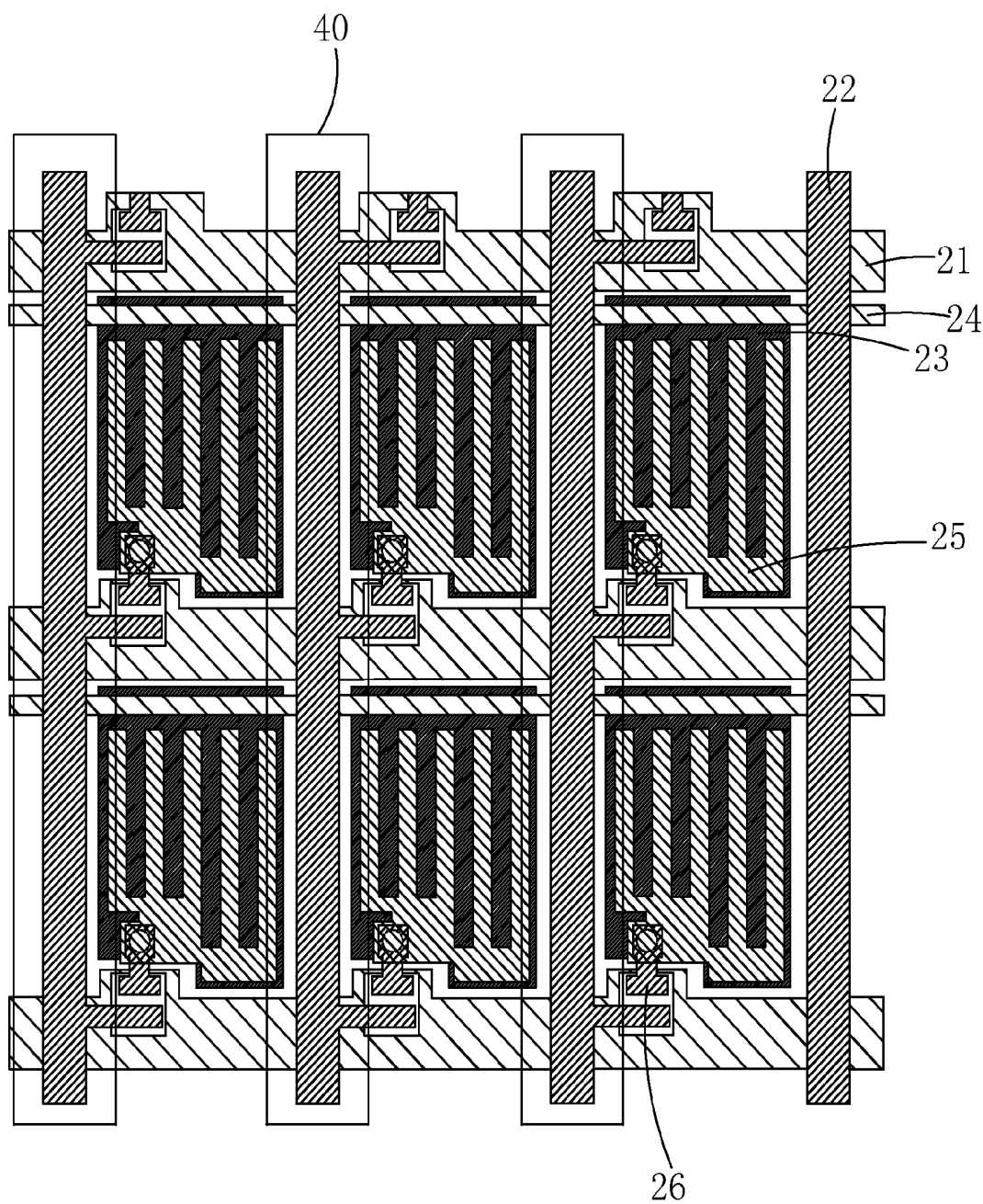


Fig. 2

IPS TYPE IN CELL TOUCH DISPLAY PANEL

FIELD OF THE INVENTION

[0001] The present invention relates to a display technology field, and more particularly to an IPS type In Cell touch display panel.

BACKGROUND OF THE INVENTION

[0002] With the rapid development of the display technology, the touch control display panel has been widely applied and accepted, used by the people. For example, the smart phone, the flat panel computer and etc. all use the touch control display panel. The touch control display panel is to combine the touch control panel and the liquid display panel as one to make the liquid crystal display panel equipped with functions of display and sensing the touch control inputs at the same time.

[0003] Generally, the liquid crystal panel mainly comprises a Color Filter (CF), a Thin Film Transistor Array Substrate (TFT Array Substrate) and a Liquid Crystal Layer positioned inbetween. The working principle is that the light of backlight module is reflected to generate images by applying driving voltages to the two glass substrate for controlling the rotations of the liquid crystal molecules. According to the orientation of the liquid crystal, the liquid crystal display panels in the mainstream market can be categorized into several types, which are Vertical Alignment (VA), Twisted Nematic (TN) or Super Twisted Nematic (STN), In-Plane Switching (IPS) and Fringe Field Switching (FFS).

[0004] In the IPS type liquid crystal display panel, the liquid crystal molecules are oriented to be parallel relative to the substrate surface, and by applying the transverse electrical field for controlling the rotations of the liquid crystal molecules.

[0005] As shown in FIG. 1, the array substrate of the IPS type liquid crystal display panel according to prior art comprises a plurality of gate scan lines **210** separately arranged along a horizontal direction, a plurality of data lines **220** separately arranged along a vertical direction, and a plurality of common electrodes **230** aligned in array, a COM metal line **240** employed to couple with the common electrodes **230** of each row, a comb pixel electrode **250** oppositely positioned to each common electrode **230**, and a pixel switch TFT **260** correspondingly positioned to each comb pixel electrode **250**. The gate scan line **210** is merely employed for transmitting the scan signal, and the data line **220** is merely employed for transmitting the data signal.

[0006] For executing the electromagnetic protection to the IPS type liquid crystal display panel, a whole sheet ITO transparent electrode is provided on the surface at one side of the CF substrate away from the liquid crystal layer i.e. at the backside of the CF substrate.

[0007] The touch control display panels can be categorized into four types of resistive, capacitive, optics, surface acoustic wave types according to sensing technology. At present, the main stream touch control technology is the capacitive type. The capacitive type can be further categorized into self capacitive type and mutual capacitive type. The main capacitive type touch control display panel in the present market is the mutual capacitive type, and the advantage of the mutual capacitive type is being able to achieve multi-touch control. The touch display panel can be categorized

according to different structures into: On cell, In Cell and Out Cell. The Out Cell touch display panel is to separately produce the touch panel and the liquid crystal display panel, and then to be laminated together to be a display panel having touch control function. The Out Cell has drawbacks of higher manufacture cost, lower light transmittance and thicker module. The In Cell touch display panel has advantages of lower cost and thinner thickness, and it has been favored by respective big display makers and has become the main development direction of the future touch control technology.

[0008] In comparison with the IPS liquid crystal display panel, the IPS type In Cell touch display panel requires to add an independent touch control circuit (including the touch scan electrode and the touch receiving electrode) and a drive control part to achieve the touch control function, which does not decrease the aperture ratio of the panel but also increase the difficulty of the process, and raise the drive cost of the panel.

SUMMARY OF THE INVENTION

[0009] An objective of the present invention is to provide an IPS type In Cell touch display panel, and in comparison with the IPS type liquid crystal display panel according to prior art, no additional process is not required, and the aperture ratio of the panel is not decreased but the drive cost of the panel can be reduced.

[0010] For realizing the aforesaid objective, the present invention provides an IPS type In Cell touch display panel, comprising: an array substrate, a CF substrate and a liquid crystal layer arranged between the array substrate and the CF substrate;

[0011] the array substrate comprises a plurality of gate scan lines separately arranged along a horizontal direction, and the touch scan electrode is shared with the gate scan line;

[0012] an inner side of the CF substrate is provided with a plurality of touch receiving electrodes, which are intersecting and perpendicular with the gate scan lines in space.

[0013] The array substrate further comprises a plurality of data lines separately arranged along a vertical direction, and a plurality of common electrodes aligned in array, a COM metal line employed to couple with the common electrodes of each row, a comb pixel electrode oppositely positioned to each common electrode, and a pixel switch TFT correspondingly positioned to each comb pixel electrode;

[0014] the plurality of gate scan lines separately arranged along the horizontal direction and the plurality of data lines separately arranged along the vertical direction are mutually insulated and staggered to divide a plurality of sub pixel areas; the each common electrode and the comb pixel electrode oppositely positioned thereto are in one sub pixel area.

[0015] The touch receiving electrode is correspondingly positioned right above the data line.

[0016] A width of the touch receiving electrode is larger than a width of the data line and is smaller than a width of the sub pixel area.

[0017] Material of the plurality of touch receiving electrodes is an ITO thin film.

[0018] Exposure, etching are implemented to the whole sheet ITO thin film to form the plurality of touch receiving electrodes.

[0019] Material of the common electrode and the comb pixel electrode is an ITO thin film.

[0020] Material of the gate scan line, the data line and the COM metal line is a stack combination of one or more of molybdenum, titanium, aluminum, copper and nickel.

[0021] The present invention further provides an IPS type In Cell touch display panel, comprising: an array substrate, a CF substrate and a liquid crystal layer arranged between the array substrate and the CF substrate;

[0022] the array substrate comprises a plurality of gate scan lines separately arranged along a horizontal direction, and the touch scan electrode is shared with the gate scan line;

[0023] an inner side of the CF substrate is provided with a plurality of touch receiving electrodes, which are intersecting and perpendicular with the gate scan lines in space;

[0024] wherein the array substrate further comprises a plurality of data lines separately arranged along a vertical direction, and a plurality of common electrodes aligned in array, a COM metal line employed to couple with the common electrodes of each row, a comb pixel electrode oppositely positioned to each common electrode, and a pixel switch TFT correspondingly positioned to each comb pixel electrode;

[0025] the plurality of gate scan lines separately arranged along the horizontal direction and the plurality of data lines separately arranged along the vertical direction are mutually insulated and staggered to divide a plurality of sub pixel areas; the each common electrode and the comb pixel electrode oppositely positioned thereto are in one sub pixel area;

[0026] wherein material of the plurality of touch receiving electrodes is an ITO thin film;

[0027] wherein exposure, etching are implemented to the whole sheet ITO thin film to form the plurality of touch receiving electrodes.

[0028] The benefits of the present invention are: the present invention provides an IPS type In Cell touch display panel, comprising: an array substrate, a CF substrate and a liquid crystal layer arranged between the array substrate and the CF substrate; the array substrate comprises a plurality of gate scan lines separately arranged along a horizontal direction, and the touch scan electrode is shared with the gate scan line; an inner side of the CF substrate is provided with a plurality of touch receiving electrodes, which are intersecting and perpendicular with the gate scan lines in space. In the IPS type In Cell touch display panel of the present invention, the array substrate has the same structure as the array substrate in the IPS type liquid crystal display panel according to prior art but the touch scan electrode is shared with the gate scan line. No additional process is not required, and the aperture ratio of the panel is not decreased but the drive cost of the panel can be reduced.

[0029] In order to better understand the characteristics and technical aspect of the invention, please refer to the following detailed description of the present invention is concerned with the diagrams, however, provide reference to the accompanying drawings and description only and is not intended to be limiting of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The technical solution and the beneficial effects of the present invention are best understood from the following detailed description with reference to the accompanying figures and embodiments.

[0031] In drawings,

[0032] FIG. 1 is a top view diagram of one side of an array substrate of an IPS type liquid crystal display panel according to prior art;

[0033] FIG. 2 is a top view diagram of an IPS type In Cell touch display panel according to the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0034] For better explaining the technical solution and the effect of the present invention, the present invention will be further described in detail with the accompanying drawings and the specific embodiments.

[0035] The present invention provides an IPS type In Cell touch display panel, comprising: an array substrate, a CF substrate and a liquid crystal layer arranged between the array substrate and the CF substrate.

[0036] AS shown in FIG. 2, the array substrate comprises a plurality of gate scan lines **21** separately arranged along a horizontal direction, a plurality of data lines **22** separately arranged along a vertical direction, and a plurality of common electrodes **23** aligned in array, a COM metal line **24** employed to couple with the common electrodes **23** of each row, a comb pixel electrode **25** oppositely positioned to each common electrode **23**, and a pixel switch TFT **26** correspondingly positioned to each comb pixel electrode **25**.

[0037] The plurality of gate scan lines **21** separately arranged along the horizontal direction and the plurality of data lines **22** separately arranged along the vertical direction are mutually insulated and staggered to divide a plurality of sub pixel areas; the each common electrode **23** and the comb pixel electrode **25** oppositely positioned thereto are in one sub pixel area.

[0038] The touch scan electrode is shared with the gate scan line **21**.

[0039] The gate scan line **21**, the COM metal line **24** and the gate of the pixel switch TFT **26** are at the same layer, and formed by patterning a first metal layer. Material of the first metal layer is a stack combination of one or more of one or more of molybdenum (Mo), titanium (Ti), aluminum (Al), copper (Cu) and nickel (Ni). The gate of the pixel switch TFT **26** is coupled to the gate scan line **21**.

[0040] The gate scan line **21** and the data line **22** sandwich an insulative layer (not shown) inbetween. The data line **22** and the source, the drain of the pixel switch TFT **26** are at the same layer, and formed by patterning a second metal layer. Material of the second metal layer is a stack combination of one or more of one or more of Mo, Ti, Al, Cu and Ni. The source of the pixel switch TFT **26** is coupled to the data line **22**, and both the source and the drain of the pixel switch TFT **26** contact with the semiconductor layer.

[0041] A passivation protective layer (not shown) covers on the data line **22**, the source and the drain of the pixel switch TFT **26**. The comb pixel electrode **25** is oppositely positioned to the common electrode **23** on the passivation protective layer, and the comb pixel electrode **25** is coupled to the drain of the pixel switch TFT **26** through the via penetrating the passivation protective layer. Material of

common electrode **23** and the comb pixel electrode **25** is an Indium Tin Oxide (ITO) thin film.

[0042] As known from the aforesaid description, the array substrate has the same structure as the array substrate in the IPS type liquid crystal display panel according to prior art but the touch scan electrode is shared with the gate scan line **21**. No additional process is not required, and the aperture ratio of the panel is not decreased. The gate scan line **21** transmits a scan pulse signal in the display period, and is employed to be touch scan electrode to transmit a touch scan signal in the non-display period. The solo drive of the touch scan is not required to reduce the drive cost of the panel.

[0043] An inner side of the CF substrate is provided with a plurality of touch receiving electrodes **40**, which are intersecting and perpendicular with the gate scan lines **21** in space. Unlike the CF substrate in the IPS type liquid crystal display panel according to prior art, a whole sheet ITO transparent electrode is provided at the backside for electromagnetic protection. Besides, the structure of the CF substrate is the same as the CF substrate in the IPS type liquid crystal display panel according to prior art, and comprises components of color film photoresist, a black matrix, photospacers and alignment films. The detail description is omitted here.

[0044] Furthermore, the touch receiving electrode **40** is correspondingly positioned right above the data line **22**. A width of the touch receiving electrode **40** is larger than a width of the data line **22** and is smaller than a width of the sub pixel area.

[0045] Exposure, etching are implemented to the whole sheet ITO thin film to form the plurality of touch receiving electrodes **40**.

[0046] The touch receiving electrode **40** cooperates and shares the touch scan electrode with the gate scan line **21** to achieve the touch control function.

[0047] In conclusion, the IPS type In Cell touch display panel of the present invention comprises: an array substrate, a CF substrate and a liquid crystal layer arranged between the array substrate and the CF substrate; the array substrate comprises a plurality of gate scan lines separately arranged along a horizontal direction, and the touch scan electrode is shared with the gate scan line; an inner side of the CF substrate is provided with a plurality of touch receiving electrodes, which are intersecting and perpendicular with the gate scan lines in space. In the IPS type In Cell touch display panel of the present invention, the array substrate has the same structure as the array substrate in the IPS type liquid crystal display panel according to prior art but the touch scan electrode is shared with the gate scan line. No additional process is not required, and the aperture ratio of the panel is not decreased but the drive cost of the panel can be reduced.

[0048] Above are only specific embodiments of the present invention, the scope of the present invention is not limited to this, and to any persons who are skilled in the art, change or replacement which is easily derived should be covered by the protected scope of the invention. Thus, the protected scope of the invention should go by the subject claims.

What is claimed is:

1. An IPS type In Cell touch display panel, comprising: an array substrate, a CF substrate and a liquid crystal layer arranged between the array substrate and the CF substrate;

the array substrate comprises a plurality of gate scan lines separately arranged along a horizontal direction, and the touch scan electrode is shared with the gate scan line;

an inner side of the CF substrate is provided with a plurality of touch receiving electrodes, which are intersecting and perpendicular with the gate scan lines in space.

2. The IPS type In Cell touch display panel according to claim 1, wherein the array substrate further comprises a plurality of data lines separately arranged along a vertical direction, and a plurality of common electrodes aligned in array, a COM metal line employed to couple with the common electrodes of each row, a comb pixel electrode oppositely positioned to each common electrode, and a pixel switch TFT correspondingly positioned to each comb pixel electrode;

the plurality of gate scan lines separately arranged along the horizontal direction and the plurality of data lines separately arranged along the vertical direction are mutually insulated and staggered to divide a plurality of sub pixel areas; the each common electrode and the comb pixel electrode oppositely positioned thereto are in one sub pixel area.

3. The IPS type In Cell touch display panel according to claim 2, wherein the touch receiving electrode is correspondingly positioned right above the data line.

4. The IPS type In Cell touch display panel according to claim 3, wherein a width of the touch receiving electrode is larger than a width of the data line and is smaller than a width of the sub pixel area.

5. The IPS type In Cell touch display panel according to claim 1, wherein material of the plurality of touch receiving electrodes is an ITO thin film.

6. The IPS type In Cell touch display panel according to claim 5, wherein exposure, etching are implemented to the whole sheet ITO thin film to form the plurality of touch receiving electrodes.

7. The IPS type In Cell touch display panel according to claim 2, wherein material of the common electrode and the comb pixel electrode is an ITO thin film.

8. The IPS type In Cell touch display panel according to claim 2, wherein material of the gate scan line, the data line and the COM metal line is a stack combination of one or more of molybdenum, titanium, aluminum, copper and nickel.

9. An IPS type In Cell touch display panel, comprising: an array substrate, a CF substrate and a liquid crystal layer arranged between the array substrate and the CF substrate;

the array substrate comprises a plurality of gate scan lines separately arranged along a horizontal direction, and the touch scan electrode is shared with the gate scan line;

an inner side of the CF substrate is provided with a plurality of touch receiving electrodes, which are intersecting and perpendicular with the gate scan lines in space;

wherein the array substrate further comprises a plurality of data lines separately arranged along a vertical direction, and a plurality of common electrodes aligned in array, a COM metal line employed to couple with the common electrodes of each row, a comb pixel electrode

oppositely positioned to each common electrode, and a pixel switch TFT correspondingly positioned to each comb pixel electrode;
the plurality of gate scan lines separately arranged along the horizontal direction and the plurality of data lines separately arranged along the vertical direction are mutually insulated and staggered to divide a plurality of sub pixel areas; the each common electrode and the comb pixel electrode oppositely positioned thereto are in one sub pixel area;
wherein material of the plurality of touch receiving electrodes is an ITO thin film;
wherein exposure, etching are implemented to the whole sheet ITO thin film to form the plurality of touch receiving electrodes.

10. The IPS type In Cell touch display panel according to claim 9, wherein the touch receiving electrode is correspondingly positioned right above the data line.

11. The IPS type In Cell touch display panel according to claim 10, wherein a width of the touch receiving electrode is larger than a width of the data line and is smaller than a width of the sub pixel area.

12. The IPS type In Cell touch display panel according to claim 9, wherein material of the common electrode and the comb pixel electrode is an ITO thin film.

13. The IPS type In Cell touch display panel according to claim 9, wherein material of the gate scan line, the data line and the COM metal line is a stack combination of one or more of molybdenum, titanium, aluminum, copper and nickel.

* * * * *

专利名称(译)	ips类型的单元触摸显示面板		
公开(公告)号	US20170219891A1	公开(公告)日	2017-08-03
申请号	US14/779003	申请日	2015-08-24
[标]申请(专利权)人(译)	深圳市华星光电技术有限公司		
申请(专利权)人(译)	深圳市中国星光电科技有限公司.		
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[标]发明人	XU XIANGYANG		
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IPC分类号	G02F1/1343 G02F1/1335 G02F1/1362 G06F3/041 G02F1/1333		
CPC分类号	G02F1/134363 G06F3/0412 G02F1/13338 G02F1/136286 G02F2001/134345 G02F1/13439 G02F2201/121 G02F2201/124 G02F2201/123 G02F1/133514 G02F1/1343 G02F1/134309 G02F2001/136295 G02F2001/134372 G06F2203/04103		
优先权	201510482219.4 2015-08-03 CN		
外部链接	Espacenet USPTO		

摘要(译)

本发明提供一种IPS型In Cell触控显示面板，包括阵列基板，CF基板和设置在阵列基板与CF基板之间的液晶层；阵列基板包括沿水平方向分开布置的多条栅极扫描线（21），并且触摸扫描电极与栅极扫描线共用（21）；CF基板的内侧设置有多个触摸接收电极（40），其在空间中与栅极扫描线（21）交叉并垂直。与IPS型液晶显示面板相比，本发明的IPS型In Cell触控显示面板不需要额外的工艺，并且不会降低面板的光圈，但可以降低面板的驱动成本。

