



(19) **United States**

(12) **Patent Application Publication**
 TSAI et al.

(10) **Pub. No.: US 2019/0129216 A1**
(43) **Pub. Date: May 2, 2019**

(54) **TOUCH DISPLAY PANEL AND TOUCH DISPLAY DEVICE**

G02F 1/1335 (2006.01)
G02F 1/1362 (2006.01)
G02F 1/1343 (2006.01)

(71) Applicant: **WUHAN CHINA STAR OPTOELECTRONICS TECHNOLOGY CO., LTD.**, Wuhan, Hubei (CN)

(52) **U.S. Cl.**
CPC *G02F 1/13338* (2013.01); *G06F 3/0412* (2013.01); *G02F 1/133514* (2013.01); *G06F 3/044* (2013.01); *G02F 1/134309* (2013.01); *G02F 1/133345* (2013.01); *G02F 1/133528* (2013.01); *G02F 1/136209* (2013.01)

(72) Inventors: **Yucheng TSAI**, Shenzhen, Guangdong (CN); **Zhou ZHANG**, Shenzhen, Guangdong (CN); **Pan XU**, Shenzhen, Guangdong (CN); **Changwen MA**, Shenzhen, Guangdong (CN)

(57) **ABSTRACT**

(21) Appl. No.: **15/753,929**

(22) PCT Filed: **Jan. 4, 2018**

(86) PCT No.: **PCT/CN2018/071349**

§ 371 (c)(1),
(2) Date: **Nov. 6, 2018**

(30) **Foreign Application Priority Data**

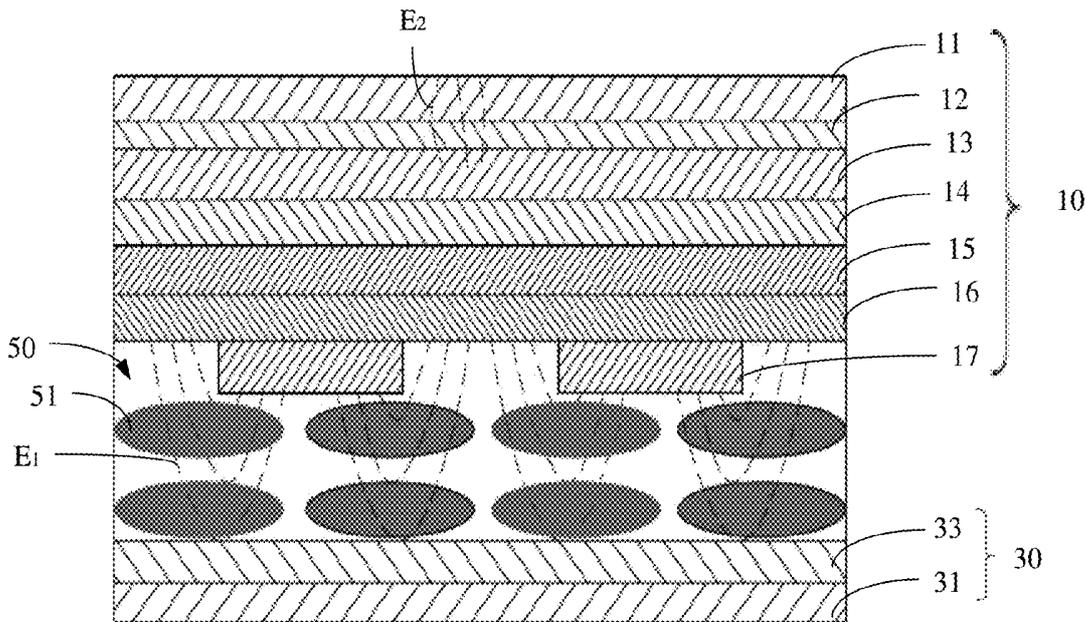
Oct. 31, 2017 (CN) 201711053731.2

Publication Classification

(51) **Int. Cl.**
G02F 1/1333 (2006.01)
G06F 3/041 (2006.01)

A touch display panel and a touch display device are provided. The touch display panel, comprising an array substrate and a color filter substrate are cell-assembled, and a liquid crystal layer positioned between the array substrate and the color filter substrate. The array substrate includes a first substrate, a black matrix layer, a touch sensing layer, a first electrode layer and a pixel electrode layer are sequentially positioned, the pixel electrode layer is nearby the liquid crystal layer, the first substrate layer is positioned on a side of the pixel electrode which far away the liquid crystal layer. The touch display panel using the first substrate for controlling the touch display panel displays image while touch, the touch electrode field and driving electrode file in the touch display panel are not effect to each other, such that avoids to decrease resolution of touch display panel.

100



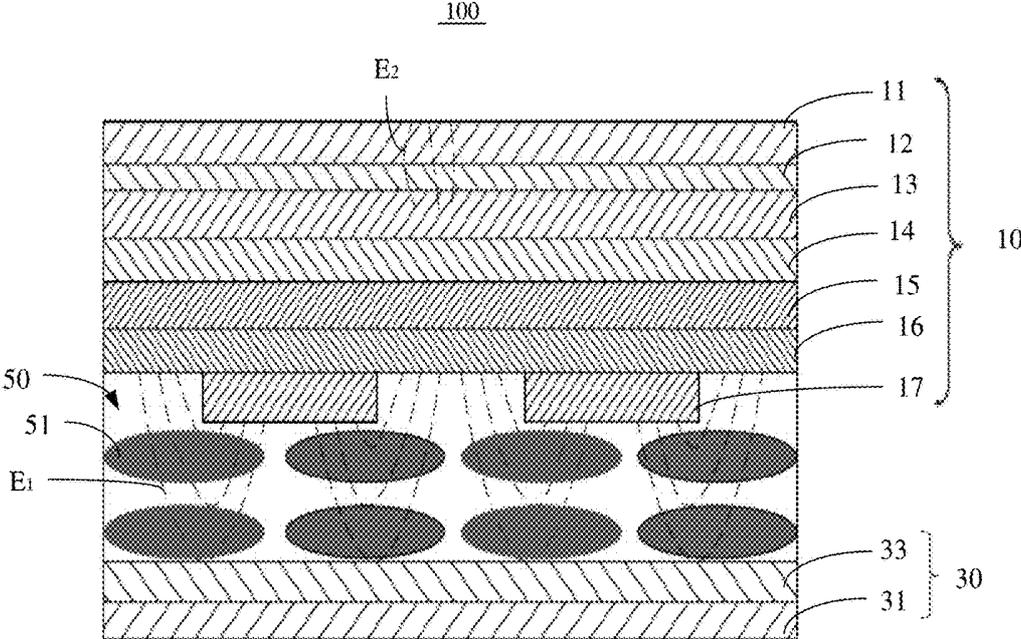


FIG. 1

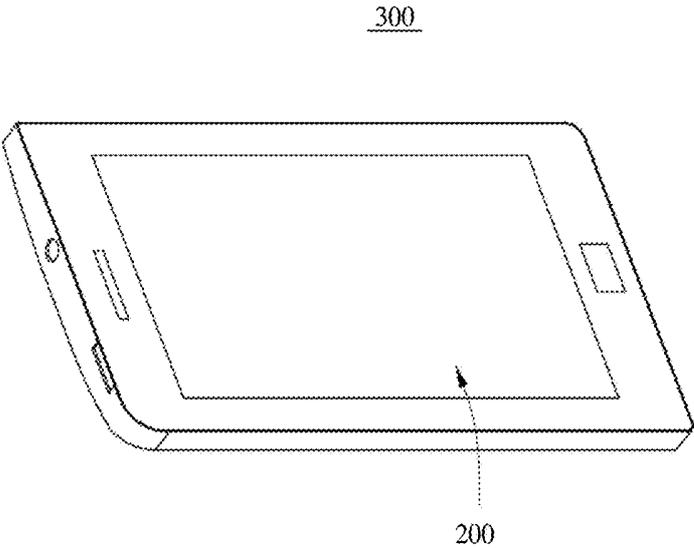


FIG. 2

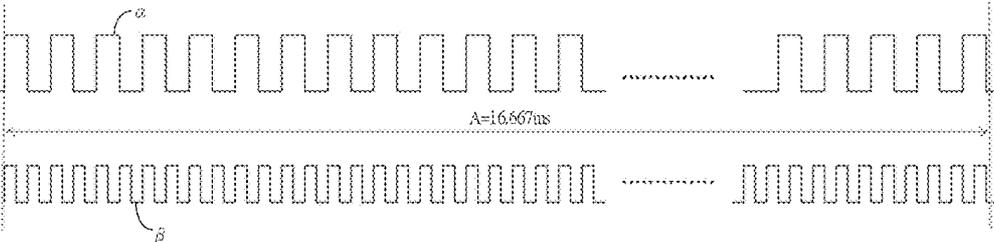


FIG. 3

TOUCH DISPLAY PANEL AND TOUCH DISPLAY DEVICE

RELATED APPLICATIONS

[0001] The present application is a National Phase of International Application Number PCT/CN2018/071349, filed Jan. 4, 2018, and claims the priority of China Application No. 201711053731.2, filed Oct. 31, 2017.

FIELD OF THE DISCLOSURE

[0002] The disclosure relates to a touch display technical field, and more particularly to a touch display panel and a touch display device has the touch display panel.

BACKGROUND

[0003] With technologies improved every day, display device is widely applied to human's life, and has higher requirement for resolution of display device. Touch display device has fast development, the currently mainstream product using Add on touch panel structure. Therefore, the traditional Add on touch panel has heavy and thick structure, high cost, with requirement of thinning the display device for consumers. In Cell liquid crystal panel become an important direction of touch display filed.

[0004] In Cell touch display panel is generally indicating the driving electrode and the sensing electrode are also designed into the inner structure of the liquid crystal cell. In the present In Cell touch display panel, the touch testing function and display function are usually sharing a common electrode, in order to avoid affect the image display effect by the changing the touch voltage, the touch testing function and display function usually alternative changing by time, such that touch driving panel using time sharing driving. For example, while the 60 Hz product driving by time-sharing, in a frame time of 16.7 ms, about 12 ms for displays, 4 ms for achieving touch function. If using the time-sharing to drive touch panel in a frame time, it needs to share partial time for achieving touch function, it causes display time not enough such that display charging cannot be saturated under high resolution. It decreases display property (such as resolution).

SUMMARY

[0005] A technical problem to be solved by the disclosure is to provide a touch display panel.

[0006] Furthermore, the disclosure further provides a touch display device including the touch display panel.

[0007] An objective of the disclosure is achieved by following embodiments. In particular, a touch display panel, comprising an array substrate and a color filter substrate are cell-assembled, and a liquid crystal layer positioned between the array substrate and the color filter substrate, wherein, the array substrate includes a first substrate, a black matrix layer, a touch sensing layer, a first electrode layer and a pixel electrode layer are sequentially positioned, the pixel electrode layer is nearby the liquid crystal layer, the first substrate layer is positioned on a side of the pixel electrode which far away the liquid crystal layer.

[0008] In an embodiment, the array substrate further comprises a passivation layer, the passivation layer is positioned between the first electrode layer and the pixel electrode layer.

[0009] In an embodiment, the color filter substrate comprises a second substrate and a color layer forming on a surface of the second substrate, the liquid crystal layer is positioned on a color layer which is positioned far away the second substrate.

[0010] In an embodiment, the array substrate further comprises an intermediate layer, the intermediate layer is positioned between the touch sensing layer and the first electrode layer.

[0011] In an embodiment, the touch display panel further comprises at least one chip, the chip is electrically connecting with the array substrate.

[0012] In an embodiment, the array substrate further comprises a first polarizer, the first polarizer is positioned between the first substrate and the black matrix layer.

[0013] In an embodiment, the touch display panel further comprises a second polarizer, the second polarizer is positioned on a surface of the second substrate which is far away the color layer.

[0014] In an embodiment, a plurality of reflective portion is positioned on the second substrate.

[0015] According to another aspect of the disclosure, the disclosure further provides a touch display device. The touch display device includes a backlight assembly and the touch display panel as described above. The backlight assembly is positioned on a side of the color filter substrate which is far away the liquid crystal layer.

[0016] According to the touch display panel of this disclosure, user could touch the first substrate for controlling display image of the touch display panel by finger. According to the black matrix layer and the touch sensing layer are positioned on the same side of the liquid crystal layer, and more close to the first substrate which be touched by user than the liquid crystal layer. And the first electrode layer is positioned between the touch sensing layer and the liquid crystal layer for separating the touch electric field generated by touch and the driving electric field generated by driving the liquid crystal layer, the touch electric field and the driving electric field are not effect to each other. Therefore, it enhances charging time of the display for ensuring high resolution of the touch display panel.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Accompanying drawings are for providing further understanding of embodiments of the disclosure. The drawings form a part of the disclosure and are for illustrating the principle of the embodiments of the disclosure along with the literal description. Apparently, the drawings in the description below are merely some embodiments of the disclosure, a person skilled in the art can obtain other drawings according to these drawings without creative efforts. In the figures:

[0018] FIG. 1 is a structural schematic view of a touch display panel according to an embodiment of the disclosure;

[0019] FIG. 2 is a structural schematic view of a touch display device comprises the touch display panel according to an embodiment of the disclosure; and

[0020] FIG. 3 is a timing diagram of the touch display panel according to an embodiment of the disclosure.

DETAILED DESCRIPTION OF PREFERRED
EMBODIMENTS

[0021] The specific structural and functional details disclosed herein are only representative and are intended for describing exemplary embodiments of the disclosure. However, the disclosure can be embodied in many forms of substitution, and should not be interpreted as merely limited to the embodiments described herein.

[0022] In the following, the touch display panel 100, the touch display screen 200 has the touch display panel 100, and the touch display device 300 has the touch display panel 100 associated with the disclosure will be described with reference to FIG. 1 through FIG. 3, and the embodiments.

[0023] Please refer to FIG. 1, FIG. 1 is a structural schematic view of a touch display panel according to an embodiment of the disclosure. The touch display panel 100 comprises an array substrate 10 and a color filter substrate 30 are cell-assembled, and a liquid crystal layer 50 is positioned between the array substrate 10 and the color filter substrate 30.

[0024] The array substrate 10 includes a first substrate 11, a black matrix (BM) layer 12, a touch sensing layer 13, an intermediate layer 14, a first electrode layer 15 (VCOM), a passivation layer 16 and a pixel electrode layer 17 are sequentially positioned.

[0025] In this embodiment, the first substrate 11 is a glass substrate. The touch sensing layer 13 and the pixel electrode layer 17 are both made by material of indium tin oxide (ITO).

[0026] In this embodiment, the pixel electrode layer 17 includes a plurality of pixel electrode unit 170 is positioned at interval.

[0027] The color filter substrate 30 includes a second substrate 31 and a color layer 33 forming on a surface of the second substrate 31.

[0028] The second substrate 31 could be glass substrate, and also could be other material substrate.

[0029] The liquid crystal layer 50 is positioned on a side of the pixel electrode layer 17 which is far away the first substrate 11, and positioned on a side of the color layer 33 which is far away the second substrate 31. Specifically, the liquid crystal layer 50 is positioned between the color layer 33 and the pixel electrode layer 17, and the color layer 33 and the region of the passivation layer 16 which is without covering by the pixel electrode layer 17. The liquid crystal layer 50 includes a plurality of the liquid crystal molecular 51.

[0030] The pixel electrode layer 17 is providing the driving electric field E_1 to the liquid crystal layer 50, and driving the liquid crystal molecular 51 according to potential of the pixel electrode layer 17 such that achieves to display image.

[0031] The touch display panel 100 further comprises at least one chip (not shown). In this embodiment, the chip is positioned on surface which has the black matrix layer 12 of the first substrate 11. The chip is electrically connecting with the array substrate 10 for receiving the touch signals.

[0032] In another embodiment, the array substrate further comprises a first polarizer (not shown), the first polarizer is positioned between the first substrate 11 and the black matrix layer 12 for decreasing light leakage phenomenon of the touch display panel 100, and increases display contrast and enhances display quality.

[0033] In another embodiment, the touch display panel 100 further comprises a second polarizer (not shown), the

second polarizer is positioned on a surface of the second substrate 31 which is far away the color layer 33.

[0034] In another embodiment, a plurality of reflective portion (not shown) is positioned on the second substrate 31 for changing the transmission route of the light, and enhances luminous rate of the touch display panel 100.

[0035] Please refer to FIG. 2, the disclosure further provides a touch display screen 200 has the touch display panel 100 described above, the touch display screen 200 further comprises a backlight assembly (not shown), the backlight assembly is positioned on a side of the color filter substrate 30 which is far away the liquid crystal layer 50. Specifically, the backlight assembly is positioned on surface of the second substrate 31 which is far away the color layer 33.

[0036] Please refer to FIG. 2, the disclosure further provides a touch display device 300 has the touch display panel 100 described above. The touch display device 300 could be cell phone, tablet, and television and so on. The touch display device 300 could include the touch display screen 200 described above. The touch display screen 200 could be applied to the cell phone, tablet, and television, the touch display device 300 is correspondingly includes the touch display panel 100 and the backlight assembly of the touch display screen 200.

[0037] The touch display device 300 further comprises a flexible circuit (not shown). The backlight assembly is positioned on a side of the color filter substrate 30 which is far away the liquid crystal layer 50. Specifically, the backlight assembly is positioned on surface of the second substrate 31 which is far away the color layer 33. The flexible circuit is connecting to the backlight assembly and the second substrate 31, and electrically connecting with the chip.

[0038] Please refer to FIG. 3, while using the touch display device 300 above, user could touch the first substrate 11 for controlling display image of the touch display panel 100 by finger. According to the black matrix layer 12 and the touch sensing layer 13 are positioned on the same side of the liquid crystal layer 50, and more close to the first substrate 11 which be touched by user than the liquid crystal layer 50. And the first electrode layer 15 is positioned between the touch sensing layer 13 and the liquid crystal layer 50, it causes the touch electric field E_2 and the driving electric field E_1 are separating by the first electrode layer 15, the touch electric field E_2 and the driving electric field E_1 are not effect to each other. Therefore, during the time sharing driving touch display panel 100, FIG. 3 is a timing diagram of the touch display panel according to an embodiment of the disclosure. Wherein, A is time of a frame, α is display signal, β is touch signal. In each of time of a frame A, touch and display are respectively at the same time, which is while the time of one frame is 16.667 ms, the display time is 16.667 ms, and achieve to the touch function is also 16.667 ms, these two are not be interfered. Therefore, it enhances charging time of the display for ensuring high resolution of the touch display panel 100.

[0039] The foregoing contents are detailed description of the disclosure in conjunction with specific preferred embodiments and concrete embodiments of the disclosure are not limited to these descriptions. For the person skilled in the art of the disclosure, without departing from the concept of the disclosure, simple deductions or substitutions can be made and should be included in the protection scope of the application

What is claimed is:

1. A touch display panel, comprising an array substrate and a color filter substrate are cell-assembled, and a liquid crystal layer positioned between the array substrate and the color filter substrate, wherein, the array substrate includes a first substrate, a black matrix layer, a touch sensing layer, a first electrode layer and a pixel electrode layer are sequentially positioned, the pixel electrode layer is nearby the liquid crystal layer, the first substrate layer is positioned on a side of the pixel electrode which far away the liquid crystal layer.
2. The touch display panel according to claim 1, wherein the array substrate further comprises a passivation layer, the passivation layer is positioned between the first electrode layer and the pixel electrode layer.
3. The touch display panel according to claim 1, wherein the color filter substrate comprises a second substrate and a color layer forming on a surface of the second substrate, the liquid crystal layer is positioned on a color layer which is positioned far away the second substrate.
4. The touch display panel according to claim 1, wherein the array substrate further comprises an intermediate layer, the intermediate layer is positioned between the touch sensing layer and the first electrode layer.
5. The touch display panel according to claim 1, wherein the touch display panel further comprises at least one chip, the chip is electrically connecting with the array substrate.
6. The touch display panel according to claim 1, wherein the array substrate further comprises a first polarizer, the first polarizer is positioned between the first substrate and the black matrix layer.
7. The touch display panel according to claim 1, wherein the touch display panel further comprises a second polarizer, the second polarizer is positioned on a surface of the second substrate which is far away the color layer.
8. The touch display panel according to claim 3, wherein a plurality of reflective portion is positioned on the second substrate.
9. A touch display device, comprising a backlight assembly and a touch display panel, the touch display panel

comprises an array substrate and a color filter substrate are cell-assembled, and a liquid crystal layer positioned between the array substrate and the color filter substrate, wherein, the array substrate includes a first substrate, a black matrix layer, a touch sensing layer, a first electrode layer and a pixel electrode layer are sequentially positioned, the pixel electrode layer is nearby the liquid crystal layer, the first substrate layer is positioned on a side of the pixel electrode which far away the liquid crystal layer; the backlight assembly is positioned on a side of the color filter substrate which is far away the liquid crystal layer.

10. The touch display device according to claim 9, wherein the array substrate further comprises a passivation layer, the passivation layer is positioned between the first electrode layer and the pixel electrode layer.

11. The touch display device according to claim 9, wherein the color filter substrate comprises a second substrate and a color layer forming on a surface of the second substrate, the liquid crystal layer is positioned on a color layer which is positioned far away the second substrate.

12. The touch display device according to claim 9, wherein the array substrate further comprises an intermediate layer, the intermediate layer is positioned between the touch sensing layer and the first electrode layer.

13. The touch display device according to claim 9, wherein the touch display panel further comprises at least one chip, the chip is electrically connecting with the array substrate.

14. The touch display device according to claim 9, wherein the array substrate further comprises a first polarizer, the first polarizer is positioned between the first substrate and the black matrix layer.

15. The touch display device according to claim 9, wherein the touch display panel further comprises a second polarizer, the second polarizer is positioned on a surface of the second substrate which is far away the color layer.

16. The touch display device according to claim 11, wherein a plurality of reflective portion is positioned on the second substrate.

* * * * *

专利名称(译)	触摸显示面板和触摸显示设备		
公开(公告)号	US20190129216A1	公开(公告)日	2019-05-02
申请号	US15/753929	申请日	2018-01-04
[标]申请(专利权)人(译)	武汉华星光电技术有限公司		
申请(专利权)人(译)	中国武汉恒星光电科技有限公司.		
当前申请(专利权)人(译)	中国武汉恒星光电科技有限公司.		
[标]发明人	TSAI YUCHENG ZHANG ZHOU XU PAN MA CHANGWEN		
发明人	TSAI, YUCHENG ZHANG, ZHOU XU, PAN MA, CHANGWEN		
IPC分类号	G02F1/1333 G06F3/041 G02F1/1335 G02F1/1362 G02F1/1343		
CPC分类号	G02F1/13338 G06F3/0412 G02F1/133514 G02F1/136209 G02F1/134309 G02F1/133345 G02F1/133528 G06F3/044 G02F2201/123 G06F3/0416 G06F3/0443		
优先权	201711053731.2 2017-10-31 CN		
外部链接	Espacenet USPTO		

摘要(译)

提供一种触控显示面板和触控显示装置。包括阵列基板和滤色器基板的触摸显示面板是单元组装的，并且液晶层位于阵列基板和滤色器基板之间。阵列基板包括第一基板，黑矩阵层，触控感应层，第一电极层和像素电极层依次定位，像素电极层位于液晶层附近，第一基板层位于像素电极的一侧远离液晶层。使用用于控制触摸显示面板的第一基板的触摸显示面板在触摸时显示图像，触摸显示面板中的触摸电极场和驱动电极文件彼此不起作用，从而避免降低触摸显示面板的分辨率。

