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(54) **LIQUID CRYSTAL DISPLAY PANEL WITH SWITCHABLE VIEWING ANGLE AND DRIVING METHOD THEREOF**

(71) Applicant: **Shenzhen China Star Optoelectronics Technology Co., Ltd.**, Shenzhen, Guangdong (CN)

(72) Inventor: **Yuejun Tang**, Shenzhen, Guangdong (CN)

(73) Assignee: **Shenzhen China Star Optoelectronics Technology Co., Ltd.**, Shenzhen, Guangdong (CN)

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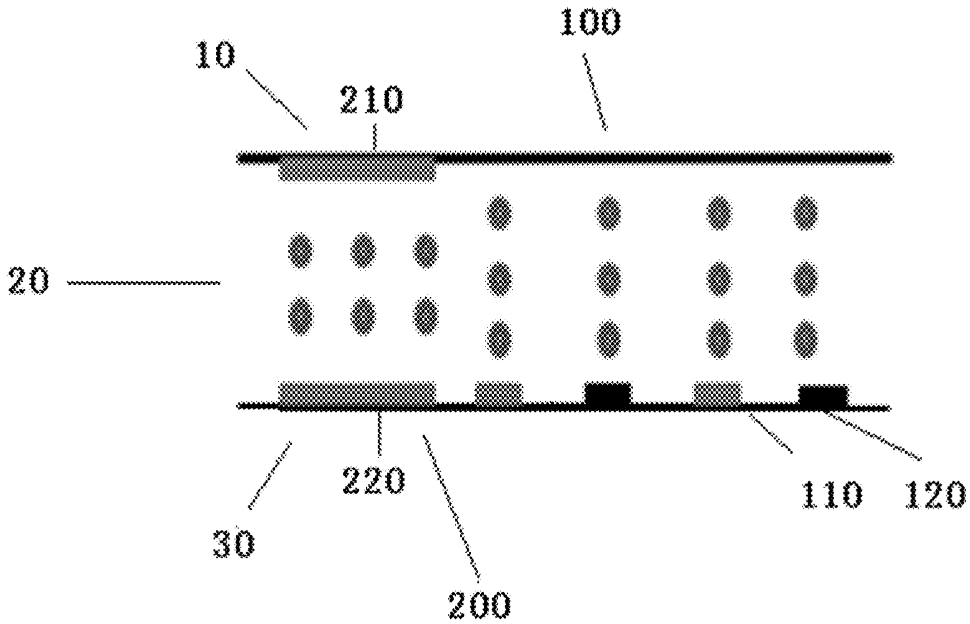
(57) **ABSTRACT**

Disclosed is a liquid crystal display panel with a switchable viewing angle and a driving method thereof. A pixel unit located in a display area of the liquid crystal display panel comprises: a main pixel region, which is horizontally aligned, wherein pixel electrodes and common electrodes are alternately arranged on the lower substrate and spaced from one another; and a sub-pixel region, which is perpendicularly aligned, wherein upper substrate electrodes and corresponding pixel electrodes are arranged below the upper substrate and on the lower substrate, respectively. When no bias voltage is applied to the upper substrate electrodes in the sub-pixel region, liquid crystal molecules corresponding to the sub-pixel region do not deflect, such that large viewing angle light leakage occurs in the sub-pixel region, thereby achieving narrow viewing angle display. When a bias voltage is applied to the upper substrate electrodes in the sub-pixel region, the liquid crystal molecules corresponding to the sub-pixel region deflect to a flat state, such that large viewing angle light leakage ceases in the sub-pixel region, thereby achieving wide viewing angle display.



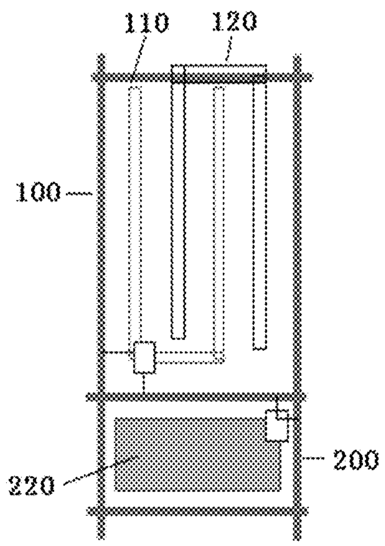


Fig. 1

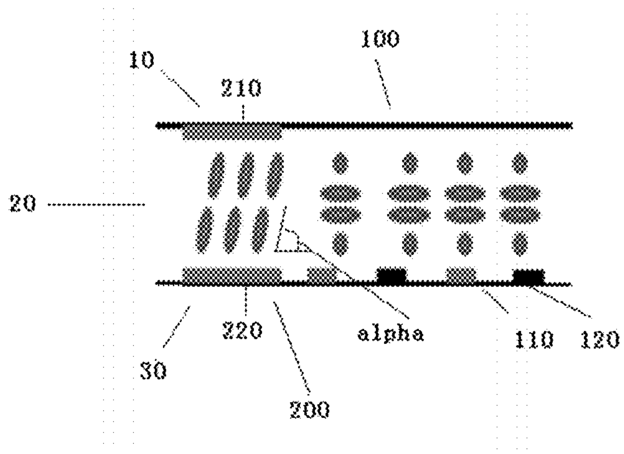


Fig. 2A

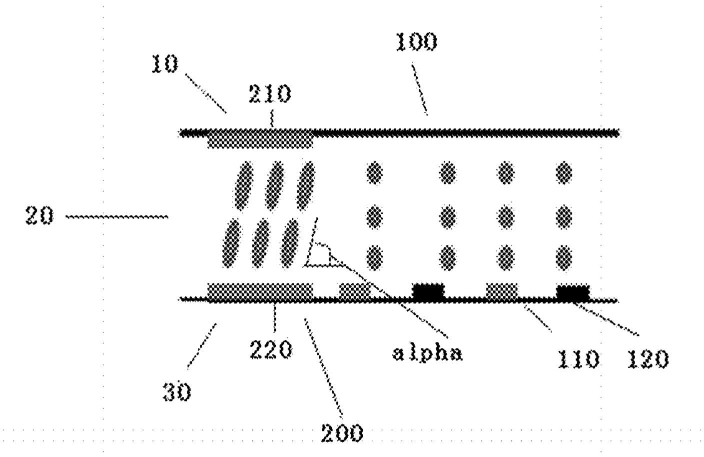

10
100
210
20
220
alpha
110
120
30
200

Fig. 2B

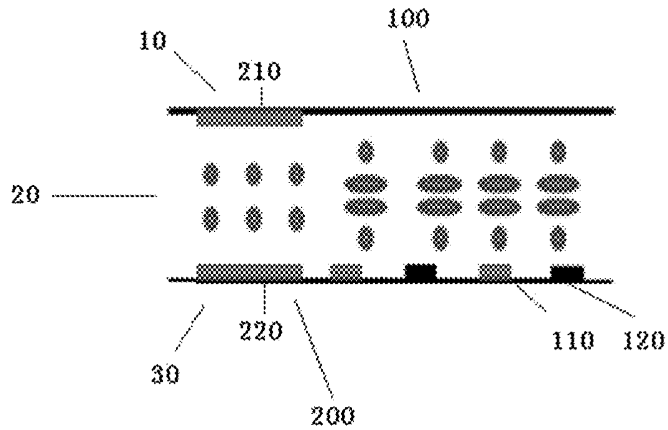

10
100
210
20
220
110
120
30
200

Fig. 3A

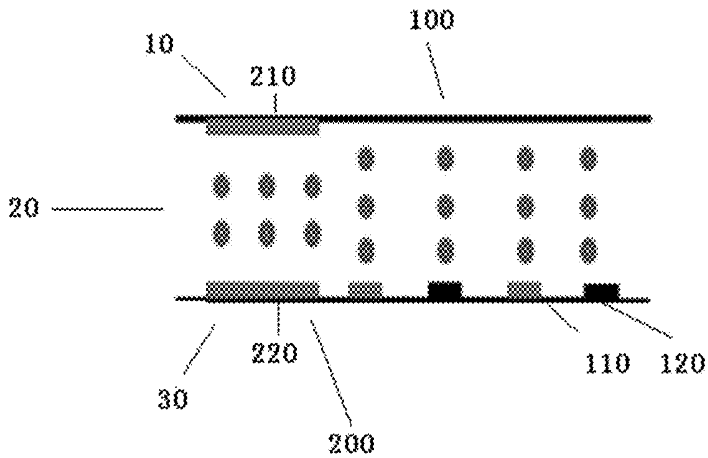


Fig. 3B

LIQUID CRYSTAL DISPLAY PANEL WITH SWITCHABLE VIEWING ANGLE AND DRIVING METHOD THEREOF

[0001] The present application claims benefit of Chinese patent application CN 201410856071.1, entitled "Liquid crystal display panel with switchable viewing angle and driving method thereof" and filed on Dec. 31, 2014, the entirety of which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present disclosure relates to a technology of liquid crystal displays, and in particular, to a liquid crystal display panel with a switchable viewing angle and a driving method thereof.

BACKGROUND OF THE INVENTION

[0003] A viewing angle range (viewing angle for short) is an important performance index of a liquid crystal display panel. It is necessary for a liquid crystal display panel to vary a polarization state of light transmitted therethrough via adjusting orientation of liquid crystal molecules, so as to achieve a display function. Due to influences of optical anisotropy of liquid crystal molecules, a liquid crystal display device has a smaller viewing angle than a cathode-ray tube display device. In order to increase the viewing angle of the liquid crystal display device, the techniques of vertical alignment (VA) mode, pattern vertical alignment (PVA) mode, multi-domain vertical alignment (MVA) mode, in-plane switching (IPS) mode, fringe field switching (FFS) mode are successively proposed as technologies constantly develop, thereby achieving wide viewing angle display of the liquid crystal display device.

[0004] Although liquid crystal display panels tend to have wider viewing angles now, under certain conditions, a switching function between a wide viewing angle and a narrow viewing angle is still necessary for a liquid crystal display panel. This is especially true for a portable electronic apparatus, e.g., a mobile phone, a pocket computer, or a notebook computer, which uses a liquid crystal display device. For instance, a user may, sometimes need to share images stored in the portable electronic apparatus with other persons, while at other times, expect to protect the images stored in the portable electronic apparatus from other persons as privacy. Therefore, it is necessary to provide a liquid crystal display panel with a switchable viewing angle.

[0005] In the prior art, researchers have put forward the following solutions to switching between a wide viewing angle and a narrow viewing angle.

[0006] To start with, a shutter shielding film can be used. When a user expects the liquid crystal display to display pictures at a narrow viewing angle, a shutter shielding film can be coated on a screen of the liquid crystal display panel. Such a procedure is inconvenient to operate. Besides, the user has to take the shutter shielding film along with him/her.

[0007] Moreover, a double backlight system can be used. According to the double backlight system, an ordinary backlight system can be used to achieve wide viewing angle display, and a collimating backlight system can be further used to achieve narrow viewing angle display. This system will undoubtedly increase manufacturing costs, thickness, and energy consumption of the liquid crystal display panel.

[0008] In addition, a double-layer liquid crystal display panel can be used. That is, a main liquid crystal display panel can be used to display images normally, and an additional liquid crystal display panel can be employed to control viewing angles for display. This double-layer liquid crystal display panel will also increase manufacturing costs, thickness, and energy consumption of the liquid crystal display panel.

[0009] Obviously, none of the above liquid crystal display panels can satisfy the requirements of a portable electronic apparatus for size or energy consumption.

[0010] Therefore, the inventor of the present disclosure, based on practical experience in designing and manufacturing liquid crystal display panels, and relevant professional knowledge thereof, has proposed a liquid crystal display panel with a switchable viewing angle, which has a simpler structure and is more convenient to operate, thereby satisfying high requirements of portable electronic apparatuses, such as mobile phones, for stable circuits, weight, and energy consumption.

SUMMARY OF THE INVENTION

[0011] Directed against the above problems, the present disclosure provides a liquid crystal display panel with a switchable viewing angle, which has a simpler structure and is more convenient to operate, and a driving method thereof.

[0012] In order to solve the above technical problems, the present disclosure provides a liquid crystal display panel with a switchable viewing angle, comprising an upper substrate, a lower substrate, and a liquid crystal layer provided therebetween. A pixel unit located in a display area comprises: a main pixel region, which is horizontally aligned, wherein pixel electrodes and common electrodes are alternately arranged on the lower substrate and spaced from one another; and a sub-pixel region, which is perpendicularly aligned, wherein upper substrate electrodes and corresponding pixel electrodes are arranged below the upper substrate and on the lower substrate, respectively. When no bias voltage is applied to the upper substrate electrodes in the sub-pixel region, liquid crystal molecules corresponding to the sub-pixel region do not deflect, such that large viewing angle light leakage occurs in the sub-pixel region, thereby achieving narrow viewing angle display. When a bias voltage is applied to the upper substrate electrodes in the sub-pixel region, the liquid crystal molecules corresponding to the sub-pixel region deflect to a flat state, such that large viewing angle light leakage ceases in the sub-pixel region, thereby achieving wide viewing angle display.

[0013] According to one embodiment of the present disclosure, the above liquid crystal display panel further comprises two display drivers, respectively used for controlling voltages of the electrodes in the main pixel region and the sub-pixel region, wherein when only one of the display drivers applies a voltage to the electrodes in the main pixel region, the liquid crystal display panel will be in a narrow viewing angle mode; while when the two display drivers simultaneously apply voltages to the electrodes in both the main pixel region and the sub-pixel region, the liquid crystal display panel will be in a wide viewing angle mode.

[0014] According to one embodiment of the present disclosure, the liquid crystal molecules in the main pixel region rotate in a plane parallel with the upper substrate and the lower substrate, which forms an IPS or FFS operating mode.

[0015] According to one embodiment of the present disclosure, the liquid crystal molecules in the sub-pixel region rotate in a plane perpendicular to the upper substrate and the lower substrate, which forms a VA operating mode.

[0016] According to one embodiment of the present disclosure, the pixel electrodes and the common electrodes that are located in the main pixel region, and the upper substrate electrodes and the pixel electrodes that are located in the sub-pixel region are all made of transparent conductive material.

[0017] According to one embodiment of the present disclosure, one and a same polypropylene imine material is used to achieve horizontal alignment of the main pixel region and perpendicular alignment of the sub-pixel region.

[0018] According to one embodiment of the present disclosure, different polypropylene imine materials are used to achieve horizontal alignment of the main pixel region and perpendicular alignment of the sub-pixel region, respectively.

[0019] In addition, the present disclosure further provides a driving method of a liquid crystal display panel with a switchable viewing angle. A pixel unit in a display area of the liquid crystal display panel comprises: a main pixel region, which is horizontally aligned, wherein pixel electrodes and common electrodes are alternately arranged on the lower substrate and spaced from one another; and a sub-pixel region, which is perpendicularly aligned, wherein upper substrate electrodes and corresponding pixel electrodes are arranged below the upper substrate and on the lower substrate, respectively. The driving method comprises the steps of: applying no bias voltage, in a narrow viewing angle display mode, to the upper substrate electrodes in the sub-pixel region, such that liquid crystal molecules corresponding to the sub-pixel region do not deflect, thereby causing large viewing angle light leakage in the sub-pixel region; and applying a bias voltage, in a wide viewing angle display mode, to the upper substrate electrodes in the sub-pixel region, such that the liquid crystal molecules corresponding to the sub-pixel region deflect to a flat state, thereby ceasing large viewing angle light leakage in the sub-pixel region.

[0020] According to one embodiment of the present disclosure, in the above driving method, the liquid crystal molecules in the main pixel region rotate in a plane parallel with the upper substrate and the lower substrate, which forms an IPS or FFS operating mode.

[0021] According to one embodiment of the present disclosure, in the above driving method, the liquid crystal molecules in the sub-pixel region rotate in a plane perpendicular to the upper substrate and the lower substrate, which forms a VA operating mode.

[0022] Compared with the prior art, one or more embodiment of the present disclosure can has the following advantages.

[0023] According to the present disclosure, the wide viewing angle mode or the narrow viewing angle mode can be selected depending on whether the bias voltage is to be applied to the upper substrate electrodes, which is easy to operate. In addition, according to the present disclosure, the bias voltage can be applied to the upper substrate electrodes to achieve the wide viewing angle mode, which is suitable for negative liquid crystal material. Compared with a conventional liquid crystal display device using a double backlight system or a double-layer liquid crystal display panel to achieve switching between wide and narrow viewing angles, the liquid crystal display device provided in the present disclosure has an attenuated liquid crystal display panel, and reduced manufacturing costs and energy consumption.

[0024] Other features and advantages of the present disclosure will be further explained in the following description, and partly become self-evident therefrom, or be understood through implementing the present disclosure. The objectives and advantages of the present disclosure will be achieved through the structure specifically pointed out in the description, claims, and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The drawings are provided for further understanding of the present disclosure, and constitute one part of the description. They serve to explain the present disclosure in conjunction with the embodiments, rather than to limit the present disclosure in any manner. In the drawings:

[0026] FIG. **1** is a partial top view of a display area of a liquid crystal display panel according to an embodiment of the present disclosure;

[0027] FIG. **2**A shows a deflection state of liquid crystal molecules when the liquid crystal display panel of FIG. **1** is in a narrow viewing angle bright state;

[0028] FIG. **2**B shows a deflection state of the liquid crystal molecules when the liquid crystal display panel of FIG. **1** is in a narrow viewing angle dark state;

[0029] FIG. **3**A shows a deflection state of the liquid crystal molecules when the liquid crystal display panel of FIG. **1** is in a wide viewing angle bright state; and

[0030] FIG. **3**B shows a deflection state of the liquid crystal molecules when the liquid crystal display panel of FIG. **1** is in a wide viewing angle dark state.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0031] The present disclosure is based on hybrid light distribution technology. In order to explain the purposes, technical solutions, and advantages of the present disclosure more explicitly, the present disclosure will be further described in detail with reference to the accompany drawings.

[0032] The present disclosure will be explained in detail with reference to FIGS. **1-3** in the following.

[0033] FIG. **1** is a partial top view of a display area of a liquid crystal display panel according to a first embodiment of the present disclosure. As is in the prior art, the panel comprises an upper substrate **10** and a lower substrate **30** parallel with each other, and a liquid crystal layer **20**, preferably negative liquid crystal material, provided between the upper substrate **10** and the lower substrate **30**.

[0034] In the present embodiment, the upper substrate **10** can comprise an upper substrate glass layer, an upper substrate quarter-wave plate, an upper substrate half-wave plate, and an upper substrate polarizer; and the lower substrate **30** can comprise a lower substrate glass layer, a lower substrate quarter-wave plate, a lower substrate half-wave plate, and a lower substrate polarizer. The upper substrate quarter-wave plate and the lower substrate quarter-wave plate have parallel optical axes; the upper substrate half-wave plate and the lower substrate half-wave plate have parallel optical axes; and the upper substrate polarizer and the lower substrate polarizer have optical axes perpendicular to each other.

[0035] A pixel unit located in the display area comprises a main pixel region **100** and a sub-pixel region **200**.

[0036] The main pixel region **100** is horizontally aligned, wherein thin striped pixel electrodes **110** and common electrodes **120**, which are parallel with one another, are alternately arranged on the lower substrate **30** and spaced from one another. Typically, the pixel electrodes **110** and the common electrodes **120** have the same width, and are spaced from one another at equal intervals.

[0037] The sub-pixel region **200** is perpendicularly aligned, wherein upper substrate electrodes **210** and corresponding pixel electrodes **220** are respectively arranged below the upper substrate **10** and on the lower substrate **30**.

[0038] The aforementioned pixel electrodes **110** and common electrodes **120** that are located in the main pixel region **110**, and the upper substrate electrodes **210** and the pixel electrodes **220** that are located in the sub-pixel region **200** can all be made of transparent conductive materials, which can be at least one selected from a group consisting of ITO, IZO, and IGO.

[0039] In addition, in order to achieve switching between a wide viewing angle and a narrow viewing angle, the main pixel region **100** can be horizontally aligned, and the sub-pixel region **200** can be perpendicularly aligned. Specifically, one and a same polypropylene imine material or different polypropylene imine materials can be used to perform optical alignment.

[0040] If one and a same polypropylene imine material is used, a mask can be used to first cover the sub-pixel region during a horizontal alignment operation on the main pixel region, and then to cover the main pixel area during a perpendicular alignment operation on the sub-pixel region.

[0041] If different polypropylene imine materials are used, a perpendicular alignment film can be first formed in the sub-pixel region, without a friction procedure, and then a horizontal alignment film can be coated on the perpendicular alignment film, followed by execution of a friction procedure, so as to achieve horizontal alignment. Subsequently, the horizontal alignment film coated on the perpendicular alignment film in the sub-pixel region can be selectively removed through photoetching, so as to expose the perpendicular alignment film in the sub-pixel region.

[0042] Appropriate voltages can be applied to the electrodes in the horizontally aligned main pixel region and perpendicularly aligned sub-pixel region, so as to deflect corresponding liquid crystal molecules in the main pixel region and the sub-pixel region in proper manners, respectively. The liquid crystal display panel can thereby achieve narrow viewing angle display and wide viewing angle display respectively. For example, the liquid crystal molecules in the main pixel region rotate in a plane parallel with the upper substrate and the lower substrate, which forms an IPS or FFS operating mode. And the liquid crystal molecules in the sub-pixel region rotate in a plane perpendicular to the upper substrate and the lower substrate, which forms a VA operating mode.

[0043] Specific operating modes are as follows.

[0044] FIGS. **2**A and **2**B show deflection states of the liquid crystal molecules when the above liquid crystal display panel is in a narrow viewing angle display mode.

[0045] When a corresponding voltage is applied to the electrodes in the main pixel region (pixel electrodes and/or common electrodes) only, the corresponding liquid crystal molecules in the main pixel region will rotate in a plane parallel with the upper and lower substrates, due to the horizontal alignment of the main pixel region. The voltage can be controlled in size to vary a rotating angle of the liquid crystal molecules in the plane parallel with the upper and lower substrates. Meanwhile, since no bias voltage is applied to the upper substrate electrodes in the sub-pixel region, or a bias voltage applied to the upper substrate electrodes in the sub-pixel region is too low to drive the liquid crystal molecules to deflect, the corresponding liquid crystal molecules in the sub-pixel region maintain a large pretilt angle (marked as alpha in the figures). Under such circumstances, when the display screen is viewed at a large viewing angle, lateral light leakage will occur in the sub-pixel region, thereby achieving narrow viewing angle display of the liquid crystal display panel.

[0046] FIGS. **3**A and **3**B show deflection states of the liquid crystal molecules when the above liquid crystal display panel is in a wide viewing angle display mode.

[0047] When a corresponding voltage is applied to the electrodes (pixel electrodes and/or common electrodes) in the main pixel region, the corresponding liquid crystal molecules in the main pixel region will rotate in a plane parallel with the upper and lower substrates, due to the horizontal alignment of the main pixel region. The voltage can be controlled in size to vary a rotating angle of the liquid crystal molecules in the plane parallel with the upper and lower substrates. Meanwhile, a corresponding bias voltage is applied to the upper substrate electrodes in the sub-pixel region, or the bias voltage applied to the upper substrate electrodes in the sub-pixel region is so high as to exceed a voltage threshold for driving liquid crystal molecules to deflect, the corresponding liquid crystal molecules in the sub-pixel region thus deflect, thereby rendering the pretilt angle (marked as alpha in the figures) smaller. When the voltage reaches a certain value, the liquid crystal molecules in the sub-pixel region will completely fall in a flat state. As a result, light leakage will disappear from the sub-pixel region viewed at a large viewing angle, thereby achieving wide viewing angle display of the liquid crystal display panel.

[0048] As such, in a specific embodiment, two display drivers can be arranged, for controlling the voltages of electrodes in the main pixel region and the sub-pixel region, respectively, thereby achieving switching between the narrow viewing angle display and the wide viewing angle display. For example, when only one of the display drivers is applying a voltage to the electrodes in the main pixel region, the liquid crystal display panel will be in a narrow viewing angle mode, while when the two display drivers are applying voltages to the electrodes in the main pixel region and the sub-pixel region simultaneously, the liquid crystal display panel will be in a wide viewing angle mode.

[0049] It should be noted that, as required in specific implementation, a constant voltage can be applied to the common electrodes in the main pixel region, and a voltage can be applied to corresponding pixel electrodes only, to achieve the purpose of controlling deflection of the liquid crystal molecules in the main pixel region. It has been already known to apply a voltage to the pixel electrodes in the main pixel region or the sub-pixel region for controlling deflection angles of the liquid crystal molecules, which will therefore not be described in detail herein.

[0050] In the present disclosure, the bias voltage is applied to the upper substrate electrodes in the sub-pixel region to achieve the wide viewing angle mode, thereby achieving convenient switching between the wide viewing angle and the narrow viewing angle. This is especially suitable for a liquid crystal panel using negative liquid crystal material. Compared with a conventional display device using a double backlight system or a double-layer liquid crystal display panel, the liquid crystal display device provided in the present disclosure which can achieve switching between wide and narrow viewing angles has an attenuated liquid crystal display panel, and reduced manufacturing costs and energy consumption.

[0051] The above description should not be construed as limitations of the present disclosure, but merely as exemplifications of preferred embodiments thereof. Any variations or replacements that can be readily envisioned by those skilled in the art are intended to be within the scope of the present disclosure.

1. A liquid crystal display panel with a switchable viewing angle, comprising an upper substrate, a lower substrate, and a liquid crystal layer provided therebetween, wherein a pixel unit located in a display area comprises:
   - a main pixel region, which is horizontally aligned, wherein pixel electrodes and common electrodes are alternately arranged on the lower substrate and spaced from one another, and
   - a sub-pixel region, which is perpendicularly aligned, wherein upper substrate electrodes and corresponding pixel electrodes are arranged below the upper substrate and on the lower substrate, respectively, and

wherein when no bias voltage is applied to the upper substrate electrodes in the sub-pixel region, liquid crystal molecules corresponding to the sub-pixel region do not deflect, such that large viewing angle light leakage occurs in the sub-pixel region, thereby achieving narrow viewing angle display; while when a bias voltage is applied to the upper substrate electrodes in the sub-pixel region, the liquid crystal molecules corresponding to the sub-pixel region deflect to a flat state, such that large viewing angle light leakage ceases in the sub-pixel region, thereby achieving wide viewing angle display.

2. The liquid crystal display panel according to claim **1**, further comprising two display drivers, respectively used for controlling voltages of the electrodes in the main pixel region and the sub-pixel region, wherein when only one of the display drivers applies a voltage to the electrodes in the main pixel region, the liquid crystal display panel will be in a narrow viewing angle mode; while when the two display drivers simultaneously apply voltages to the electrodes in both the main pixel region and the sub-pixel region, the liquid crystal display panel will be in a wide viewing angle mode.

3. The liquid crystal display panel according to claim **1**, wherein the liquid crystal molecules in the main pixel region rotate in a plane parallel with the upper substrate and the lower substrate, which forms an IPS or FFS operating mode.

4. The liquid crystal display panel according to claim **2**, wherein the liquid crystal molecules in the main pixel region rotate in a plane parallel with the upper substrate and the lower substrate, which forms an IPS or FFS operating mode.

5. The liquid crystal display panel according to claim **1**, wherein the liquid crystal molecules in the sub-pixel region rotate in a plane perpendicular to the upper substrate and the lower substrate, which forms a VA operating mode.

6. The liquid crystal display panel according to claim **2**, wherein the liquid crystal molecules in the sub-pixel region rotate in a plane perpendicular to the upper substrate and the lower substrate, which forms a VA operating mode.

7. The liquid crystal display panel according to claim **3**, wherein the liquid crystal molecules in the sub-pixel region rotate in a plane perpendicular to the upper substrate and the lower substrate, which forms a VA operating mode.

8. The liquid crystal display panel according to claim **1**, wherein the pixel electrodes and the common electrodes that are located in the main pixel region, and the upper substrate electrodes and the pixel electrodes that are located in the sub-pixel region are all made of transparent conductive material.

9. The liquid crystal display panel according to claim **1**, wherein one and a same polypropylene imine material is used to achieve horizontal alignment of the main pixel region and perpendicular alignment of the sub-pixel region.

10. The liquid crystal display panel according to claim **1**, wherein one and a same polypropylene imine material is used to achieve horizontal alignment of the main pixel region and perpendicular alignment of the sub-pixel region.

11. The liquid crystal display panel according to claim **2**, wherein one and a same polypropylene imine material is used to achieve horizontal alignment of the main pixel region and perpendicular alignment of the sub-pixel region.

12. The liquid crystal display panel according to claim **3**, wherein one and a same polypropylene imine material is used to achieve horizontal alignment of the main pixel region and perpendicular alignment of the sub-pixel region.

13. The liquid crystal display panel according to claim **1**, wherein different polypropylene imine materials are used to achieve horizontal alignment of the main pixel region and perpendicular alignment of the sub-pixel region, respectively.

14. The liquid crystal display panel according to claim **2**, wherein different polypropylene imine materials are used to achieve horizontal alignment of the main pixel region and perpendicular alignment of the sub-pixel region, respectively.

15. The liquid crystal display panel according to claim **3**, wherein different polypropylene imine materials are used to achieve horizontal alignment of the main pixel region and perpendicular alignment of the sub-pixel region, respectively.

16. A driving method of a liquid crystal display panel with a switchable viewing angle,
   - wherein a pixel unit in a display area of the liquid crystal display panel comprises:
     - a main pixel region, which is horizontally aligned, wherein pixel electrodes and common electrodes are alternately arranged on the lower substrate and spaced from one another, and
     - a sub-pixel region, which is perpendicularly aligned, wherein upper substrate electrodes and corresponding pixel electrodes are arranged below the upper substrate and on the lower substrate, respectively, and wherein the driving method comprises the steps of:
   - applying no bias voltage, in a narrow viewing angle display mode, to the upper substrate electrodes in the sub-pixel region, such that liquid crystal molecules corresponding to the sub-pixel region do not deflect, thereby causing large viewing angle light leakage in the sub-pixel region, and
   - applying a bias voltage, in a wide viewing angle display mode, to the upper substrate electrodes in the sub-pixel region, such that the liquid crystal molecules corresponding to the sub-pixel region deflect to a flat state, thereby ceasing large viewing angle light leakage in the sub-pixel region.

17. The driving method of claim **16**, wherein the liquid crystal molecules in the main pixel region rotate in a plane parallel with the upper substrate and the lower substrate, which forms an IPS or FFS operating mode.

18. The driving method of claim **16**, wherein the liquid crystal molecules in the sub-pixel region rotate in a plane perpendicular to the upper substrate and the lower substrate, which forms a VA operating mode.

19. The driving method of claim **17**, wherein the liquid crystal molecules in the sub-pixel region rotate in a plane perpendicular to the upper substrate and the lower substrate, which forms a VA operating mode.

* * * * *

patsnap

专利名称(译)	具有可切换视角的液晶显示面板及其驱动方法
公开(公告)号	US20160246138A1
公开(公告)日	2016-08-25
申请号	US14/418607
申请日	2015-01-20
[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.
当前申请(专利权)人(译)	深圳市中国星光电科技有限公司.
[标]发明人	TANG YUEJUN
发明人	TANG, YUEJUN
IPC分类号	G02F1/1343 G02F1/1337 G02F1/133
CPC分类号	G02F1/133711 G02F2001/134372 G02F1/133 G02F1/1343 G02F1/139 G02F1/133753 G02F2001/134345 G02F2001/133757 G02F1/13439 G02F1/134363 G02F1/13306 G02F1/1323 G02F2001/133638 G02F2001/134381 G02F2413/04 G02F2413/06
优先权	201410856071.1 2014-12-31 CN
其他公开文献	US9897872
外部链接	Espacenet USPTO

摘要(译)

公开了一种具有可切换视角的液晶显示面板及其驱动方法。位于液晶显示面板的显示区域中的像素单元包括：主像素区域，其水平对齐，其中像素电极和公共电极交替地布置在下基板上并且彼此间隔开;和一个垂直排列的子像素区域，其中上基板电极和相应的像素电极分别设置在上基板下方和下基板上。当没有偏压施加到子像素区域中的上基板电极时，对应于子像素区域的液晶分子不会偏转，使得在子像素区域中发生大视角漏光，从而实现窄视角显示。当偏置电压施加到子像素区域中的上基板电极时，对应于子像素区域的液晶分子偏转到平坦状态，使得在子像素区域中大视角光泄漏停止，从而实现宽视角显示。