



US 20050219432A1

(19) **United States**(12) **Patent Application Publication**

Na et al.

(10) **Pub. No.: US 2005/0219432 A1**(43) **Pub. Date:****Oct. 6, 2005**(54) **LIQUID CRYSTAL DISPLAY DEVICE**(52) **U.S. Cl.** **349/40**(75) **Inventors:** **Du-Hyun Na**, Incheon (KR);
Choel-Min Woo, Sangju (KR)(57) **ABSTRACT**

Correspondence Address:

BRINKS HOFER GILSON & LIONE**P.O. BOX 10395****CHICAGO, IL 60610 (US)**(73) **Assignee:** **LG PHILIPS LCD CO., LTD.**(21) **Appl. No.:** **11/027,428**(22) **Filed:** **Dec. 30, 2004**(30) **Foreign Application Priority Data**

Apr. 6, 2004 (KR) 2004-23529

Publication Classification(51) **Int. Cl.⁷** **G02F 1/133**

A LCD device includes substrates attached to each other with a cell gap therebetween. An image display unit is composed of pixels arranged on the first substrate, for substantially displaying an image. Gate lines are arranged in a horizontal direction, for applying a gate low voltage and a gate high voltage to the image display unit. Data lines are arranged in a vertical direction, for applying image information to the image display unit. A common voltage line applies a common voltage. First electrostatic preventing units are respectively connected to one side of the data lines and commonly connected to a first gate line. Second electrostatic preventing units are respectively connected to one side of the gate lines and commonly connected to the common voltage line. Third electrostatic preventing units connect the first gate line and the common voltage line.

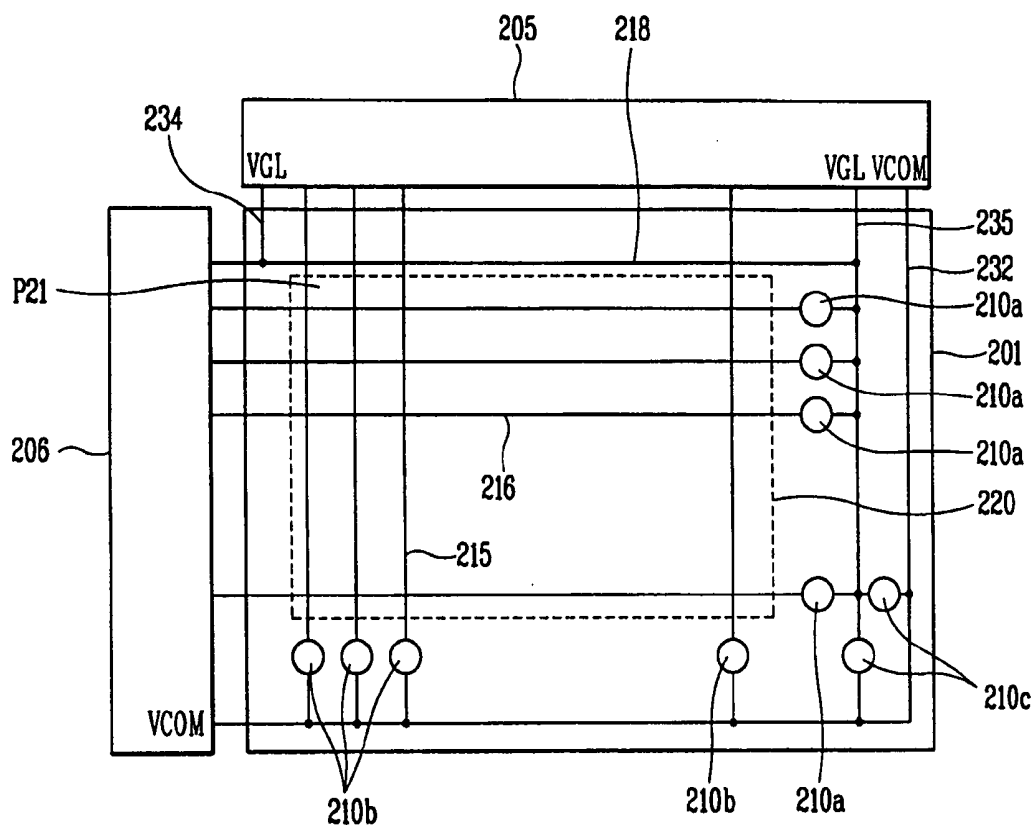


FIG. 1
RELATED ART

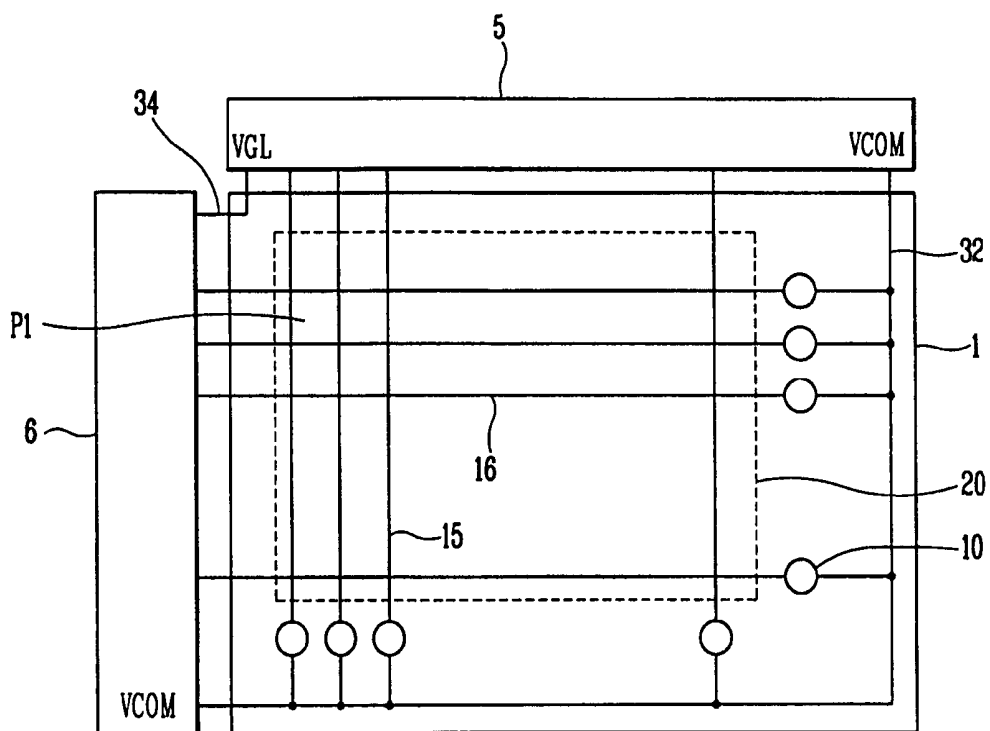


FIG. 2

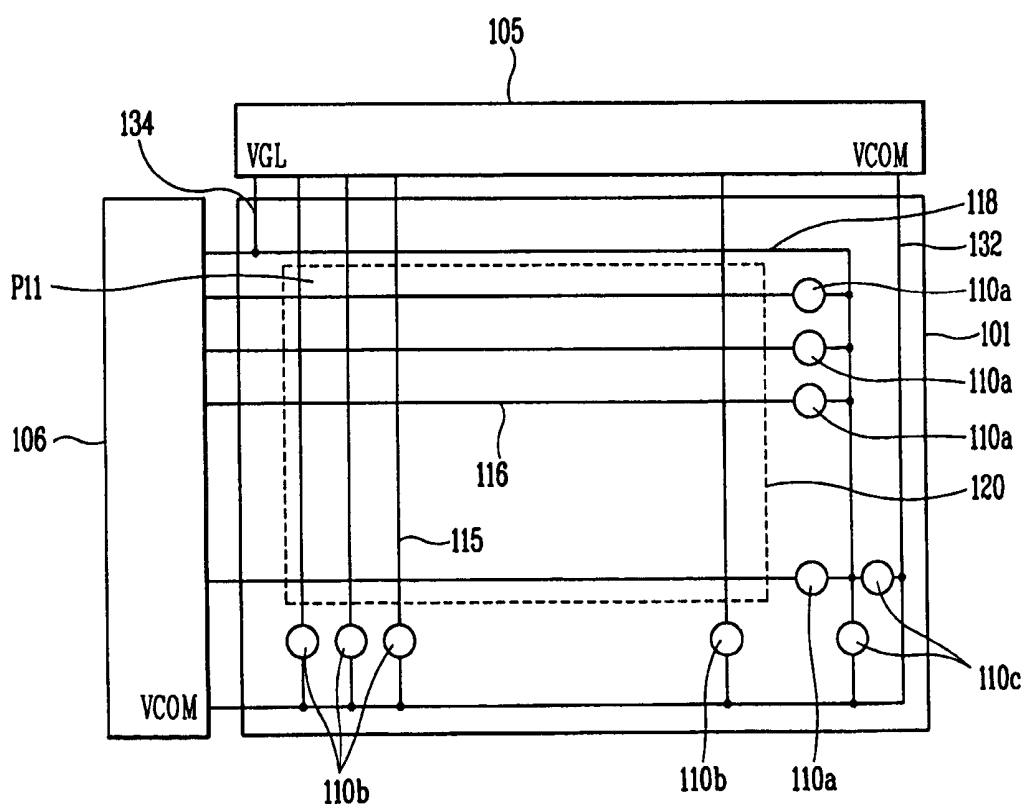
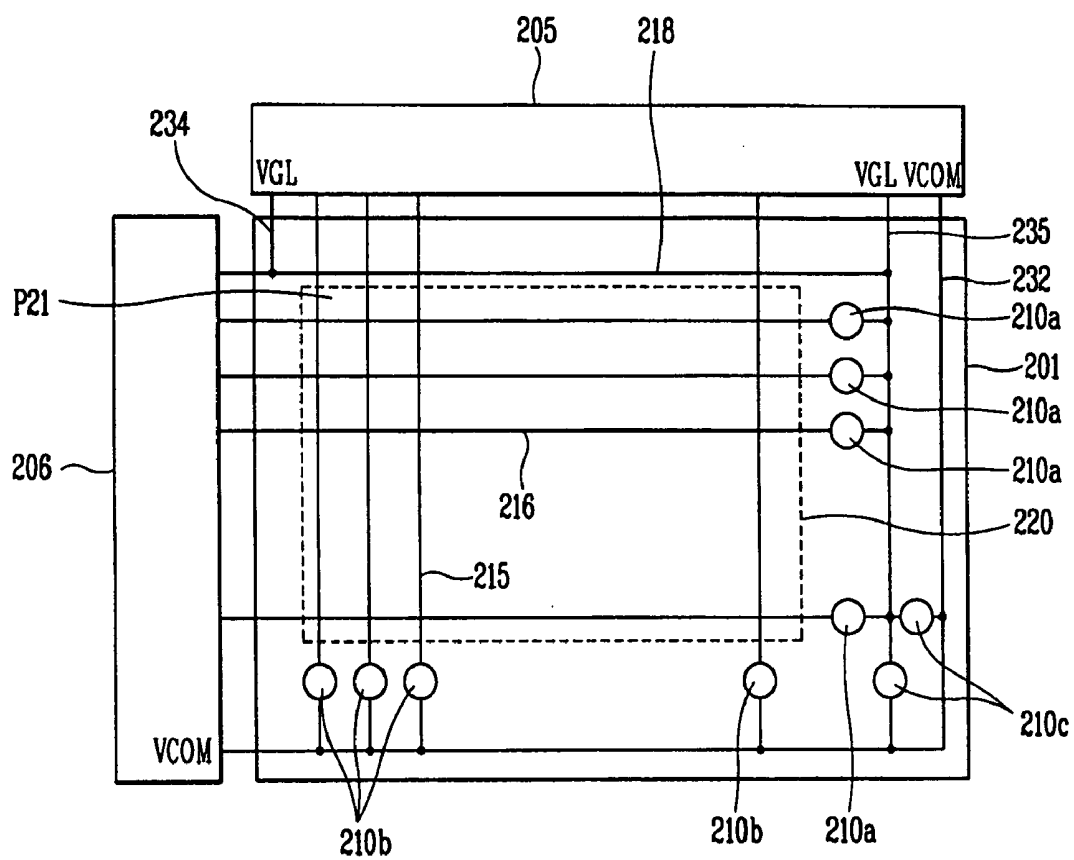


FIG. 3



LIQUID CRYSTAL DISPLAY DEVICE

[0001] This application claims the benefit of Korean Patent Application No. 2004-23529, filed in Korea on Apr. 6, 2004, which is hereby incorporated by reference for all purposes as if fully set forth herein.

TECHNICAL FIELD

[0002] The present invention relates to a LCD device, and more particularly, to a LCD device capable of preventing degradation of image quality due to a leakage current by removing a difference of voltages applied to both sides of an electrostatic preventing unit.

BACKGROUND

[0003] 1. Description of the Conventional Art

[0004] In the recent information age, a display device is becoming more and more important as a visual information transmission media. The display device has to satisfy low power consumption requirements, be thin and light, produce high image quality, etc.

[0005] A liquid crystal display (LCD) device displays an image by using optical anisotropy of a liquid crystal material. The LCD has better viewing characteristics and less power consumption and heating than the conventional cathode-ray tube (CRT). These characteristics promote the LCD device as the next generation display device.

[0006] A liquid crystal material used in the LCD device is not a spontaneous light emitting material, but material receptive of light for displaying an image by modulating an amount of external light. Thus, in the conventional LCD device, an additional light source for irradiating light to a LCD panel, that is, a backlight unit is required.

[0007] Generally, an LCD device contains a LCD panel with a thin film transistor array (TFT) substrate and a color filter (CF) substrate that face each other are attached to each other to have a certain cell gap. A driving unit is provided for driving the LCD panel. A back-light unit is provided at a rear surface of the LCD panel for supplying light to a liquid crystal layer of the LCD panel.

[0008] On the TFT substrate of the LCD panel, a plurality of gate lines arranged in a horizontal direction at a regular interval are perpendicular to a plurality of data lines arranged in a vertical direction at a regular interval. The intersection region formed by the crossing gate lines and the data lines is defined as a pixel.

[0009] The pixel is provided with a switching device, such as a thin film transistor, and a pixel electrode. The switching device is electrically connected to the data line and the gate line to receive image information through the data line and to apply the image information to a pixel electrode while maintaining a turn-on state by a gate voltage applied through the gate line. The pixel electrode forms an electric field with a common electrode provided at the CF substrate thereby changing the orientation of the liquid crystal molecules.

[0010] The CF substrate is provided with red (R), green (G), and blue (B) color filters for separating light supplied from the back-light unit into R, G, and B light and for displaying various color images by mixing the R, G, and B light. A black matrix for preventing light leakage is formed

at outer peripheries of the R, G, and B color filters. A common electrode is formed at whole surface of the CF substrate, and applies an electric field to the liquid crystal layer with the pixel electrode thereby to change an arrangement form of the liquid crystal molecules. This permits the common electrode to control the transmittance of light supplied from the back-light unit and display an image of the LCD panel.

[0011] The driving unit consists of a data driving unit and a gate driving unit. When the gate driving unit sequentially applies a gate voltage to each gate line, the switching devices electrically connected to the gate line to which the gate voltage is applied are turned on and the turned on switching devices receive image information from the data lines. At this time, the image information is applied to the pixel through the switching device, and is applied to the pixel electrode provided in the pixel.

[0012] The LCD device uses a holding method. When the gate driving unit sequentially applies a gate high voltage to each gate line, image information applied to the pixel through the data line is applied to the pixel electrode thereby to be charged at a storage capacitor. The storage capacitor maintains the state of the liquid crystal molecules for one frame even when a gate high voltage is transferred into a gate low voltage thereby to maintain a brightness of the pixels.

[0013] The LCD device can be driven by an external or internal voltage change. When devices inside the LCD device are destroyed by an electrostatic discharge or an over-voltage, the image quality is degraded. In order to reduce the damage due to a sudden high voltage, an electrostatic preventing unit is provided in the LCD device.

[0014] FIG. 1 is a drawing schematically showing a general LCD device.

[0015] As shown in FIG. 1 the LCD device consists of a LCD panel 1 with a TFT substrate (not shown) and a CF substrate (not shown) facing each other and attached to each other to have a certain cell gap. A plurality of data lines 15 are arranged on the LCD panel 1 in a vertical direction and a plurality of gate lines 16 are arranged on the LCD panel 1 in a horizontal direction. A data driving unit 5 supplies image information to the data lines 15 and a gate driving unit 6 supplies control signals and driving voltages to the gate lines 16. A common voltage line 32 formed on the thin film transistor array substrate applies a common voltage (VCOM) to a common electrode of the color filter substrate. An electrostatic preventing unit 10 is connected to the gate lines 16 and the data lines 15. The electrostatic preventing unit 10 disperses the current.

[0016] The intersection regions of the data lines 15 and the gate lines 16 are defined as pixels P1. The pixels P1 are arranged on the TFT substrate in a matrix thereby to constitute an image display unit 20 for substantially displaying an image.

[0017] The LCD device is provided with a timing control unit and a power supplying unit. Image information and the control signals outputted from the timing control unit, and the driving voltages outputted from the power supplying unit are supplied to the gate driving unit 6 through the data driving unit 5.

[0018] As shown, the data driving unit 5 and the gate driving unit 6 are electrically connected to each other through a connecting line 34. The data driving unit 5 applies a gate low voltage VGL to the gate driving unit 6 through the connecting line 34. Although not shown, a plurality of lines are formed in order to connect the data driving unit 5 and the gate driving unit 6. Through the plurality of lines, the gate driving unit 6 receives a gate high voltage VGH and a common voltage VCOM. The common voltage VCOM is formed along an outer periphery of the thin film transistor array substrate, and is applied to the gate driving unit 6 through the common voltage line 32 connected to the data driving unit 5 and the gate driving unit 6.

[0019] The common voltage VCOM supplied to the gate driving unit 6 through the common voltage line 32 is applied to Ag dots (not shown) formed at edges of the thin film transistor array substrate. Since the Ag dot electrically connects the thin film transistor array substrate and the color filter substrate, the common voltage VCOM applied to the Ag dot is applied to the color filter substrate.

[0020] The control signals and driving voltages for driving the LCD device are supplied to the gate driving unit 6 from the timing control unit. Especially, a gate low voltage VGL and a gate high voltage VGH are applied to the gate driving unit 6. The gate low voltage VGL is applied to all the gate lines 16, and the gate high voltage VGH is sequentially applied to the gate lines 16 one by one, thereby turning-on the thin film transistor, the switching device provided at the pixels P1. At this time, image information is supplied to the pixels P1 through the data lines 15.

[0021] An electrostatic preventing unit 10 is respectively provided at one side of the data lines 15 and the gate lines 16. One side of the electrostatic preventing unit 10 is electrically connected to the data lines 15 or the gate lines 16, and another side of the electrostatic preventing unit 10 is connected to the common voltage line 32. The common voltage line 32 is electrically connected to the electrostatic preventing units 10 connected to the gate lines 16 and the electrostatic preventing units 10 connected to the data lines 15.

[0022] The electrostatic preventing units 10 are not operated at ordinary times. However, when an over-current is suddenly applied to the data lines 15 and the gate lines 16 due to an electrostatic inflow, the electrostatic preventing units 10 are conductive and thereby the gate lines 16 and the data lines 15 are connected through the common voltage line 32. This permits the current to be dispersed amongst the gate lines 16 and the data lines 15, thereby minimizing damage of the LCD device due to an electrostatic discharge.

[0023] The electrostatic preventing unit 10 protects each kind of device at the time of an instantaneous high voltage occurrence. The electrostatic preventing unit 10 has to be formed so that a current can not flow thereto at ordinary times. The gate low voltage VGL or the gate high voltage VGH outputted from the gate driving unit 6 is applied to one side of the electrostatic preventing unit 10, and the common voltage VCOM outputted from the common voltage line 32 is applied to another side of the electrostatic preventing unit 10. A voltage difference is thus generated between both sides of the electrostatic preventing unit 10. Therefore, a leakage current flows through the electrostatic preventing unit 10 due to the voltage difference even when the electrostatic

preventing unit 10 is cut-off, and thereby a voltage level of the gate low voltage VGL or the gate high voltage VGH applied to each gate line 16 may be changed. When the voltage level of the gate low voltage VGL becomes unstable due to the leakage current, the pixels of the image display unit 20 cause a voltage change and thereby degrade the picture quality.

SUMMARY

[0024] The LCD device prevents the picture quality from being degraded by minimizing distortion of a gate low voltage or a gate high voltage applied to gate lines. The leakage current is minimized by removing a voltage difference between both sides of an electrostatic preventing unit.

[0025] By way of introduction only, in one embodiment, a display device contains first and second substrates attached to each other with a cell gap therebetween. An image display unit is provided that contains a plurality of pixels arranged on the first substrate. A plurality of gate lines is arranged on the first substrate in a horizontal direction. The gate lines apply a gate low voltage and a gate high voltage to the image display unit. A plurality of data lines are arranged on the first substrate in a vertical direction. The data lines apply image information to the image display unit. A common voltage line is formed on the first substrate. The common voltage line applies a common voltage to the second substrate. First electrostatic preventing units are respectively connected to one side of the gate lines and are commonly connected to a first gate line. Second electrostatic preventing units are respectively connected to one side of the data lines and are commonly connected to the common voltage line. Third electrostatic preventing units connect the first gate line and the common voltage line.

[0026] In another embodiment, the display device contains gate lines and data lines arranged on the first substrate in horizontal and vertical directions to define pixels. A gate driving unit applies a gate low voltage and a gate high voltage to the pixels through the gate lines while a data driving unit applies image information to the pixels through the data lines. A first line is connected to the gate lines through first electrostatic preventing units. The first line is also connected to the data driving unit and receives the gate low voltage from the data driving unit. A common voltage line is connected to the data lines through second electrostatic preventing units and is connected to the first lines through a third electrostatic preventing unit.

[0027] In another embodiment, the display device contains means for simultaneously supplying all of the gate lines with the gate low voltage, simultaneously supplying all of the data lines with the common voltage, and linking the gate low voltage and common voltage, when undesired electrostatic charge is present in the gate or data lines to dissipate the electrostatic charge throughout all of the gate and data lines while minimizing leakage current when the display device is operating normally.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[0029] In the drawings:

[0030] **FIG. 1** is a view schematically showing a LCD device in accordance with the conventional art;

[0031] **FIG. 2** is a view showing an LCD device according to one embodiment of the present invention; and

[0032] **FIG. 3** is a view showing an LCD device according to a second embodiment of the present invention.

DETAILED DESCRIPTION

[0033] A LCD device includes first and second substrates attached to each other with a cell gap therebetween. An image display unit contains a plurality of pixels arranged on the first substrate, for substantially displaying an image. A plurality of gate lines are arranged on the first substrate in a horizontal direction for applying a gate low voltage and a gate high voltage to the image display unit and a plurality of data lines are arranged on the first substrate in a vertical direction for applying image information to the image display unit. A common voltage line is formed on the first substrate for applying a common voltage to the second substrate. First electrostatic preventing units are connected at one side of the gate lines and commonly connected to a first gate line, second electrostatic preventing units are connected at one side of the data lines and commonly connected to the common voltage line, and third electrostatic preventing units connect the first gate line and the common voltage line.

[0034] A voltage difference between both sides of the electrostatic preventing units respectively connected at one side of the gate lines is not generated by equally setting the voltages applied to both sides of the electrostatic preventing units. A leakage current is not generated, which prevents the gate voltage from being distorted and accordingly degradation of the picture quality.

[0035] **FIG. 2** is a view showing an LCD device according to one embodiment of the present invention.

[0036] Referring to **FIG. 2**, the LCD device contains a LCD panel **101** having first and second substrates facing and attached to each other with a cell gap therebetween. An image display unit **120** contains a plurality of pixels **P11** arranged on the first substrate for substantially displaying an image. A plurality of gate lines **116** are arranged on the first substrate in a horizontal direction for applying a gate low voltage and a gate high voltage to the image display unit **120** and a plurality of data lines **115** are arranged on the first substrate in a vertical direction for applying image information to the image display unit **120**. A common voltage line **132** is formed on the first substrate for applying a common voltage to the second substrate. First electrostatic preventing units **110a** are connected at one side of the gate lines **116** and are commonly connected to a first gate line **118**. Second electrostatic preventing units **110b** are connected at one side of the data lines **115** and are commonly connected to the common voltage line **132**. Third electrostatic preventing units **110c** connect the first gate line **118** and the common voltage line **132**.

[0037] On the LCD panel **101**, the gate lines **116** and the data lines **115** cross each other thereby to define a plurality of pixels **P11**. The pixels **P11** are arranged on the LCD panel

101 in a matrix. On the LCD panel **101**, the image display unit **120** is provided that contains the plurality of pixels **P11** and displays an image.

[0038] The data lines **115** are formed up to the edge of the LCD panel **101** thereby to be electrically connected to a data driving unit **105**, and the gate lines **116** are formed up to the edge of the LCD panel **101** thereby to be electrically connected to a gate driving unit **106**. This allows image information outputted from the data driving unit **105** to be applied to the pixels of the image display unit **120** through the data lines **115**. Also, a gate high voltage **VGH** or a gate low voltage **VGL** outputted from the gate driving unit **106** is applied to the pixels of the image display unit **120** through the gate lines **116**.

[0039] The data driving unit **105** receives control signals and image information from a timing control unit for generating control signals and image information and outputting according to data supplied from outside, and receives driving voltages from a power supplying unit for generating driving voltages necessary to drive the LCD device. The driving voltages generated from the power supplying unit include a gate low voltage **VGL**, a gate high voltage **VGH**, and a common voltage **VCOM**.

[0040] The gate low voltage **VGL** is supplied to the gate driving unit **106** through a gate low voltage line **134** for connecting the data driving unit **105** and the gate driving unit **106**. As shown, the gate low voltage line **134** is connected to the gate driving unit **106**, and is connected to a first gate line **118** thereby to apply the gate low voltage **VGL** to the first gate line **118**.

[0041] The first gate line **118** is a dummy line to which a gate low voltage or a gate high voltage is not applied from the gate driving unit **106**, and maintains a low potential state by the gate low voltage **VGL** applied from the data driving unit **105**. The gate low voltage **VGL** or the gate high voltage **VGH** is sequentially applied from the second gate line to the final gate line. Since the first gate line **118** does not substantially apply a gate voltage to the pixels, the first gate line **118** is preferably formed at an outer periphery of the image display unit **120** in order to prevent an aperture ratio of the pixels from being decreased.

[0042] Although not shown, the common voltage **VCOM** and the gate high voltage **VGH** are applied to the gate driving unit **106** through lines for electrically connecting the data driving unit **105** and the gate driving unit **106**.

[0043] A common voltage line **132** is formed along an outer periphery of the image display unit **120**. One end of the common voltage line **132** is connected to the data driving unit **105** and another end of the common voltage line **132** is connected to the gate driving unit **106**, so that the common voltage **VCOM** is applied to both the data driving unit **105** and the gate driving unit **106**. Also, the common voltage line **132** is formed at the edges of the first substrate and is connected to an Ag dot (not shown) electrically connected to the second substrate. Thus, the common voltage **VCOM** is applied to a common electrode of the second substrate through the Ag dot.

[0044] A first electrostatic preventing unit **110a** is respectively provided at one side of each of the gate lines **116** arranged on the first substrate in a horizontal direction. One side of each of the first electrostatic preventing units **110a** is

connected to the respective gate line **116**, and the other side thereof is commonly connected to the first gate line **118** formed along the outer periphery of the LCD panel **101**.

[0045] The gate low voltage VGL or the gate high voltage VGH from the gate driving unit **106** is thus applied to one side of the first electrostatic preventing units **110a**, and the gate low voltage VGL is applied to another side of the first electrostatic preventing units **110a** through the first gate line **118**. This permits a gate voltage of the same potential to be applied to both sides of the first electrostatic preventing units **110a** thereby preventing a leakage current due to a voltage difference.

[0046] The first gate line **118** to which the first electrostatic preventing units **110a** are commonly connected is connected to the common voltage line **132** through the third electrostatic preventing unit **110c**.

[0047] The second electrostatic preventing units **110b** are respectively provided at one side of the data lines **115** arranged on the first substrate in a vertical direction. The data lines **115** are commonly connected to the common voltage line **132** through the second electrostatic preventing units **110b**.

[0048] As mentioned, the gate lines **116** and the data lines **115** are electrically connected to each other through the first, second, and third electrostatic preventing units **110a**, **110b**, and **110c**. Thus, even when an electrostatic discharge is introduced to one of the gate lines **116** and the data lines **115**, an over-current due to the electrostatic discharge can be dispersed to the entire lines through the first, second, and third electrostatic preventing units **110a**, **110b**, and **110c**. The same potential is applied to both sides of the first electrostatic preventing units **110a** for preventing an electrostatic discharge, so that the gate low voltage VGL applied to the gate lines **116** is prevented from being distorted.

[0049] However, a voltage difference between both sides of the first electrostatic preventing units **110a** is actually generated. The reason is because the first gate line **118** for receiving the gate low voltage VGL from the data driving unit **105** and applying it to each electrostatic preventing unit **110a** is formed along the outer periphery of the first substrate. This causes a large line resistance to be generated at the first gate line **118**, and thereby a voltage of the gate low voltage VGL applied to the first gate line **118** is lowered. The lowered voltage of the gate low voltage VGL is applied to each first electrostatic preventing unit **110a**, so that potentials applied to both sides of the first electrostatic preventing units **110a** are substantially different. A leakage current is generated by the voltage difference between both sides of the first electrostatic preventing units **110a**.

[0050] When a leakage current flows through the first electrostatic preventing units **110a**, the gate low voltage VGL applied to the gate lines **116** is distorted when the pixels **P11** is driven. Thus, desired image information is not inputted to the pixels **P11** and the desired image is not displayed.

[0051] FIG. 3 is a view showing an LCD device according to a second embodiment of the present invention.

[0052] As shown in FIG. 3, the LCD device includes a LCD panel **201** having first and second substrates facing each other and attached with a cell gap therebetween. An

image display unit **220** containing a plurality of pixels **P21** is arranged on the LCD panel **201** in a matrix for substantially displaying an image. A plurality of gate lines **216** is arranged on the first substrate in a horizontal direction for applying a gate low voltage and a gate high voltage to the image display unit **220** and a plurality of data lines **215** is arranged on the first substrate in a vertical direction for applying image information supplied from a data driving unit **205** to the image display unit **220**. A common voltage line **232** formed on the first substrate applies a common voltage VCOM to the second substrate. A low voltage line **235** is formed along an outer periphery of the first substrate and receives a gate low voltage VGL through at least two paths from the data driving unit **205**. First electrostatic preventing units **210a** are respectively connected to one side of the gate lines **216** and commonly connected to the gate low voltage line **235**, second electrostatic preventing units **210b** are respectively connected to one side of the data lines **215** and commonly connected to the common voltage line **232**, and third electrostatic preventing units **210c** connect the low voltage line **235** and the common voltage line **232**.

[0053] A driving unit of the LCD device includes a timing control unit for receiving external data and generating control signals and image information using the data. A power supplying unit generates various driving voltages to be used to drive the LCD device by a power supplied from the outside. A data driving unit **205** receives image information and the control signal outputted from the timing control unit, and outputs the image information to the image display unit **220**. A gate driving unit **206** receives driving voltages and control signals from the timing control unit and the power supplying unit, and applies a gate low voltage VGL or a gate high voltage VGH to the image display unit **220**.

[0054] The gate driving unit **206** is connected to the data driving unit **205** by a plurality of lines, and receives control signals and driving voltages from the data driving unit **205** through the lines. A gate low voltage VGL, a gate high voltage VGH, and a common voltage VCOM are applied to the gate driving unit **206**. The gate low voltage VGL is supplied to the gate driving unit **206** from the data driving unit **205** through a connecting line **234**. The gate low voltage VGL is applied to all the gate lines **216** through the gate driving unit **206**, and the gate high voltage is sequentially applied to each gate line **216** as a frame unit.

[0055] Image information converted into an analog form in the data driving unit **205** is applied to pixels **P21** through the data lines **215** synchronized with the gate high voltage of the gate driving unit **206** thus to be applied to pixels **P21** through the data lines **215**.

[0056] The first electrostatic preventing units **210a** are respectively connected to one side of the gate lines **216**, and are commonly connected to the low voltage line **235** formed at the outer periphery of the first substrate.

[0057] In the second embodiment of the present invention, the gate low voltage VGL is applied to the first electrostatic preventing units **210a** through the first gate line **218** formed along the outer periphery of the first substrate not through the low voltage line **235**. Because of this, a lowered voltage is generated due to the line resistance of the first gate line **218**. To decrease the line resistance, a line for applying the gate low voltage VGL to the first electrostatic preventing

units **210a** is short. Also, in order to compensate the voltage lowering due to the line resistance, the gate low voltage VGL can be applied to the first gate line **218** through many paths of the data driving unit **205**.

[0058] In the second embodiment of the present invention, the gate low voltage VGL is applied to the first gate line **218** by connecting the data driving unit **205** and the first gate line **218** through many paths. That is, like in the first embodiment, the data driving unit **205** and the first gate line **218** are electrically connected at an edge of the LCD panel **201** where the first gate line **218** is formed thereby to apply the gate low voltage VGL to the first gate line **218**. Also, the data driving unit **205** and the first electrostatic preventing units **210a** are connected to each other with the shortest distance at another edge of the LCD panel **201** thereby to form another path for applying the gate low voltage VGL. According to this, the gate low voltage VGL that has not been voltage-lowered can be applied to the first electrostatic preventing units **210a**, so that a voltage difference between both sides of the first electrostatic preventing units **210a** is removed thus to prevent a leakage current. The shortest distance can be formed as a straight line or a non-straight line according to the kind of device and lines on the first substrate.

[0059] The second electrostatic preventing units **210b** are respectively connected to one side of the data lines **215**. The second electrostatic preventing units **210b** are commonly connected to the common voltage line **232**, and are electrically connected to the gate lines **216** through the common voltage line **232** and the third electrostatic preventing units **210c**.

[0060] As mentioned, the gate lines **216** and the data lines **215** are electrically connected to each other through the first, second, and third electrostatic preventing units **210a**, **210b**, and **210c**. Thus, even when an electrostatic discharge is introduced to one of the gate lines **216** and the data lines **215**, an over-current due to the electrostatic discharge can be dispersed to the entire lines through the first, second, and third electrostatic preventing units **210a**, **210b**, and **210c** and thereby minimize damage to the LCD device.

[0061] The first, second, and the third electrostatic preventing units **210a**, **210b**, and **210c** are provided at the outer periphery of the image display unit **220**. The gate low voltage line **235** is also formed at the outer periphery of the image display unit **220** in order to enhance an aperture ratio of the image display unit **220** and in order to utilize the outer periphery region of the image display unit **220** where a space is comparatively obtained.

[0062] As mentioned, the same gate low voltage VGL as the gate low voltage VGL applied to one side of the first electrostatic preventing units **210a** is also applied to the other side of the first electrostatic preventing units **210a**. This removes a voltage difference between both sides of the first electrostatic preventing units **210a**. To apply the gate low voltage VGL to the other side of the first electrostatic preventing units **210a**, the first gate line **218** is formed along the outer periphery of the first substrate. The first electrostatic preventing units **210a** are commonly connected to the first gate line **218**, and the first gate line **218** is electrically connected to the common voltage line **232** through the third electrostatic preventing units **210c**.

[0063] The first electrostatic preventing units **210a** are connected to the data driving unit **205** with the shortest

distance in order to apply a gate low voltage VGL having a minimized voltage lowering to the first electrostatic preventing units **210a**.

[0064] In the above LCD device, the same potential is formed at both sides of the electrostatic preventing units thereby minimizing generation of a leakage current. Thus, a gate low voltage or a gate high voltage applied to the gate lines can be constantly maintained to thereby prevent degradation of the picture quality due to the leakage current of the electrostatic preventing units.

[0065] Also, the line provided to form the same potential at both sides of the electrostatic preventing units is connected to the electrostatic preventing units, so that an inferior driving of the LCD device due to an electrostatic discharge can be prevented.

[0066] As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalence of such metes and bounds are therefore intended to be embraced by the appended claims.

What is claimed is:

1. A display device comprising:

first and second substrates attached to each other with a cell gap therebetween;

an image display unit containing a plurality of pixels arranged on the first substrate;

a plurality of gate lines arranged on the first substrate in a horizontal direction and applying a gate low voltage and a gate high voltage to the image display unit;

a plurality of data lines arranged on the first substrate in a vertical direction and applying image information to the image display unit;

a common voltage line formed on the first substrate and applying a common voltage to the second substrate;

first electrostatic preventing units respectively connected to one side of the gate lines and commonly connected to a first gate line;

second electrostatic preventing units respectively connected to one side of the data lines and commonly connected to the common voltage line; and

third electrostatic preventing units connecting the first gate line and the common voltage line.

2. The display device of claim 1, wherein the first, second, and third electrostatic preventing units are formed at an outer periphery region of the image display unit.

3. The display device of claim 1, wherein the first gate line is formed at an outer periphery region of the image display unit.

4. The display device of claim 1, wherein only a gate low voltage is applied to the first gate line.

5. The display device of claim 4, wherein the first gate line is connected to the gate low voltage at only one location.

6. The display device of claim 4, wherein the first gate line is connected to the gate low voltage at a plurality of locations.

7. The display device of claim 6, wherein the first gate line is connected to the gate low voltage at opposing sides of the first gate line in the horizontal direction.

8. The display device of claim 1, wherein the first gate line is connected to the common voltage line through multiple parallel third electrostatic preventing units at one location.

9. A display device comprising:

first and second substrates attached to each other with a cell gap therebetween;

a plurality of gate lines and data lines arranged on the first substrate in horizontal and vertical directions and defining a plurality of pixels;

a gate driving unit applying a gate low voltage and a gate high voltage to the pixels through the gate lines;

a data driving unit applying image information to the pixels through the data lines;

a first line connected to the gate lines through first electrostatic preventing units, the first line connected to the data driving unit and to which the gate low voltage is applied from the data driving unit; and

a common voltage line connected to the data lines through second electrostatic preventing units, and connected to the first lines through a third electrostatic preventing unit.

10. The display device of claim 9, wherein the first line is formed outside a viewable region of the display device.

11. The display device of claim 9, wherein the first, second, and third electrostatic preventing units are formed outside a viewable region of the display device.

12. The display device of claim 9, wherein the gate lines are connected to the data lines through the first, second, and third electrostatic preventing units.

13. The display device of claim 9, wherein the first line is electrically connected to the data driving unit through multiple paths.

14. The display device of claim 9, wherein the first line connects the data driving unit and the first, second, and third electrostatic preventing units via the shortest distance.

15. The display device of claim 9, wherein only a gate low voltage is applied to the first gate line.

16. The display device of claim 15, wherein the first gate line is connected to the gate low voltage at only one location.

17. The display device of claim 15, wherein the first gate line is connected to the gate low voltage at a plurality of locations.

18. The display device of claim 17, wherein the first gate line is connected to the gate low voltage at opposing sides of the first gate line.

19. The display device of claim 9, wherein the first gate line is connected to the common voltage line through a plurality of third electrostatic preventing units.

20. The display device of claim 19, wherein the third electrostatic preventing units are connected to the same location on the first line.

21. The display device of claim 9, wherein the first line is a dummy line to which neither the gate low voltage nor the gate high voltage is applied from the gate driving unit.

22. A display device comprising:

first and second substrates attached to each other with a cell gap therebetween;

a plurality of gate lines and data lines arranged on the first substrate in horizontal and vertical directions and defining a plurality of pixels;

a gate driving unit applying a gate low voltage and a gate high voltage to the pixels through the gate lines;

a data driving unit applying image information to the pixels through the data lines;

a common voltage line to supply a common voltage to the gate and data lines;

means for simultaneously supplying all of the gate lines with the gate low voltage, simultaneously supplying all of the data lines with the common voltage, and linking the gate low voltage and common voltage, when undesired electrostatic charge is present in the gate or data lines to dissipate the electrostatic charge throughout all of the gate and data lines while minimizing leakage current when the display device is operating normally.

23. The display device of claim 22, wherein the means is formed outside a viewable region of the display device.

24. The display device of claim 22, wherein the gate low voltage and common voltage are linked through multiple paths.

25. The display device of claim 22, wherein the means are disposed to minimize an electrical resistance between the data driving unit and the gate lines.

26. The display device of claim 22, wherein neither the gate low voltage nor the gate high voltage is applied from the gate driving unit to the means.

* * * * *

专利名称(译)	液晶显示装置		
公开(公告)号	US20050219432A1	公开(公告)日	2005-10-06
申请号	US11/027428	申请日	2004-12-30
[标]申请(专利权)人(译)	乐金显示有限公司		
申请(专利权)人(译)	LG飞利浦LCD CO. , LTD.		
当前申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
[标]发明人	NA DU HYUN WOO CHOEL MIN		
发明人	NA, DU-HYUN WOO, CHOEL-MIN		
IPC分类号	G02F1/13 G02F1/1333 G02F1/1362		
CPC分类号	G02F1/136204 G02F1/13452		
优先权	1020040023529 2004-04-06 KR		
其他公开文献	US7349037		
外部链接	Espacenet USPTO		

摘要(译)

LCD装置包括彼此附接的基板，其间具有单元间隙。图像显示单元由布置在第一基板上的像素组成，用于基本上显示图像。栅极线沿水平方向排列，用于向图像显示单元施加栅极低电压和栅极高电压。数据线沿垂直方向排列，用于将图像信息施加到图像显示单元。公共电压线施加公共电压。第一静电防止单元分别连接到数据线的一侧并共同连接到第一栅极线。第二静电防止单元分别连接到栅极线的一侧并共同连接到公共电压线。第三静电防止单元连接第一栅极线和公共电压线。

