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(54) **LIQUID CRYSTAL DISPLAY**

(75) Inventors: **Sung Woon Kim**, Kyongki-do (KR);
Dong Hae Suh, Daegu (KR); **Youn Hak Jeong**, Kyongki-do (KR)

(73) Assignee: **Boe-Hydis Technology Co., Ltd.**,
Kyongki-do (KR)

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(58) **Field of Search** 349/43, 106, 110,
349/139, 143, 111

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Primary Examiner—Toan Ton

Assistant Examiner—Tai Duong

(74) *Attorney, Agent, or Firm*—Ladas & Parry LLP

(57) **ABSTRACT**

The present invention provides a liquid crystal display having improved screen quality by preventing abnormal light leakage due to ions in a pixel. The present invention comprises: an array substrate whereon a plurality of gate lines and data lines are arranged to be perpendicular to each other, a TFT is formed at the intersection of the lines and a pixel electrode is formed in a pixel region defined by the lines; a color filter substrate combined with the array substrate, whereon a color filter is formed corresponding to the pixel region, a block matrix is formed corresponding to the interface of pixels and a counter electrode is formed on the whole surface including the color filter and the block matrix; and a liquid crystal layer comprising a plurality of liquid crystal molecules interposed between the array substrate and the color filter substrate, wherein the pixel electrode has a rectangular shape and a plurality of acute angle tips are formed on the edges thereof.

7 Claims, 2 Drawing Sheets

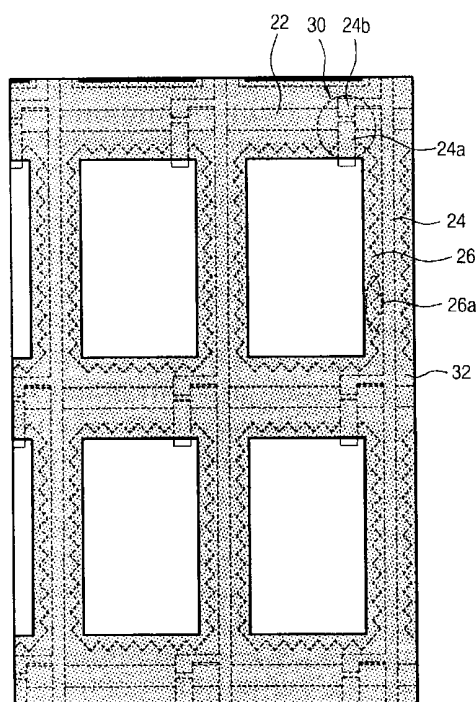


FIG. 1

(PRIOR ART)

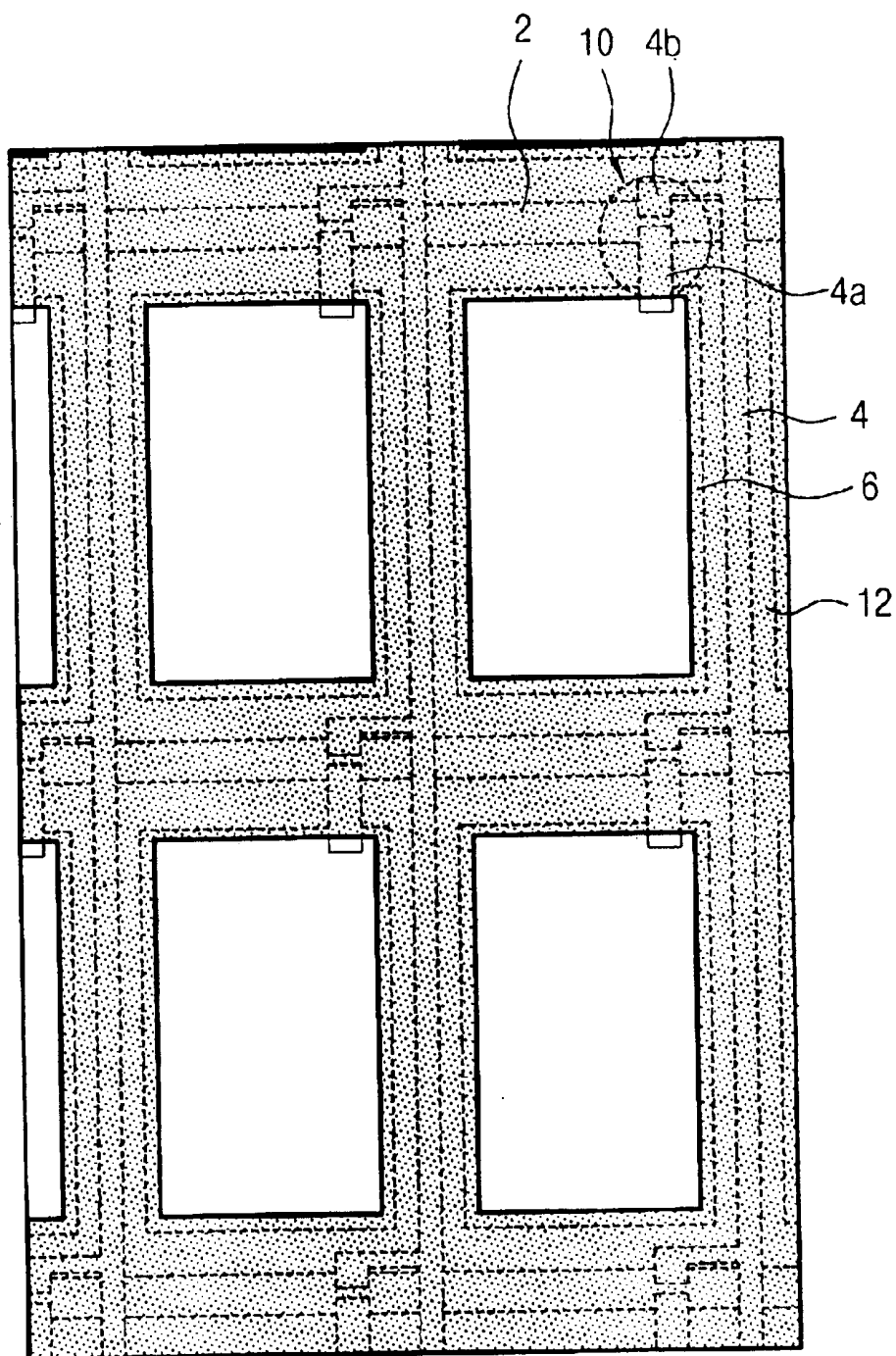
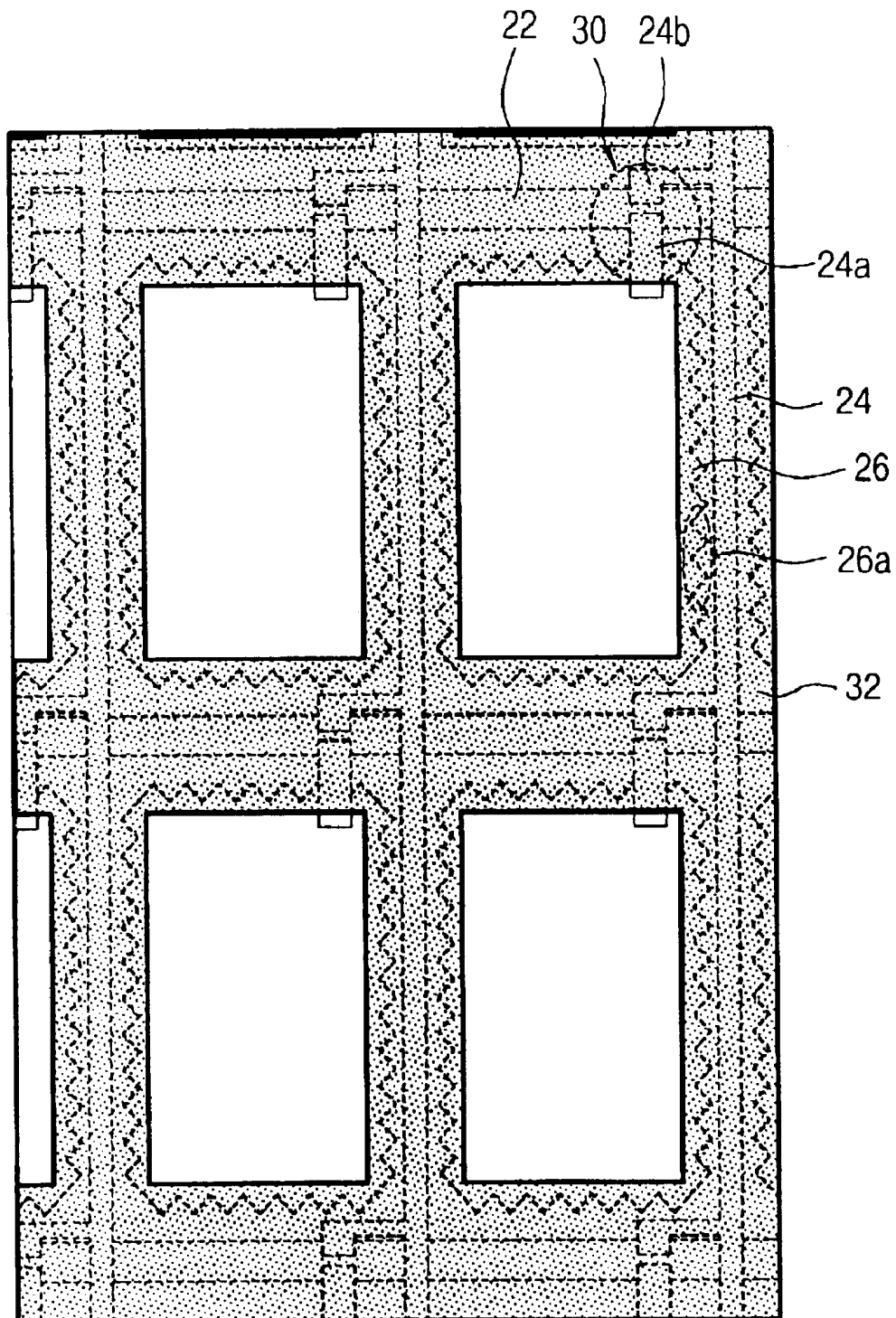


FIG. 2



LIQUID CRYSTAL DISPLAY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a liquid crystal display, and more particularly, to a liquid crystal display having improved screen quality by preventing abnormal light leakage due to ions in a pixel.

2. Description of the Related Art

Compared with Cathode-Ray Tube (hereinafter, referred to as "CRT"), a Liquid Crystal Display (hereinafter, referred to as "LCD") generally has advantages of lightweight, thin structure and low power consumption and therefore, it has been substituted for the CRT in a terminal of information apparatus and video devices. Recently, a LCD having a Thin Film Transistor (hereinafter, referred to as "TFT") as a switching device in each pixel arranged in a shape of matrix has realized a wide viewing angle, thereby preventing a color shift and obtaining a high quality screen. As a result, the TFT-LCD has been widely used as a monitor of laptop and desktop computers and as a TV screen.

Generally, the LCD comprises an array substrate having a structure that a TFT and a pixel electrode are formed in a pixel, a color filter substrate including a color filter and a counter electrode and a liquid crystal layer interposed between the substrates. The LCD realizes a predetermined image by driving liquid crystal molecules according to the voltage applied to the pixel electrode and the counter electrode.

FIG. 1 is a top plan view showing a pixel structure in a conventional LCD. As shown in the drawing, a plurality of gate lines **2** are arranged to be perpendicular to a plurality of data lines **4**. A gate insulating layer (not shown) is interposed between them for electrical insulation thereof.

A TFT **10** is formed at the intersection of the gate line **2** and the data line **4** to control driving of each pixel. The TFT **10** includes a gate electrode forming a part of the gate line **2**, a semiconductor layer (not shown) formed in a shape of pattern on the gate electrode and a source and a drain electrodes **4a** and **4b** formed to be overlapped with a part of the semiconductor layer. The source electrode **4a** is in a shape of island and the drain electrode **4b** is extended from the data line **4**.

A protective layer (not shown) is formed on the resulting surface. A pixel electrode **6** made of transparent metal such as Indium Tin Oxide (ITO) is formed in a pixel region defined by the gate line **2** and the data line **4** to be in contact with the source electrode **4a**. The pixel electrode **6** is formed in a rectangular shape, thereby forming the same electric field by the same voltage in the whole pixel region.

A color filter substrate is arranged opposite to the array substrate on the upper part thereof. The color filter substrate comprises a red, a green and a blue color filters (not shown) formed corresponding to pixels of the array substrate, respectively, a block matrix **12** formed on the interface of pixels, that is, on the upper part of the gate line **2** and the data line **4**, and a counter electrode (not shown) formed on the whole region including the color filter and the block matrix **12**.

Although it is not shown in the drawing, a plurality of liquid crystal molecules is interposed between the array substrate and the color filter substrate.

However, the conventional LCD has a problem that a screen quality is lowered due to abnormal light leakage such

as afterimage by distorted data signal voltage since ions in the LCD prevent the application of desirable voltage.

That is, during the manufacturing process, ions are added to the LCD that contains ions originally. And, the pixel electrode of the array substrate and the counter electrode of the color filter substrate are formed in a rectangular shape so that there is no region generating more intensive electric field by the same voltage in the whole pixel region.

In this case, when the data signal voltage is applied, ions in the pixel are uniformly adsorbed in the pixel by DC component voltage and then, liquid crystals in the pixel receive a voltage different from the data signal voltage applied by the ions adsorbed in the pixel. As a result, undesirable movements of liquid crystals are caused, thereby generating abnormal light leakage such as an after-image.

SUMMARY OF THE INVENTION

Accordingly, the present invention has been made in an effort to solve the problems occurring in the related art, and an object of the present invention is to provide a LCD having an improved screen quality by preventing abnormal light leakage due to ions in the LCD.

In order to achieve the object, the present invention comprises: an array substrate whereon a plurality of gate lines and data lines are arranged to be perpendicular to each other, a TFT is formed at the intersection of the lines and a pixel electrode is formed in a pixel region defined by the lines; a color filter substrate combined with the array substrate, whereon a color filter is formed corresponding to the pixel region, a block matrix is formed corresponding to the interface of pixels and a counter electrode is formed on the whole surface including the color filter and the block matrix; and a liquid crystal layer comprising a plurality of liquid crystal molecules interposed between the array substrate and the color filter substrate, wherein the pixel electrode has a rectangular shape and a plurality of acute angle tips are formed on at least one of the edges thereof.

The tip is formed on the edges of one or more pixel electrodes adjacent to the data line or the gate line and preferably each edge of the rectangularly shaped pixel electrode comprises at least four, and up to eleven, acute angle tips. Preferably, each tip is arranged in the black matrix region.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects, and other features and advantages of the present invention will become more apparent after a reading of the following detailed description when taken in conjunction with the drawings, in which:

FIG. 1 is a top plan view showing the structure of pixel in a conventional LCD; and

FIG. 2 is a top plan view showing the structure of pixel in the LCD according to the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference will now be made in greater detail to a preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings and the description to refer to the same or like parts.

FIG. 2 is a top plan view showing the structure of pixel in the LCD according to the present invention.

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Referring to FIG. 2, a plurality of gate lines **22** and data lines **24** are arranged to be perpendicular to each other. A gate insulating layer (not shown) is formed between the gate line **22** and the data line **24** for electrical insulation thereof.

A TFT **30** is formed at the intersection of the gate line **22** and the data line **24**. The TFT **30** includes a gate electrode forming a part of the gate line, a semiconductor layer (not shown) formed in a shape of pattern on the gate electrode, and source/drain electrodes **24a** and **24b** overlapped with the ends of one and the other sides of the semiconductor layer. The source electrode **24a** is formed in a shape of island and the drain electrode **24b** is formed in a shape extended from the data line **24**.

A protective layer (not shown) is formed on the resulting structure to protect the TFT **30**. A pixel electrode **26** made of transparent metal such as ITO is formed in a pixel region defined by the gate line **22** and the data line **24** to be in contact with the source electrode **24a**.

A color filter substrate is arranged opposite to the array substrate on the upper part thereof. The color filter substrate comprises a color filter (not shown) formed corresponding to each pixel, a black matrix **32** formed on the upper part of the gate line **22** and the data line **24** corresponding to the interface of pixels, and a counter electrode (not shown) formed on the whole region including the color filter and the black matrix.

A liquid crystal layer comprising a plurality of liquid crystal molecules is interposed between the array substrate and the color filter substrate.

The pixel electrode **26** is fanned generally in a rectangular shape and a plurality of acute tips is formed on the edge thereof. The acute tip **26a** is formed in the black matrix **32** region, that is, the region shielded by the black matrix **32** when a user views the LCD from the front of the color filter substrate. The acute tip **26a** is formed desirably on one or more regions adjacent to the gate line **22** or the data line **24**, and preferably comprise at least four and up to eleven acute angled tips.

As a result, the present invention can prevent abnormal light leakage due to ions by inducing the region where a distortion of data signal voltage is generated to black matrix region not shown to the user.

As described above, the LCD of the present invention can prevent distortion of liquid crystal driving voltage generated by long-time driving and DC component voltage application since the ions in the LCD are moved to the inner side of the black matrix and therefore, it is possible to improve a screen quality.

In the drawings and specification, there have been disclosed typical preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the following claims.

What is claimed is:

1. A liquid crystal display comprising:
an array substrate whereon

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a plurality of gate lines and data lines are arranged to be perpendicular to each other,

a TFT is formed at the intersection of the lines, and a pixel electrode is formed in a pixel region defined by the lines; a color filter substrate combined with the array substrate, whereon

a color filter is formed corresponding to the pixel region,

a black matrix is formed corresponding to the interface of pixels and

a counter electrode is formed on the whole surface including the color filter and the black matrix; and

a liquid crystal layer comprising a plurality of liquid crystal molecules interposed between the array substrate and the color filter substrate,

wherein the pixel electrode has a rectangular shape and wherein two or more edges of the pixel electrode adjacent and without protruding into the gate line or the data line are formed with a plurality of acute angle tips overlapping the black matrix region.

2. The liquid crystal display according to claim 1, wherein the tips are formed on the edges of one or more pixel electrodes adjacent to the data line or the gate line.

3. A liquid crystal display comprising:

an array substrate whereon

a plurality of gate lines and data lines are arranged to be perpendicular to each other,

a TFT is formed at the intersection of the lines and a pixel electrode is formed in a pixel region defined by the lines; a color filter substrate combined with the array substrate, whereon

a color filter is formed corresponding to the pixel region,

a black matrix is formed corresponding to the interface of pixels, and

a counter electrode is formed on the whole surface including the color filter and the black matrix; and

a liquid crystal layer comprising a plurality of liquid crystal molecules interposed between the array substrate and the color filter substrate,

wherein the pixel electrode has a rectangular shape and a plurality of acute angle tips are formed on each edge of the rectangular shaped pixel electrodes.

4. The liquid crystal display according to claim 3 wherein the entire perimeter of all four edges of the rectangularly shaped pixel electrode comprises plural acute angle tips.

5. The liquid crystal display according to claim 3 wherein each edge of the rectangularly shaped pixel electrode comprises at least four acute angle tips.

6. The liquid crystal display according to claim 5 wherein each edge of the rectangularly shaped pixel electrode comprises between 4 and 11 acute angle tips.

7. The liquid crystal display according to claim 3 wherein acute angle tips are formed overlapping the black matrix region.

* * * * *

专利名称(译)	液晶显示器		
公开(公告)号	US6914657	公开(公告)日	2005-07-05
申请号	US10/307751	申请日	2002-12-02
[标]申请(专利权)人(译)	KIM SUNG WOON SUH DONG HAE YOUN JEONG HAK		
申请(专利权)人(译)	KIM SUNG WOON SUH DONG HAE YOUN JEONG HAK		
当前申请(专利权)人(译)	BOE-HYDIS TECHNOLOGY CO. , LTD.		
[标]发明人	KIM SUNG WOON SUH DONG HAE JEONG YOUN HAK		
发明人	KIM, SUNG WOON SUH, DONG HAE JEONG, YOUN HAK		
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外部链接	Espacenet USPTO		

摘要(译)

本发明提供一种液晶显示器，其通过防止像素中的离子引起的异常光泄漏而具有改善的屏幕质量。本发明包括：阵列基板，其中多条栅极线和数据线布置成彼此垂直，TFT形成在线的交叉处，像素电极形成在由线限定的像素区域中；滤色器基板与阵列基板组合，其中对应于像素区域形成滤色器，对应于像素界面形成块矩阵，并且在包括滤色器和黑色的整个表面上形成对电极矩阵；液晶层包括插入在阵列基板和滤色器基板之间的多个液晶分子，其中像素电极具有矩形形状，并且在其边缘上形成多个锐角尖端。

