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(54) FFS MODE LIQUID CRYSTAL DISPLAY

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(57) **ABSTRACT**

Disclosed is an FFS (Fringe Field Switching) mode liquid crystal display. The FFS mode liquid crystal display comprises: a lower substrate and an upper substrate; a gate line formed on the lower substrate; a data line crossing perpendicular to the gate line; a first ITO electrode formed in a region defined by the gate line and the data line; a second ITO electrode of a comb-teeth pattern formed on the lower substrate while being overlapped on the first ITO electrode; and a black matrix formed on the upper substrate, wherein, a wedge portion of the second ITO electrode is formed at a position spaced by a predetermined interval to the inside from an edge section of the black matrix.

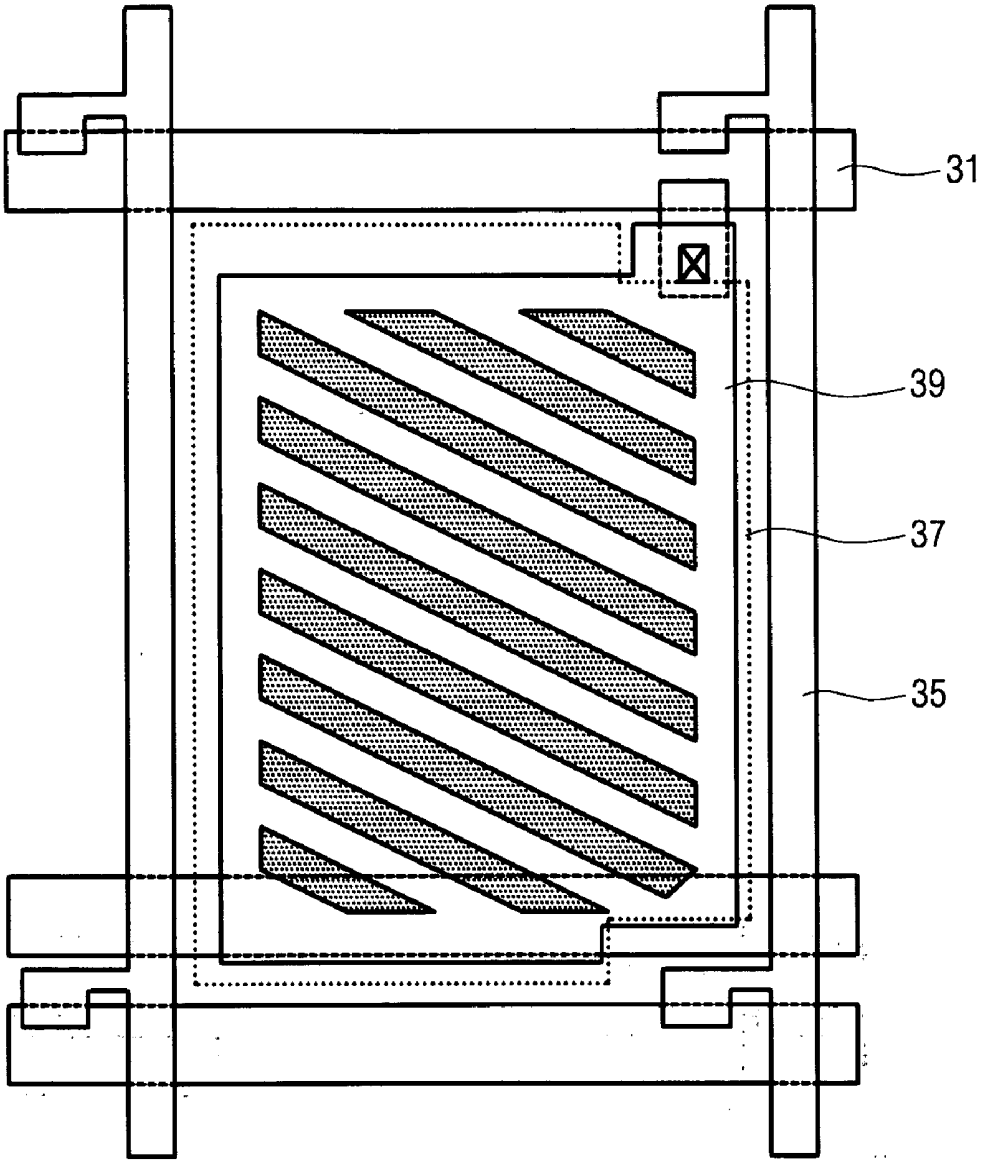


FIG. 1A

(PRIOR ART)

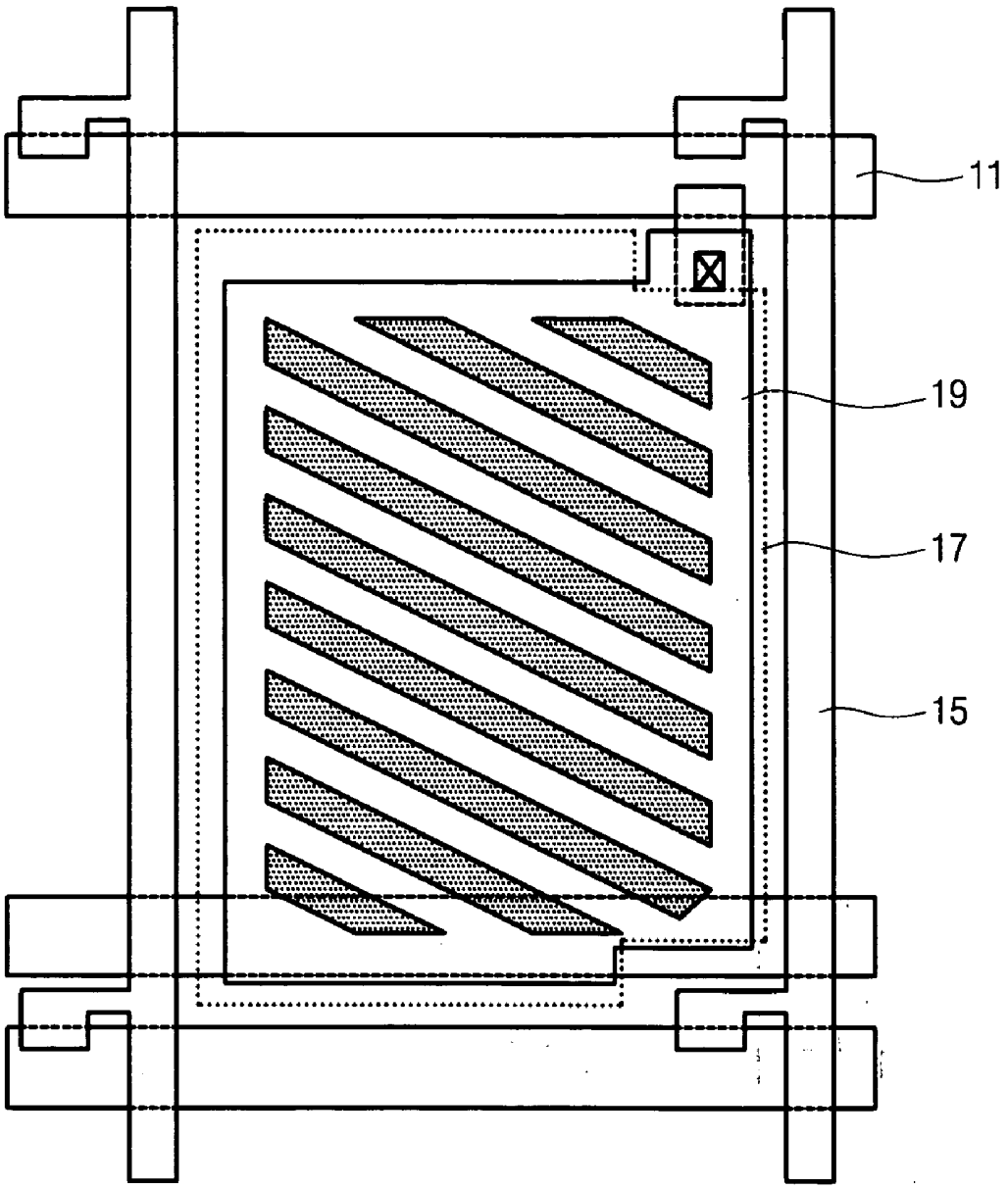


FIG. 1B

(PRIOR ART)

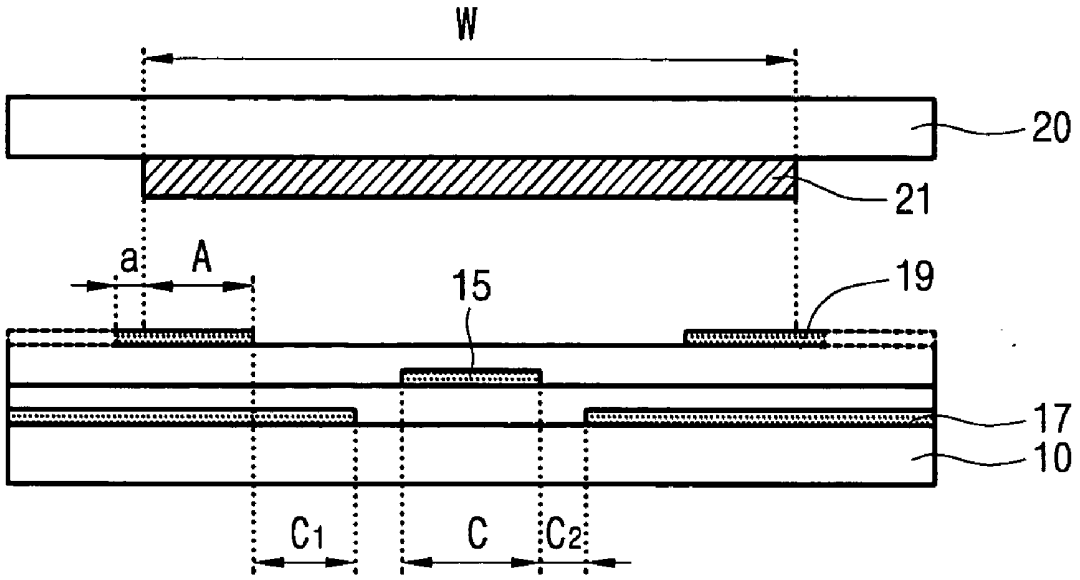


FIG.2A

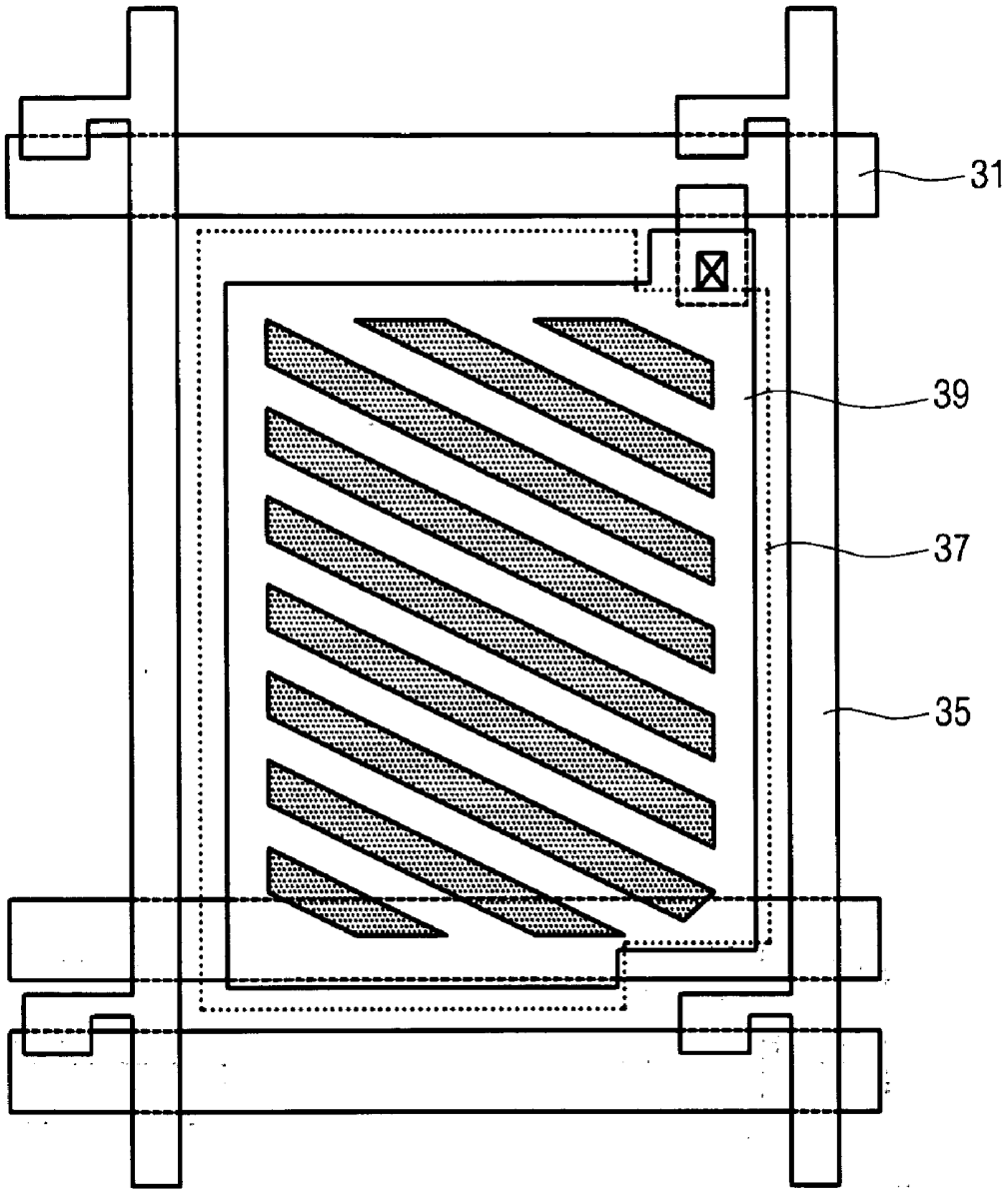


FIG.2B

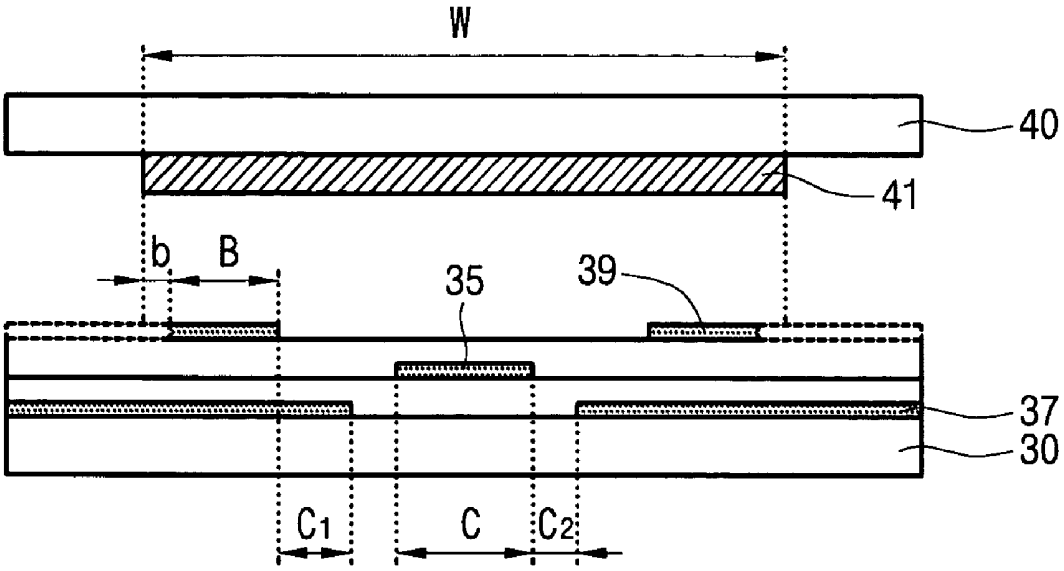


FIG.3

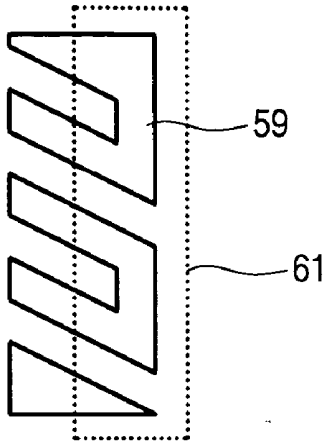
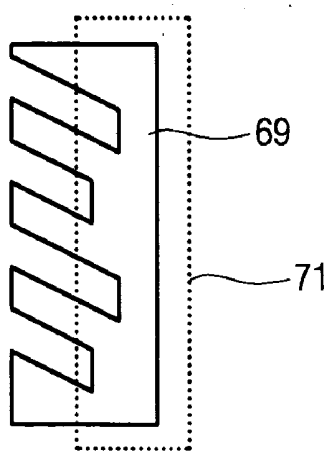


FIG.4



FFS MODE LIQUID CRYSTAL DISPLAY

BACKGROUND OF THE INVENTION

[0001] 1. Field of the invention

[0002] The present invention relates to a fringe field switching (hereinafter, simply referred to as "FFS") mode liquid crystal display, and more particularly to an FFS mode liquid crystal display capable of improving driving mura and luminance non-uniformity.

[0003] 2. Description of the Prior Art

[0004] A method for fabricating an ultra-FFS mode liquid crystal display may be described as follows, with reference to **FIGS. 1A and 1B**. Herein, **FIG. 1A** is a plan view of a conventional ultra-FFS mode liquid crystal display, and **FIG. 1B** is a sectional view thereof.

[0005] As shown in **FIGS. 1A and 1B**, according to the conventional ultra-FFS mode liquid crystal display, a gate line **11** and a data line **15** are aligned to cross perpendicular to each other on a lower substrate **10**. Then, a first ITO electrode **17** is aligned in a region defined by the gate line **11** and the data line **15**. After this, a second ITO electrode **19** for a pixel electrode overlapped on a first ITO electrode **17** is fabricated in a comb-teeth pattern, and the orientation of liquid crystal is aligned at 0°.

[0006] Also, as shown in **FIG. 1A**, an upper substrate **20** is aligned opposite to the lower substrate **10**, while being spaced from the lower substrate **10** by a predetermined interval, and a black matrix **21** is formed on the upper substrate **20**. Herein, the second ITO electrode **19** for a pixel electrode overlapped on the black matrix **21** is lengthened by a length of 'a' to the outside from an edge section of the black matrix **21**.

[0007] Owing to such a construction, when liquid crystal molecules are twisted by an electric field, upper liquid crystal molecules (a color filter substrate) and lower liquid crystal molecules (an array substrate) are twisted in opposite directions from each other, thereby compensating for chromatic shift toward a bluish color or a yellowish color, which is caused by dielectric anisotropy of the liquid crystal.

[0008] According to the conventional FFS mode liquid crystal display fabricated the above-mentioned method, since an overlapped region between electrodes is very wide, layers such as an insulation layer may be deteriorated due to long-period electrical operations, which results in inferior afterimages.

[0009] In order to correct such a disadvantage, various shapes and structures of electrodes have been studied and proposed.

[0010] However, according to conventional FFS pixels, a pixel wedge for the FFS pixels is not located in the black matrix but located in the real transmission region.

[0011] As a result, such a relationship between the pixel wedge and the black matrix causes transmittance reduction and luminance non-uniformity due to an alternation operation between them, so that the characteristics of manufactured goods are deteriorated.

SUMMARY OF THE INVENTION

[0012] Accordingly, the present invention has been made to solve the above-mentioned problems occurring in the prior art, and an object of the present invention is to provide an FFS (Fringe Field Switching) mode liquid crystal display which can improve operating mura, luminance non-uniformity, etc., which have been problematic in the conventional FFS mode liquid crystal display, by establishing a new conception of mutual factors between a black matrix and a pixel electrode provided in an FFS design structure.

[0013] In order to accomplish this object, there is provided an FFS (Fringe Field Switching) mode liquid crystal display comprising: a lower substrate and an upper substrate; a gate line formed on the lower substrate; a data line crossing perpendicular to the gate line; a first ITO electrode formed in a region defined by the gate line and the data line; a second ITO electrode of a comb-teeth pattern formed on the lower substrate while being overlapped on the first ITO electrode; and a black matrix formed on the upper substrate, wherein, a wedge portion of the second ITO electrode is formed at a position spaced by a predetermined interval to the inside from an edge section of the black matrix.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The above and other objects, features and advantages of the present invention will be more apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

[0015] **FIG. 1A** is a plan view of a conventional ultra-FFS mode liquid crystal display, and **FIG. 1B** is a sectional view thereof;

[0016] **FIG. 2A** is a layout view of an FFS mode liquid crystal display according to one embodiment of the present invention, and **FIG. 2B** is a sectional view of the FFS mode liquid crystal display shown in **FIG. 2A**; and

[0017] **FIGS. 3 and 4** are schematic views for explaining FFS mode liquid crystal displays according to other embodiments of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Hereinafter, a preferred embodiment of the present invention will be described with reference to the accompanying drawings. In the following description and drawings, the same reference numerals are used to designate the same or similar components, and so repetition of the description on the same or similar components will be omitted.

[0019] **FIG. 2A** is a layout view of an FFS (Fringe Field Switching) mode liquid crystal display according to one embodiment of the present invention, and **FIG. 2B** is a sectional view of the FFS mode liquid crystal display according to this embodiment of the present invention.

[0020] **FIGS. 3 and 4** are schematic views for explaining FFS mode liquid crystal displays according to other embodiments of the present invention, in which a wedge portion of a second ITO electrode is formed with removed parts spaced from each other, so as to improve distortion of liquid crystal.

[0021] As shown in **FIGS. 2A and 2B**, according to an FFS mode liquid crystal display of one embodiment of the present invention, a gate line **31** and a data line **35** are aligned to cross perpendicular to each other on a lower substrate **30**. Then, a first ITO electrode **37** is aligned in a region defined by the gate line **31** and the data line **35**. After

this, a second ITO electrode **39** for a pixel electrode, which is overlapped on a first ITO electrode **37**, is fabricated in a comb-teeth pattern, and the orientation of liquid crystal is aligned at 0°.

[**0022**] In addition, as shown in **FIG. 2B**, an upper substrate **40** is aligned opposite to the lower substrate **30**, while being spaced from the lower substrate **30** by a predetermined interval, and a black matrix **41** is formed on the upper substrate **40**. Herein, the second ITO electrode **39** for a pixel electrode overlapped on the black matrix **21** is formed while being spaced by a length of 'b' to the inside from an edge section of the black matrix **21**, different from the conventional construction.

[**0023**] Meanwhile, according to other embodiments of the present invention, as shown in **FIGS. 3 and 4**, a wedge portion of the second ITO electrode **59** or **69** is formed with removed parts spaced from each other, so that distortion of liquid crystal is improved.

[**0024**] As described above, according to the FFS mode liquid crystal display of the present invention, the location and the shape of the wedge portion is changed, so as to improve distortion of the liquid crystal which is caused by an electric field interference between the black matrix and the wedge portion. That is, the wedge portion of the second ITO electrode having a comb-teeth pattern is located within a region of the conductive black matrix, thereby improving the polarization efficiency of the liquid crystal, mura, luminance non-uniformity and afterimages (that is, unstableness of the liquid crystal according to an unstable operation) generated in a gray region of the wedge portion.

[**0025**] Although a preferred embodiment of the present invention has been described for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

What is claimed is:

1. An FFS (Fringe Field Switching) mode liquid crystal display comprising:

a lower substrate and an upper substrate;

a gate line formed on the lower substrate;

a data line crossing perpendicular to the gate line;

a first ITO electrode formed in a region defined by the gate line and the data line;

a second ITO electrode of a comb-teeth pattern formed on the lower substrate while being overlapped on the first ITO electrode; and

a black matrix formed on the upper substrate, wherein, a wedge portion of the second ITO electrode is formed at a position spaced by a predetermined interval to the inside from an edge section of the black matrix.

2. The FFS mode liquid crystal display as claimed in claim 1, wherein the wedge portion of the second ITO electrode is spaced by 0.5 μm or more to the inside from an edge section of the black matrix.

3. The FFS mode liquid crystal display as claimed in claim 1, wherein the black matrix includes conductive material which has a resistance of 1×10E2 Ωcm to 1×10E7 Ωcm.

4. The FFS mode liquid crystal display as claimed in claim 1, wherein the wedge portion of the second ITO electrode is formed with alternately-removed parts.

5. The FFS mode liquid crystal display as claimed in claim 1, wherein the second ITO electrode has a bumpy shape.

6. The FFS mode liquid crystal display as claimed in claim 1, wherein a width of the black matrix is 22 μm or less, and the second ITO electrode is symmetrically formed with respect to a center of a data line portion.

* * * * *

专利名称(译)	FFS模式液晶显示器		
公开(公告)号	US20050046775A1	公开(公告)日	2005-03-03
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摘要(译)

公开了一种FFS（边缘场切换）模式液晶显示器。 FFS模式液晶显示器包括：下基板和上基板;形成在下基板上的栅极线;垂直于栅极线的数据线;第一ITO电极形成在由栅极线和数据线限定的区域中;梳齿图案的第二ITO电极形成在下基板上，同时重叠在第一ITO电极上;形成在上基板上的黑矩阵，其中，第二ITO电极的楔形部分形成在从黑矩阵的边缘部分向内部隔开预定间隔的位置处。