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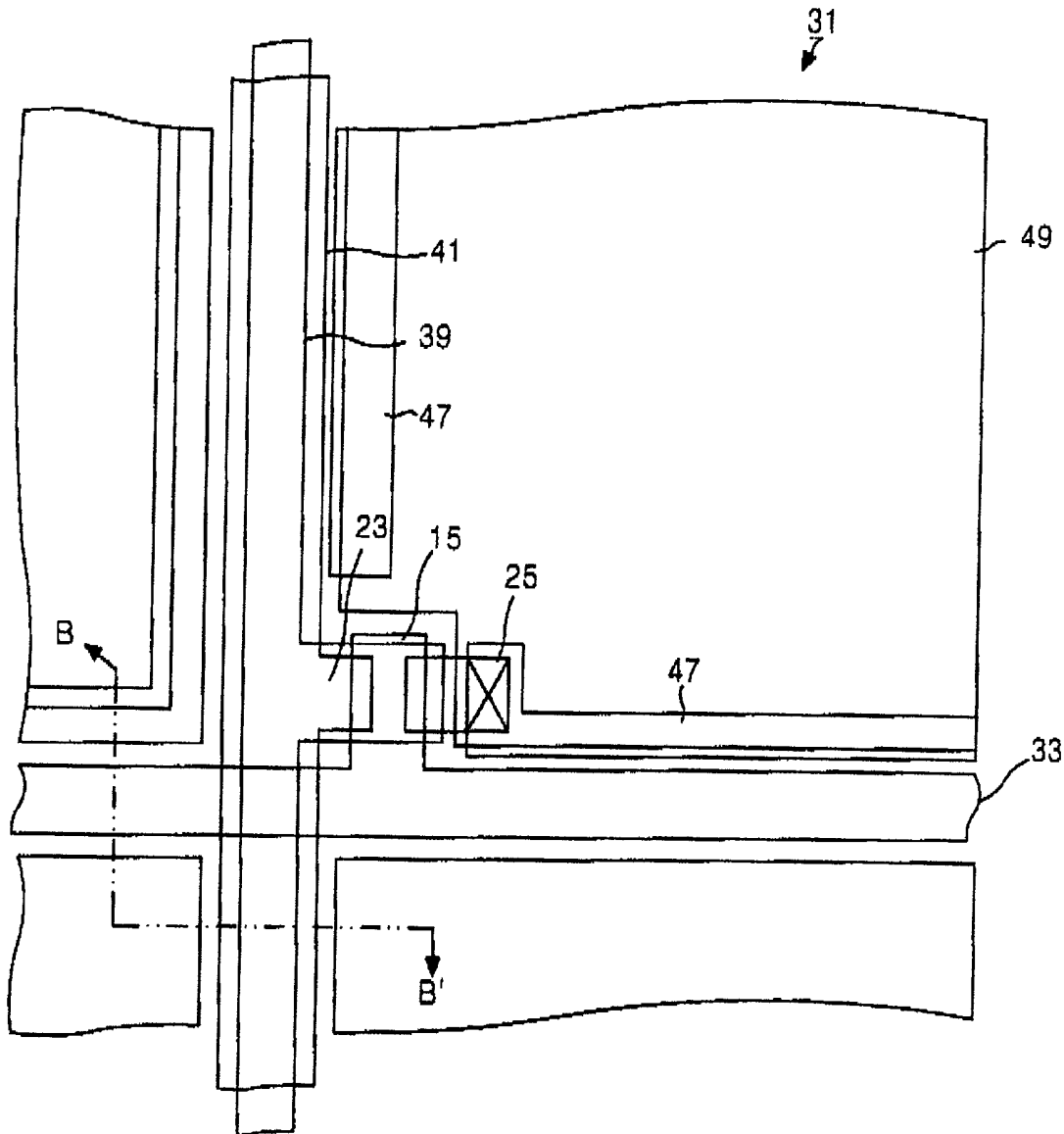


FIG. 1
CONVENTIONAL ART

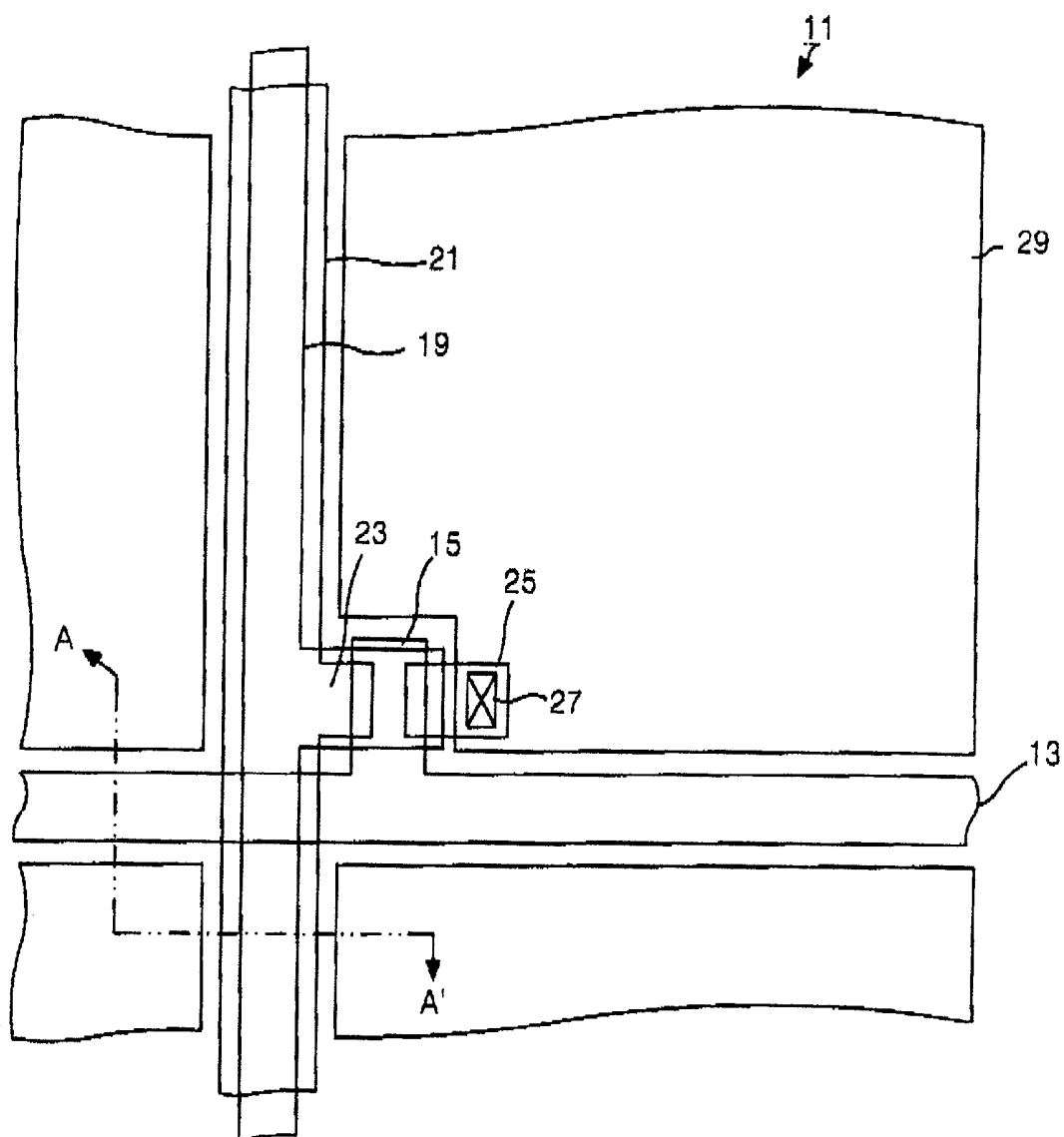


FIG. 2
CONVENTIONAL ART

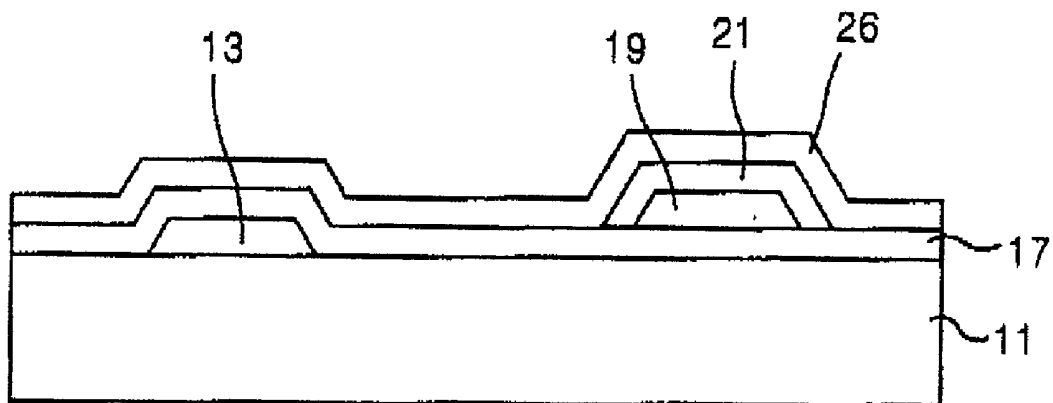


FIG. 3

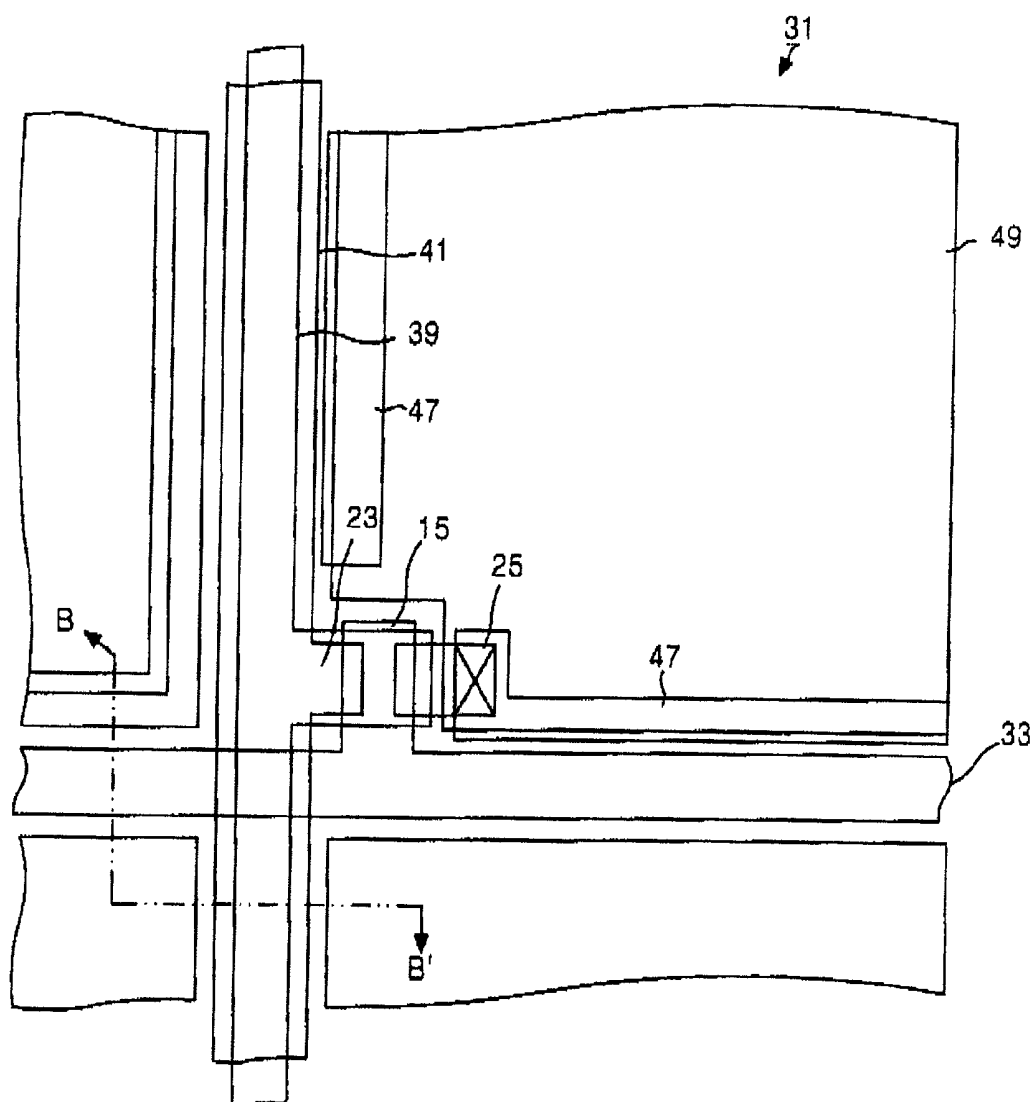
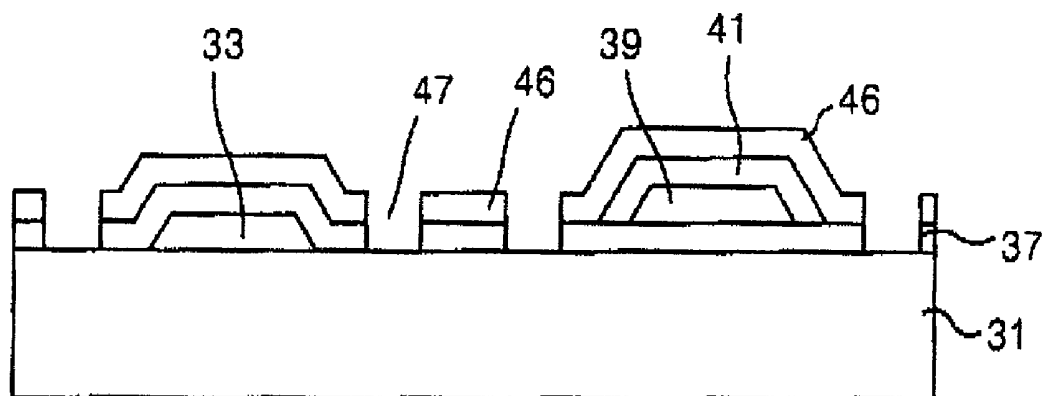


FIG. 4



LIQUID CRYSTAL DISPLAY DEVICE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention relates to a liquid crystal display, and more particularly to a liquid crystal display device wherein pattern badness generated during the process is eliminated to reduce a repair.

[0003] 2. Description of the Related Art

[0004] Generally, a liquid crystal display (LCD) has a structure in which unit pixels each having a switching device consisting of a thin film transistor (TFT) and a pixel electrode for controlling a liquid crystal injected between substrates to transmit or reflect an incident light are arranged horizontally and vertically.

[0005] In the LCD, $N \times M$ unit pixels (wherein N and M are integers), each of which consists of a thin film transistors as a switching device and a pixel electrode coupled with the thin film transistor, are vertically and horizontally arranged in a matrix type. N gate lines and M data lines transmitting signals to the gate electrodes and the source electrodes of the thin film transistors, respectively are formed in such a manner to cross each other.

[0006] FIG. 1 is a plan view showing a structure of a conventional LCD, and FIG. 2 is a section view of the conventional LCD taken along the A-A' line in FIG. 1. Referring to FIG. 1 and FIG. 2, in the conventional LCD, N gate lines 13 and M data lines 21 are formed on a transparent substrate 11 in such a manner to cross each other, thereby defining $N \times M$ pixel areas. The gate lines 13 and the data lines 21 are made from a metal and have a gate insulating layer 17 therebetween to be electrically insulated from each other. The $N \times M$ pixel areas includes $N \times M$ pixels, each of which is driven with a TFT as a switching device connected electrically to the gate line 13 and the data line 21.

[0007] The TFT consists of a gate electrode 15, a source electrode 23, a drain electrode 25, and a semiconductor layer 19 including an ohmic contact layer (not shown) and an active layer (not shown). The gate electrode 15 is connected to the gate electrode 13 while the source electrode 23 is connected to the data line 21. The drain electrode 25 is opposed to the source electrode 23 with having the gate electrode 15 therebetween. The semiconductor layer 19 is formed on the gate insulating layer 17 in such a manner to overlap with the gate electrode 15 and the source and drain electrodes 23 and 25 of the TFT as well as the data line 21.

[0008] A passivation layer 26 is provided to cover the TFT having the structure as mentioned above. A transparent pixel electrode 29 electrically connected, via a contact hole 27, to the drain electrode 25 is provided at a pixel area on the passivation layer 26.

[0009] However, the conventional LCD has a problem in that, since it must be repaired upon generation of the pattern badness in the gate line and the semiconductor line, its process time is increased.

SUMMARY OF THE INVENTION

[0010] Accordingly, it is an object of the present invention to provide a liquid crystal display device wherein pattern badness in a gate line and a semiconductor layer can be eliminated prior to the process.

[0011] In order to achieve these and other objects of the invention, a liquid crystal display device according to an embodiment of the present invention includes a trench-shaped hole defined by patterning a passivation layer and a gate insulating layer at the peripheries of a gate line and a data line to expose a transparent substrate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] These and other objects of the invention will be apparent from the following detailed description of the embodiments of the present invention with reference to the accompanying drawings, in which:

[0013] FIG. 1 is a plan view showing a structure of a conventional liquid crystal display device;

[0014] FIG. 2 is a section view of the conventional liquid crystal display device taken along the A-A' line in FIG. 1;

[0015] FIG. 3 is a plan view showing a structure of a liquid crystal display device according to an embodiment of the present invention; and

[0016] FIG. 4 is a section view of the liquid crystal display device taken along the B-B' line in FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0017] Referring to FIG. 3 and FIG. 4, there is shown a liquid crystal display device according to an embodiment of the present invention. In the liquid crystal display device, N gate lines 33 and M data lines 41 are formed on a transparent substrate 31 in such a manner to cross each other, thereby defining $N \times M$ pixel areas. The gate lines 33 and the data lines 41 are made from a conductive metal and have a gate insulating layer 37 made from an insulating material such as silicon oxide or silicon nitride therebetween to be electrically insulated from each other. The $N \times M$ pixel areas includes $N \times M$ pixels, each of which is driven with a TFT as a switching device connected electrically to the gate line 33 and the data line 41.

[0018] The TFT consists of a gate electrode 35, a source electrode 43, a drain electrode 45, and a semiconductor layer 39 including an ohmic contact layer (not shown) and an active layer (not shown). The gate electrode 35 is connected to the gate electrode 33 while the source electrode 43 is connected to the data line 41. The drain electrode 45 is opposed to the source electrode 43 with having the gate electrode 35 therebetween.

[0019] The semiconductor layer 39 has an active layer (not shown) made from polycrystalline silicon or amorphous silicon that is not doped with an impurity, and an ohmic contact layer (not shown) made from polycrystalline silicon or amorphous silicon doped with a n-type or p-type impurity. The active layer (not shown) constituting the semiconductor layer 39 between the drain electrode 45 and the source electrode 43 makes a channel. The semiconductor layer 39 is formed on the gate insulating layer 37 in such a manner to overlap with the gate electrode 35 and the source and drain electrodes 43 and 45 of the TFT as well as the data line 41. A passivation layer 46 is provided to cover the TFT having the structure as mentioned above.

[0020] Trench-shaped holes **47** are provided at the peripheries of the gate **33** and the data line **41**. The holes **47** expose the drain electrode **45** and are defined by patterning the passivation layer **46** and the gate insulating film **37** by the photolithography including a dry etching to expose the transparent substrate **31**. When the holes **47** are formed, a portion protruded for the pixel area caused by pattern badness in the semiconductor layer **39** and the gate line **33** also is removed, so that a separate repair process is not required.

[0021] A transparent pixel electrode **49** electrically connected, via the holes **47**, to the exposed drain electrode **45** is provided at the pixel area on the passivation layer **46**.

[0022] As described above, according to the present invention, a portion protruded for the pixel area caused by pattern badness in the semiconductor layer and the gate line also is removed by the trench-shaped holes defined by patterning the passivation layer and the gate insulating layer at the peripheries of the gate line and the data line, so that a separate repair process is not required.

[0023] Although the present invention has been explained by the embodiments shown in the drawings described above, it should be understood to the ordinary skilled person in the

art that the invention is not limited to the embodiments, but rather that various changes or modifications thereof are possible without departing from the spirit of the invention. Accordingly, the scope of the invention shall be determined only by the appended claims and their equivalents.

What is claimed is:

1. A liquid crystal display device including a transparent substrate, a gate line, a gate electrode, a gate insulating layer, a semiconductor layer, a data line, a source electrode, a drain electrode, a passivation layer and a pixel electrode, said device comprising:

a trench-shaped hole defined by patterning the passivation layer and the gate-insulating layer at the peripheries of the gate line and the data line to expose the transparent substrate.

2. The liquid crystal display device according to claim 1, wherein the semiconductor layer includes an active layer and an ohmic contact layer.

3. The liquid crystal display device according to claim 1, wherein the drain electrode is exposed by the hole.

* * * * *

专利名称(译)	液晶显示装置		
公开(公告)号	US20010024245A1	公开(公告)日	2001-09-27
申请号	US09/739825	申请日	2000-12-20
[标]申请(专利权)人(译)	崔佑赫 PARK KWANG燮		
申请(专利权)人(译)	崔佑赫 PARK KWANG燮		
当前申请(专利权)人(译)	崔佑赫 PARK KWANG燮		
[标]发明人	CHOI WOO HYUK PARK KWANG SEOP		
发明人	CHOI, WOO HYUK PARK, KWANG SEOP		
IPC分类号	G02F1/1335 G02F1/1333 G02F1/1362 G02F1/1368 G02F1/136		
CPC分类号	G02F1/133345 G02F1/136259 G02F1/136286 G02F1/1368 G02F2001/133337		
优先权	1019990065977 1999-12-30 KR		
其他公开文献	US7436461		
外部链接	Espacenet USPTO		

摘要(译)

一种液晶显示装置，其中消除了在该过程中产生的图案不良以减少修复。在该器件中，通过在栅极线和数据线的外围处图案化钝化层和栅极绝缘层来限定沟槽形孔，以暴露透明衬底。因此，由半导体层和栅极线中的图案不良引起的像素区域突出的部分也被通过在栅极线的周边处图案化钝化层和栅极绝缘层而限定的沟槽形状的孔去除。数据线，因此不需要单独的修复过程。

