

(10) **Patent No.:** **US 8,085,378 B2**  
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- 23 Claims, 6 Drawing Sheets**

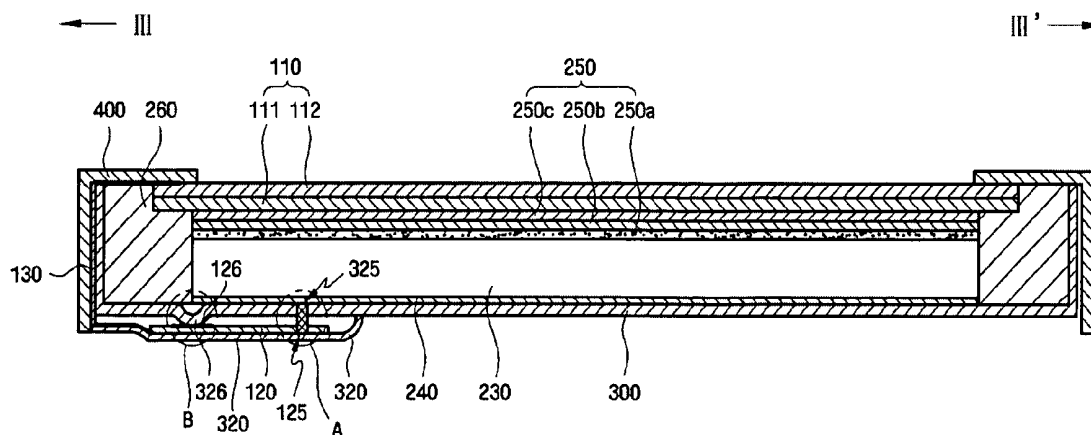


FIG. 1

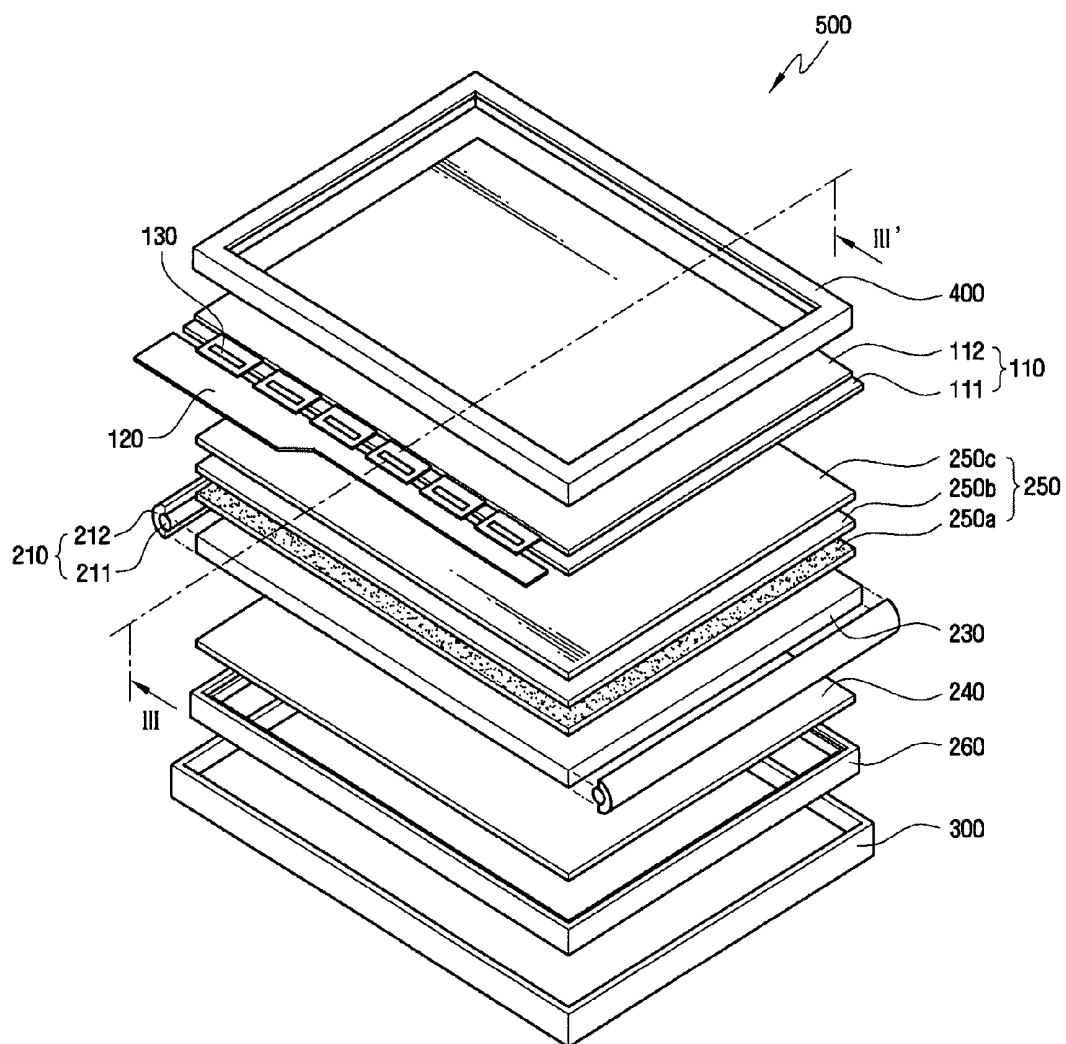


FIG. 2

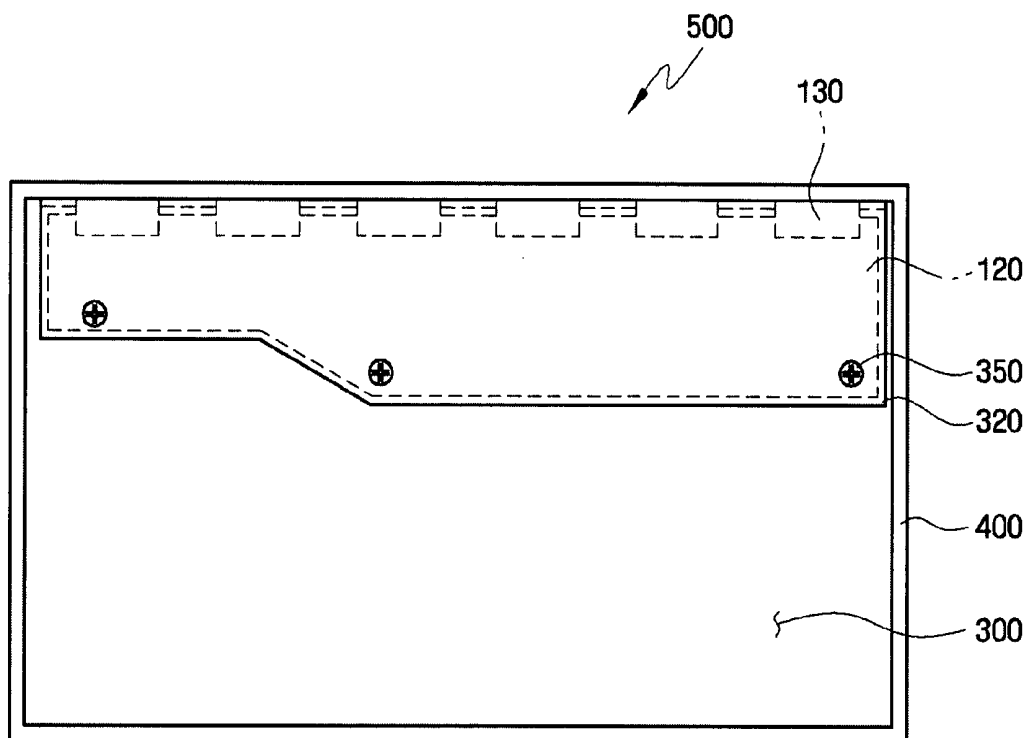
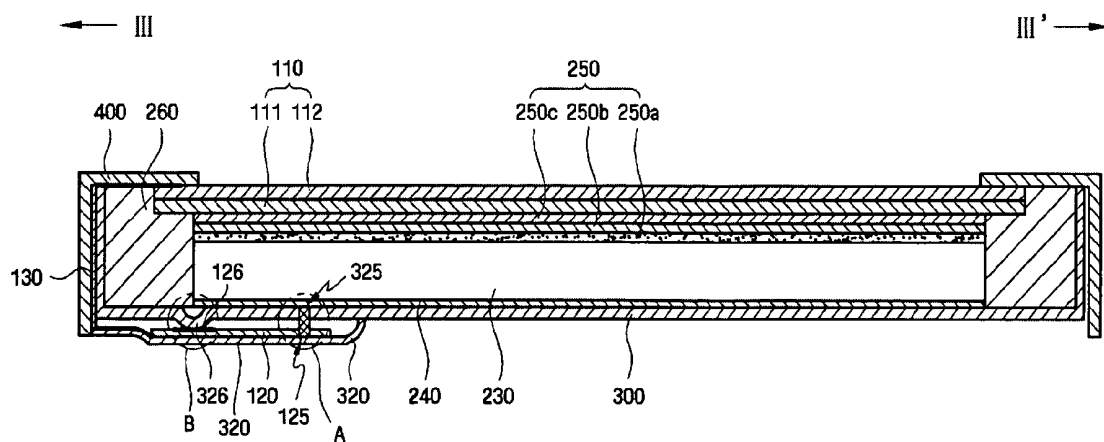


FIG. 3



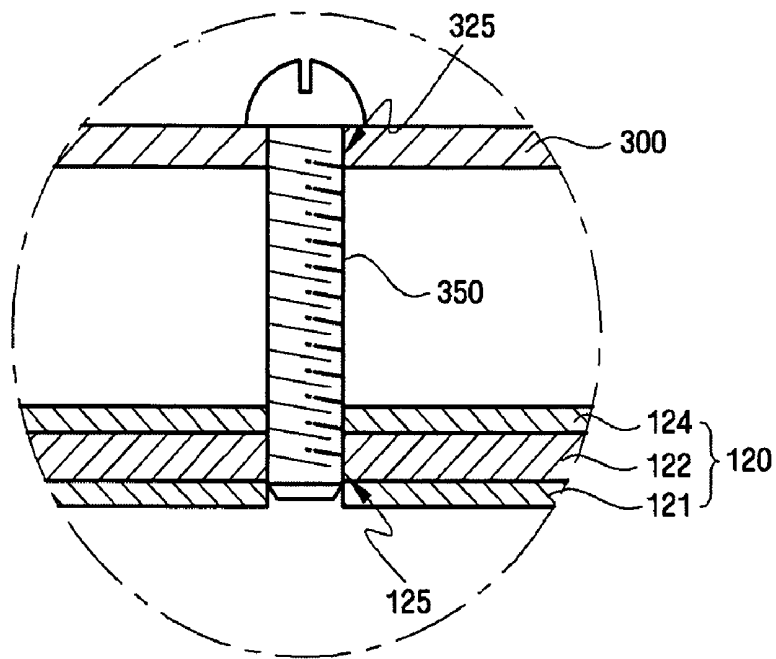
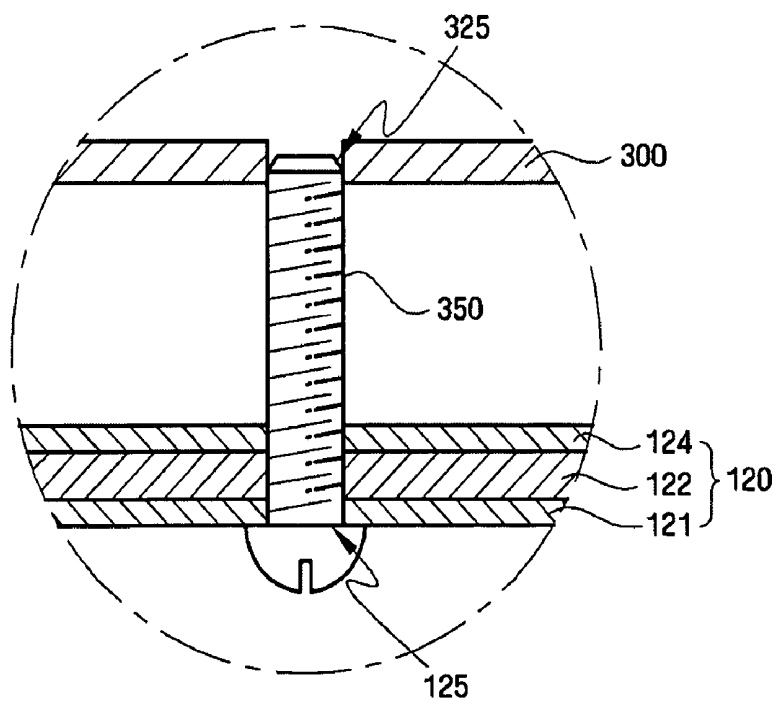
**FIG. 4A****FIG. 4B**

FIG. 5

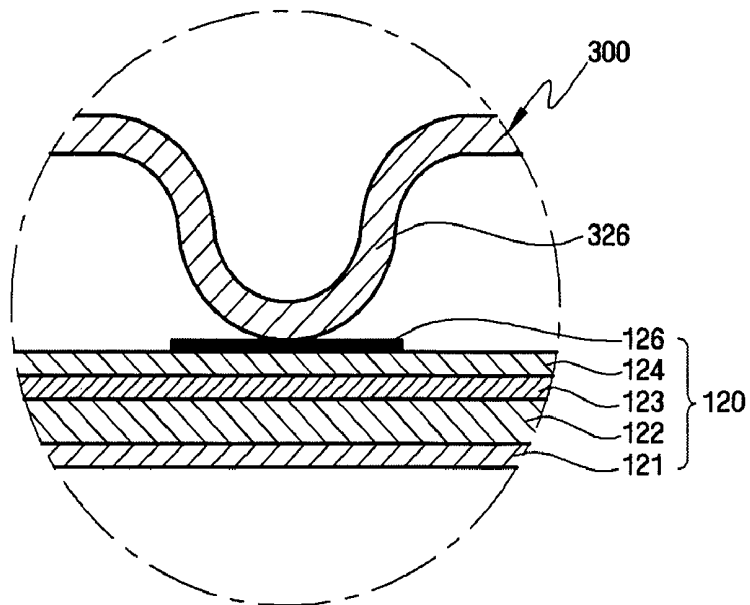
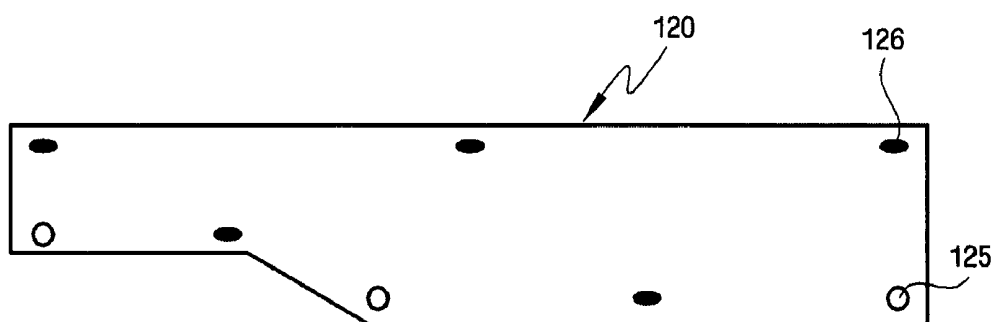


FIG. 6



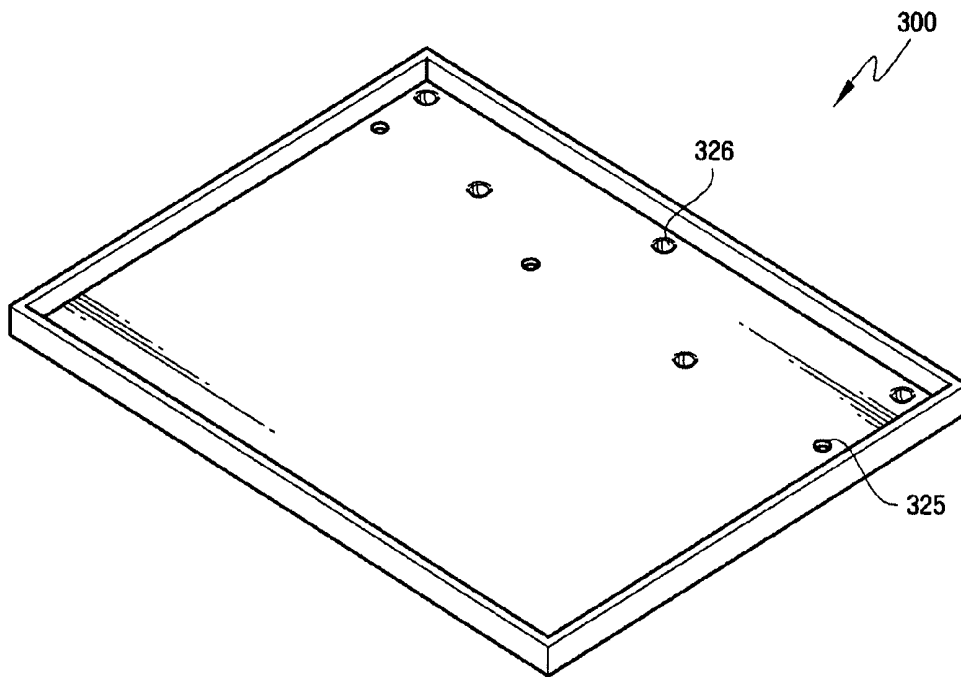
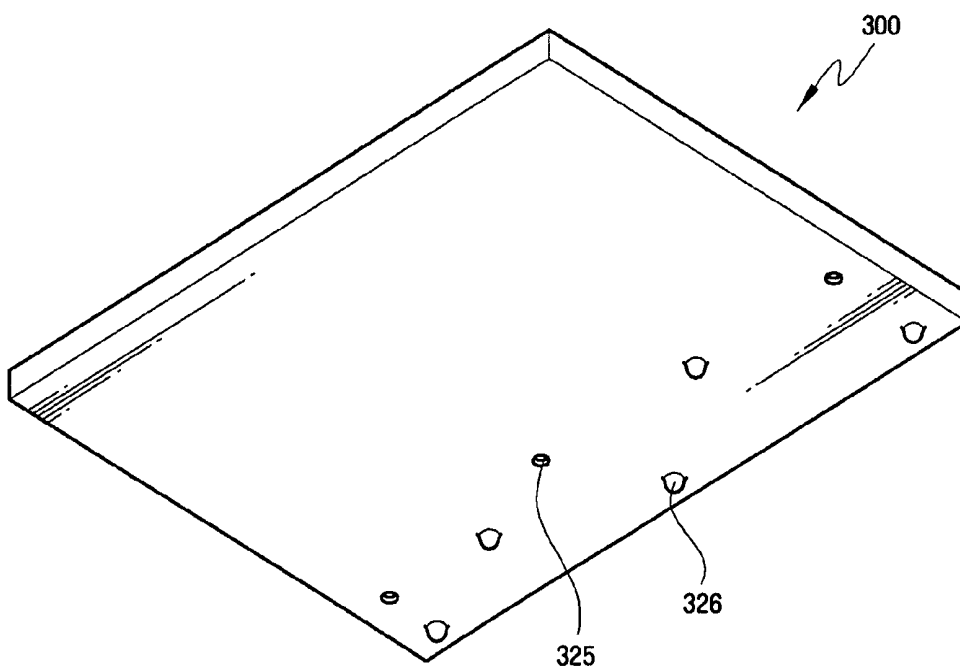
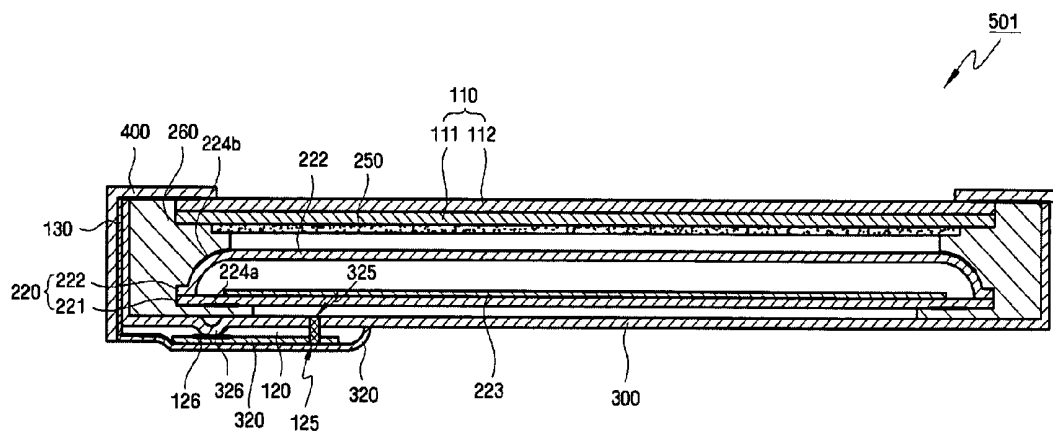
**FIG. 7A****FIG. 7B**

FIG. 8



# PRINTED CIRCUIT BOARD AND LIQUID CRYSTAL DISPLAY HAVING THE SAME

## CROSS-REFERENCE TO RELATED PATENT APPLICATION

This application claims priority from Korean Patent Application No. 10-2005-0074581 filed on Aug. 13, 2005, and all the benefits accruing therefrom under 35 U.S.C. §119, the contents of which in its entirety are incorporated herein by reference.

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates to a printed circuit board (PCB) and a liquid crystal display (LCD) having the same, and more particularly, to a PCB connected to a surface of a bottom chassis and an LCD having the same.

### 2. Description of the Related Art

With development of information society, demands for various display devices have increased. Accordingly, various flat display devices such as a liquid crystal display (LCD), an electroluminescent display (ELD), a plasma display panel (PDP), and so on have been developed and widely used in a wide variety of application fields. Specifically, due to advantageous characteristics of good picture quality, thinness, lightness in weight, and low power consumption, the LCD device is widely utilized for various electronic apparatuses.

A liquid crystal display is one of flat panel display devices that have been currently used in a most extensive manner. The liquid crystal display has two substrates provided with a plurality of electrodes, and a liquid crystal layer sandwiched between the substrates. A voltage is applied to the electrodes to allow liquid crystal molecules of the liquid crystal layer to be rearranged to adjust the amount of light transmitted there-through. Since the LCD is a non-emissive device, it cannot be used at a dark place. To overcome this drawback, an LCD employs a backlight assembly illuminating uniform light on a liquid crystal panel. The backlight assembly and the liquid crystal panel are received in a mold frame and a bottom chassis.

A PCB is disposed outside of the liquid crystal panel to generate data signals and various electric control signals for controlling an image being displayed on the liquid crystal panel. The PCB is electrically coupled to the liquid crystal panel by a tape carrier package (TCP).

To attain a compact LCD, the PCB is bent toward the backlight assembly to then be connected to the bottom chassis located therebelow. The bottom chassis has a connection hole and a support to fix and support the PCB. When the support contacts an insulating layer of the PCB, the insulating layer may be easily damaged because it is formed thinly to achieve a low-cost, lightweight, and slim PCB. That is, the insulating layer may be stripped to expose its underlying metal pattern due to external shock or vibration that may occur during transportation or handling of LCDs. This causes an electrical short between the metal pattern and the support made of the same material as the bottom chassis, e.g., metal such as aluminum (Al), thus resulting in failure or malfunction of a LCD.

## BRIEF SUMMARY OF THE INVENTION

Embodiments of the present invention provide a printed circuit board designed to suppress damage to an insulating layer, and a liquid crystal display (LCD) having the PCB.

According to an embodiment of the present invention, there is provided a printed circuit board (PCB) including a metal pattern formed on an insulating substrate, an insulating layer covering the metal pattern, and at least one insulating layer protecting pattern formed on the insulating layer.

According to an embodiment of the present invention, there is provided a liquid crystal display (LCD) including a liquid crystal panel, a backlight assembly providing light to the liquid crystal panel, a bottom chassis having at least one support protruding from a surface thereof and receiving the liquid crystal panel and the backlight assembly, and a printed circuit board (PCB) including a metal pattern formed on an insulating substrate, an insulating layer covering the metal pattern, and at least one insulating layer protecting pattern formed on the insulating layer, wherein the printed circuit board is connected to the surface of the bottom chassis.

## BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the present invention can be understood in more detail from the following descriptions taken in conjunction with the attached drawings in which:

FIG. 1 shows an exploded perspective view of a liquid crystal display (LCD) according to an embodiment of the present invention;

FIG. 2 shows a bottom view of the LCD shown in FIG. 1;

FIG. 3 shows a cross-sectional view taken along the line III-III' of FIG. 1;

FIGS. 4A and 4B show enlarged views of a portion "A" shown in FIG. 3;

FIG. 5 shows an enlarged view of a portion "B" shown in FIG. 3;

FIG. 6 shows a plan view of a printed circuit board (PCB) for an LCD according to an embodiment of the present invention;

FIG. 7A shows a perspective view of a bottom chassis of the LCD according to an embodiment of the present invention;

FIG. 7B shows a bottom perspective view of a bottom chassis for an LCD according to an embodiment of the present invention; and

FIG. 8 shows a cross-sectional view of an LCD according to an embodiment of the present invention.

## DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Exemplary embodiments of the present invention and methods of accomplishing the same will now be described more fully hereinafter with reference to the accompanying drawings. The present invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Like reference numerals refer to like elements throughout the specification.

FIG. 1 shows an exploded perspective view of a liquid crystal display (LCD) according to an embodiment of the present invention.

Referring to FIG. 1, the LCD 500 includes a liquid crystal panel 110, a backlight assembly 210, 230, 240, and 250, a mold frame 260, a bottom chassis 300 serving as a receptacle, and a top chassis 400 combined with the bottom chassis 300.

The liquid crystal panel 110 displays an image and includes first and second substrates 111 and 112 and a liquid crystal layer (not shown) sandwiched between the first and second substrates 111 and 112.

The first substrate 111 includes a plurality of gate lines arranged at regular intervals along a first direction, a plurality

of data lines arranged at regular intervals along a second direction to intersect the plurality of gate lines, a plurality of pixel electrodes arranged in a matrix form within pixel areas defined by the plurality of gate lines and the plurality of data lines, and a plurality of thin film transistors switched by signals on the gate lines to transfer signals on the data lines to the pixel electrodes.

The second substrate **112** includes a black matrix pattern blocking light from outside the pixel areas, a red-green-blue (RGB) color filter pattern producing colors, and a common electrode for generating an electric field with the pixel electrode.

The first and second substrates **111** and **112** are spaced a distance apart from each other by a spacer and bonded to each other by sealant or frit glass. A liquid crystal layer having anisotropic optical properties is sandwiched between the first and second substrates **111** and **112**.

A printed circuit board (PCB) **120** is electrically connected to one side of the liquid crystal panel **110** by a tape carrier package (TCP) **130**. The TCP **130** has a driver integrated circuit (IC) for driving the liquid crystal panel **110** at its center. The PCB **120** and the TCP **130** apply driving signals and timing signals to the gate lines and data lines on the first substrate **111** in order to control an alignment angle and a time at which liquid crystals are aligned.

The backlight assembly **210**, **230**, **240**, and **250** is disposed below the liquid crystal panel **110** and provides light to the liquid crystal panel **110**. The backlight assembly includes a light source unit **210**, a light guide plate **230**, a reflective sheet **240**, and an optical sheet **250**.

The light source unit **210** is disposed along at least one side of the light guide plate **230** and includes a light source **211** and a light source cover **212** covering the light source **211**. The light source **211** can be a linear light source, such as a cold cathode fluorescent lamp (CCFL), external electrode fluorescent lamp (EEFL), or a hot cathode fluorescent lamp (HCFL), or a point light source, such as a light emitting diode (LED). In the illustrative embodiment, a CCFL is used as the light source **211**. Meanwhile, the light source unit **210** may be disposed along one long or short side or two adjacent or opposing sides of the light guide plate **230**. FIG. 1 shows an example in which two light source units **210** are disposed along either of two opposing long sides of the light guide plate **230**.

The light guide plate **230** has a rectangular shape and guides light emitted by the light source unit **210** upwardly toward the backlight assembly **210**, **230**, **240**, and **250**, that is, toward the liquid crystal panel **110**. The light guide plate **230** is made of a highly refractive and transmissive material, for example, polymethylmethacrylate (PMMA), polycarbonate (PC) or polyethylene (PE). A light-scattering pattern is formed on a bottom surface of the light guide plate **230** to direct upward light incident from the side of the light guide plate **230**. The light-scattering pattern may be formed, for example, by patterning a scattering material coated on the bottom surface of the light guide plate **230** or by forming an embossing pattern on the bottom surface thereof.

The reflective sheet **240** is disposed below the light guide plate **230** and reflects light passing downwardly through the bottom surface of the light guide plate **230**, upwardly toward the backlight assembly **210**, **230**, **240**, and **250**, while allowing light to be uniformly emitted upwardly from the light guide plate **230**. The reflective sheet **240** may be made of a thin, highly elastic and reflective material. For example, the

reflective sheet **240** may be about 0.01 mm to about 5 mm thick polyethylene terephthalate (PET) sheet, but is not limited thereto.

The optical sheet **250** is disposed above the light guide plate **230** and uniformly irradiates light guided by the light guide plate **230** upwardly toward the backlight assembly **210**, **230**, **240**, and **250**. For example, the optical sheet **250** may be formed by selectively stacking one or more diffusion sheets **230a**, prism sheets **250b** and **250c**, and protective sheets. Alternatively, the optical sheet **250** may be formed of only one or a plurality of the same optical sheets **250**. The stacking order of the optical sheets **250** may vary within a range in which the uniformity of light can be increased. The optical sheet **250** may be formed of a transparent resin such as acrylic resin, polyurethane resin, or silicon resin.

A mold frame **260** has a receiving space to receive the backlight assembly **210**, **230**, **240**, and **250**. The mold frame **260** has the shape of a rectangular parallelepiped with an open top surface. The mold frame **260** may be made of an insulating synthetic resin.

The bottom chassis **300** is disposed below the backlight assembly **210**, **230**, **240**, and **250** and receives and supports the liquid crystal panel **110**, the backlight assembly **210**, **230**, **240**, and **250**, and the mold frame **260**. The bottom chassis **300** is made of a metal such as aluminum (Al) or Al alloy.

The top chassis **400** is combined with the bottom chassis, sandwiching the liquid crystal panel **110** and the backlight assembly between them, and defines an effective display area of the liquid crystal panel **110**.

FIG. 2 shows a bottom view of the LCD shown in FIG. 1, and FIG. 3 shows a cross-sectional view taken along the line III-III' of FIG. 1.

Referring to FIGS. 2 and 3, the PCB **120** is electrically connected to the liquid crystal panel **110** by the TCP **130** and connected, for example, to the rear surface of the bottom chassis **300**. That is, the TCP **130** connected to the liquid crystal panel **110** passes between the bottom and top chassis **300** and **400** and is bent toward the rear surface of the bottom chassis **300**. The PCB **120** is connected to the TCP **130** and connected to the rear surface of the bottom chassis **300**. One surface of the PCB **120**, on which a chip is mounted, faces the rear surface of the bottom chassis **300** in order to prevent damage to the chip due to an external force. A protective shield **320** is formed below the bottom chassis **300** and covers the other surface of the PCB **120**.

The PCB **120** and the bottom chassis **300** correspondingly have connection holes **125** and **325**. The connection holes **125** and **325** may be internally threaded. FIGS. 4A and 4B show enlarged views of a portion "A" shown in FIG. 3. As shown in FIGS. 4A and 4B, the PCB **120** can be connected to the bottom chassis **300** by fitting a fastening member **350**, for example, a screw, into the connection holes **125** and **325** in the PCB **120** and the bottom chassis **300**. By using a screw without a head or removing a screw head after fitting the fastening member **350** into the connection holes **125** and **325**, it is possible to suppress an unwanted formation of a protrusion on the inner surface of the bottom chassis **300** or the surface of the PCB **120**, on which no chip is mounted.

FIG. 5 shows an enlarged view of a portion "B" shown in FIG. 3. Referring to FIGS. 3 and 5, the bottom chassis **300** further includes a support **326** supporting the PCB **120**. The support **326** protrudes from a portion of the rear surface of the bottom chassis **300** and supports the PCB **120** by contacting the surface of the PCB **120**.

An insulating layer protecting pattern **126** is formed on the surface of the PCB **120** contacting the support **326**. The insulating layer protecting pattern **126** suppresses damage to

an insulating layer **124** of the PCB **120** due to vibration or other environmental factors caused during transportation or handling.

FIG. **6** shows a plan view of a printed circuit board (PCB) for an LCD according to an embodiment of the present invention, FIG. **7A** shows a perspective view of a bottom chassis of the LCD according to an embodiment of the present invention, and FIG. **7B** shows a bottom perspective view of a bottom chassis for an LCD according to an embodiment of the present invention.

The support and the insulating layer protecting pattern will now be described in more detail with reference to FIGS. **4A** through **6**.

Referring to FIGS. **4A** through **6**, the PCB **120** includes an insulating substrate **122** made of plastic, a metal pattern **123** formed on the insulating substrate **122** using copper or copper alloy, an upper insulating layer **124** covering the entire surface of the insulating substrate **122** having the metal pattern **123** formed thereon, and a lower insulating layer **121** formed beneath the insulating substrate **122**. A plurality of connectors (not shown) are formed on the upper insulating layer **124** and electrically connected to the metal pattern **123**. Various chips (not shown) are coupled to the plurality of connectors. The metal pattern **123** is formed very thinly over the insulating substrate **122**.

To allow the PCB **120** to be connected to and supported by the bottom chassis **300**, multiple connection holes **125** may be provided and combined with the fastening member **350** over the surface of the PCB **120**. However, because the connection holes **125** penetrate the PCB **120** to provide connections as shown in FIGS. **4A** and **4B**, the connection holes **125** are difficult to form when the metal pattern **123** underlies the connection holes **125**. Further, because the metal pattern **123** is formed with a minimum margin to achieve a low-cost PCB **120** and a lightweight LCD, it becomes more difficult to form the multiple connection holes **125**. Thus, a minimum number of connection holes **125** may be formed in a portion of the PCB **120** where little or no metal pattern **123** is formed. For example, the connection holes **125** may be formed along one side of the PCB **120**, opposite a side connected to the TCP **130**. Although FIG. **6** shows three connection holes **125**, the number of connection holes **125** may decrease to be less than or equal to three. Referring to FIGS. **7A** and **7B**, the same number of connection holes **325** may be formed in corresponding regions of the bottom chassis **300**.

When a small number of fastening members **350** (e.g., screws) are used to connect the PCB **120** and the bottom chassis **300**, the PCB **120** may not be securely supported. Consequently, the PCB **120** may make physical contact with the bottom chassis **300** causing damage to the chip mounted on the PCB **120**. Additionally, the PCB **120** may make electrical contact with the bottom chassis **300**, which is made of metal, causing a short circuit and resulting in failure or malfunction.

To address the potential for damage or malfunction, the bottom chassis **300** according to the present embodiment includes the support **326** as shown in FIGS. **7A** and **7B**. The support **326** protrudes from a portion of the rear surface of the bottom chassis **300**. The support **326** may be formed by bonding a cylindrical support of a predetermined height to the rear surface of the bottom chassis **300**. Preferably, the support **326** is formed from a portion of the bottom surface of the bottom chassis **300**, which simplifies the manufacturing process and reduces the manufacturing cost. The support **326** has a height sufficient to prevent the PCB **120** from contacting the bottom chassis **300**, determined by considering the height of the chip mounted on the PCB **120**, the area of the PCB **120**,

and the number of supports **326**. To achieve a thin LCD, it is desired that the support **326** have a minimum height considering the above conditions.

The support **326** is in contact with the upper insulating layer **124**, away from the portion of the PCB **120** on which the chip is mounted. To maintain a desirable center of gravity, the support **326** is located in the region of the bottom chassis **300** away from a portion of the bottom chassis **300** connected to the corresponding portion of the PCB **120** by the fastening member **350**, i.e., in the region of the bottom chassis **300** corresponding to a portion of the PCB **120** connected to the TCP **130**. An appropriate number of supports **326** may be disposed along the outer perimeter of the PCB **120** to uniformly support the PCB **120**. For example, as shown in FIGS. **7A** and **7B**, a plurality of supports **326** are disposed along one side of the bottom chassis **300** and additional supports **326** are formed along a line of the connection holes **325**.

When the support **326** contacts the upper insulating layer **124** of the PCB **120** as described above, the upper insulating layer **124** may be eroded during transportation or other handling processes due to an external impact and friction resulting from vibration. In this case, since the region of the PCB **120** corresponding to the region of the bottom chassis **300** on which the supports **326** are disposed includes the metal pattern **123** formed very thinly beneath the upper insulating layer **124**, unlike the region of the PCB **120** having the connection holes **125** as shown in FIGS. **4A** and **4B**, the underlying metal pattern **123** may be exposed when the upper insulating layer **124** is stripped off. The exposed metal pattern **123** is shorted out with the support **326** made of metal such as Al and the bottom chassis **300**, thus resulting in failure and malfunction of the LCD.

To suppress damage to the upper insulating layer **124** as described above, the PCB **120** includes the insulating layer protecting pattern **126** formed on the upper insulating layer **124** of the PCB **120** and overlapping the metal pattern **123**.

The insulating layer protecting pattern **126** may be formed of photo-developing ink, ultraviolet-hardening ink, thermal hardening ink, or thermal drying ink. The ink may contain epoxy resin. The ink pattern can suppress damage to the upper insulating layer **124** due to friction against the support **326**. Marker ink used for the PCB **120** may be utilized as the ink to form the insulating layer protecting pattern **126** without significantly increasing the manufacturing costs. For example, S-200 containing epoxy resin available from Taiyo Co. in Japan may be used as the marker ink.

The insulating layer protecting pattern **126** may be formed by a silk screen printing technology used in printing an identification mark of a typical PCB, thus avoiding a separate process. The presence of the insulating layer protecting pattern **126** reduces failure or malfunction of the LCD, and thus the failure rate. Referring to FIGS. **5** through **7B**, the same number of insulating layer protecting patterns **126** as the number of supports **326** may be formed to contact the corresponding supports **326**.

FIG. **8** shows a cross-sectional view of an LCD according to an embodiment of the present invention.

Referring to FIG. **8**, a surface light source **220** is disposed below a liquid crystal panel **110** and provides light to the backlight assembly **220** and **250**. The surface light source **220** includes lower and upper substrates **221** and **222**. The lower substrate **221** is attached to the upper substrate **222** to create a chamber containing a discharge space. Electrodes **224a** and **224b** of the surface light source **220** are disposed along a side of the upper substrate **222** and extend up to a corresponding side of the lower substrate **221**.

The upper substrate **222** is made of transparent insulating material such as glass and includes a planar portion and a convex portion extending in a first direction. The convex portion and the planar portion repeat alternately. The convex portion has substantially the same thickness as the planar portion. The convex portion is substantially separated from the lower substrate **221** and creates the discharge space with the lower substrate **221**. A gas layer such as mercury is formed in the discharge space. FIG. 8 shows the cross-section of the convex portion of the surface light source **220**.

A connecting path (not shown) may be created between discharge spaces of adjacent convex portions. As described above, the planar portion is sandwiched between the adjacent convex portions. The connecting path serves to make equal the pressure of gas between discharge spaces. Outer ends of the upper substrate **222** are planar with the same height as the planar portion to achieve bonding to the lower substrate **221**. A phosphor layer (not shown) is formed on the insides of the lower and upper substrates **221** and **222** and a reflective layer **223** is formed between the phosphor layer and the lower substrate **221**.

The surface light source **220** is housed within a mold frame **260** having the shape of a rectangular parallelepiped with an open top surface and a bottom chassis **300**. One or more optical plates or optical sheets **250** may be disposed above the surface light source **220** to increase brightness uniformity.

The liquid crystal panel **110** is disposed above the one or more optical sheets **250**. A PCB **120** connected to the liquid crystal panel **110** by a TCP **130** is connected to a rear surface of the bottom chassis **300**.

The PCB **120** and the bottom chassis **300** include connection holes **125** and **325** as in FIGS. 3 and 6 described above. The PCB **120** and the bottom chassis **300** also include an insulating layer protecting pattern **126** to avoid an electrical short by protecting an insulating layer, and a support **326** fixedly supporting the PCB **120** against the bottom chassis **300**. Here, the insulating layer protecting pattern **126** and the support **326** function similarly as described above.

The LCD according to an embodiment of the present invention employs a direct light type backlight assembly with the surface light source **220** disposed below the liquid crystal panel **110**, thereby providing high brightness and large-area LCD. Although, a surface light source is used as a light source of a direct light type backlight assembly, a linear light source such as a CCFL may be used.

As described above, the printed circuit board (PCB) and a liquid crystal display (LCD) including the same are provided. The PCB is fixedly supported on the bottom chassis of the LCD. An insulating layer protecting pattern is used to suppress damage to an insulating layer of the PCB, thus avoiding an electrical short in the PCB as well as failure and malfunction of the LCD. Ink can be used as the insulating layer protecting pattern, thus reducing failure rate without significantly increasing manufacturing costs.

Those skilled in the art will appreciate that variations and modifications can be made to the exemplary embodiments without substantially departing from the principles of the present invention. Therefore, the disclosed exemplary embodiments of the invention, although descriptive, are not for purposes of limitation.

What is claimed is:

1. A printed circuit board (PCB) comprising:

a metal pattern formed on an insulating substrate;  
an insulating layer covering the metal pattern; and

at least one insulating layer protecting pattern formed on the insulating layer, wherein the PCB is connected to a tape carrier package (TCP), all portions of the insulating

layer protecting pattern are on the insulating layer, the insulating layer protecting pattern comprises an ink identification mark having resin, and the insulating layer protecting pattern contacts a support of a bottom chassis.

2. The PCB of claim 1, wherein the at least one insulating layer protecting pattern is formed of photo-developing ink, ultraviolet-hardening ink, thermal hardening ink, or thermal drying ink.

3. The PCB of claim 2, wherein the ink is marker ink used in the printed circuit board.

4. The PCB of claim 1, wherein the at least one insulating layer protecting pattern is formed using silk screen printing.

5. The PCB of claim 1, wherein the at least one insulating layer protecting pattern is disposed along the outer perimeter of the substrate.

6. The PCB of claim 1, further comprising at least one connection hole combined with a fastening member.

7. The PCB of claim 6, wherein the at least one connection hole is formed along one side of the substrate.

8. The PCB of claim 1, wherein the at least one insulating layer protecting pattern formed on the insulating layer overlaps the metal pattern.

9. The PCB of claim 1, wherein the at least one insulating layer protecting pattern protects the insulating substrate from an external impact and friction resulting from vibration.

10. The PCB of claim 1, wherein the at least one insulating layer protecting pattern is formed of a resin.

11. A liquid crystal display (LCD) comprising:

a liquid crystal panel;

a backlight assembly providing light to the liquid crystal panel;

a bottom chassis having at least one support protruding from a surface thereof and receiving the liquid crystal panel and the backlight assembly, wherein the support is formed from a portion of the bottom chassis; and

a printed circuit board (PCB) including a metal pattern formed on an insulating substrate, an insulating layer covering the metal pattern, and at least one insulating layer protecting pattern formed on the insulating layer, wherein the printed circuit board is connected to the surface of the bottom chassis and the support of the bottom chassis is in direct contact with the insulating layer protecting pattern of the printed circuit board, wherein the printed circuit board is connected to the liquid crystal panel via a tape carrier package (TCP) and all portions of the insulating layer protecting pattern are on the insulating layer, and wherein the insulating layer protecting pattern comprises an ink identification mark having resin.

12. The LCD of claim 11, wherein the at least one insulating layer protecting pattern is formed of photo-developing ink, ultraviolet-hardening ink, thermal hardening ink, or thermal drying ink.

13. The LCD of claim 12, wherein the ink is marker ink used in the printed circuit board.

14. The LCD of claim 11, wherein the at least one insulating layer protecting pattern is formed using silk screen printing.

15. The LCD of claim 11 wherein the at least one insulating layer protecting pattern is disposed along the outer perimeter of the substrate.

16. The LCD of claim 11, wherein each of the PCB and the bottom chassis further include at least one connection hole at corresponding positions, and a fastening member is fitted into the at least one corresponding connection hole in the printed circuit board and the bottom chassis.

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17. The LCD of claim 16, wherein the at least one connection hole is formed in one side of the PCB and in a corresponding side of the bottom chassis.

18. The LCD of claim 11, further comprising a protective shield that is formed below the bottom chassis and covers the PCB. 5

19. The LCD of claim 11, wherein the at least one insulating layer protecting pattern formed on the insulating layer overlaps the metal pattern.

20. The LCD of claim 11, wherein the at least one insulating layer protecting pattern protects the insulating substrate from an external impact by a support and friction resulting from vibration. 10

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21. The LCD of claim 11, wherein the at least one insulating layer protecting pattern is formed of a resin.

22. The LCD of claim 11, wherein the at least one support is formed on the at least one insulating layer protecting pattern and is spaced apart from where the printed circuit board is connected to the surface of the bottom chassis.

23. The LCD of claim 22, wherein the printed circuit board is connected to the surface of the bottom chassis by a fastening member.

\* \* \* \* \*

|                |                                                              |         |            |
|----------------|--------------------------------------------------------------|---------|------------|
| 专利名称(译)        | 印刷电路板和具有该印刷电路板的液晶显示器                                         |         |            |
| 公开(公告)号        | <a href="#">US8085378</a>                                    | 公开(公告)日 | 2011-12-27 |
| 申请号            | US11/439912                                                  | 申请日     | 2006-05-24 |
| [标]申请(专利权)人(译) | 三星电子株式会社                                                     |         |            |
| 申请(专利权)人(译)    | SAMSUNG ELECTRONICS CO. , LTD.                               |         |            |
| 当前申请(专利权)人(译)  | 三星DISPLAY CO. , LTD.                                         |         |            |
| [标]发明人         | RYU HAN JIN                                                  |         |            |
| 发明人            | RYU, HAN-JIN                                                 |         |            |
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| 助理审查员(译)       | 常 , CHARLES                                                  |         |            |
| 优先权            | 1020050074581 2005-08-13 KR                                  |         |            |
| 其他公开文献         | US20070035689A1                                              |         |            |
| 外部链接           | <a href="#">Espacenet</a> <a href="#">USPTO</a>              |         |            |

#### 摘要(译)

提供印刷电路板 ( PCB ) 和包括该印刷电路板的液晶显示器 ( LCD ) 。 PCB包括形成在绝缘基板上的金属图案, 覆盖金属图案的绝缘层, 以及形成在绝缘层上的至少一个绝缘层保护图案。 LCD包括液晶面板, 向液晶面板提供光的背光组件, 具有从其表面突出的至少一个支撑件并接收液晶面板和背光组件的底架, 以及印刷电路板 ( PCB ) ) 包括形成在绝缘基板上的金属图案, 覆盖金属图案的绝缘层, 以及形成在绝缘层上的至少一个绝缘层保护图案, 其中印刷电路板连接到底架的表面。

