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(54) BACK LIGHT UNIT AND LIQUID CRYSTAL DISPLAY USING THE SAME

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(57) **ABSTRACT**

A backlight unit is provided. The backlight unit comprises: a cover bottom: a printed circuit board (PCB) that is supported by the cover bottom; a light emitting element that is positioned on the PCB; an optical film layer that is supported by the cover bottom and that is positioned on the PCB; and a guide that is mounted separately from the light emitting element in a surface of the PCB in order to support the optical film layer.

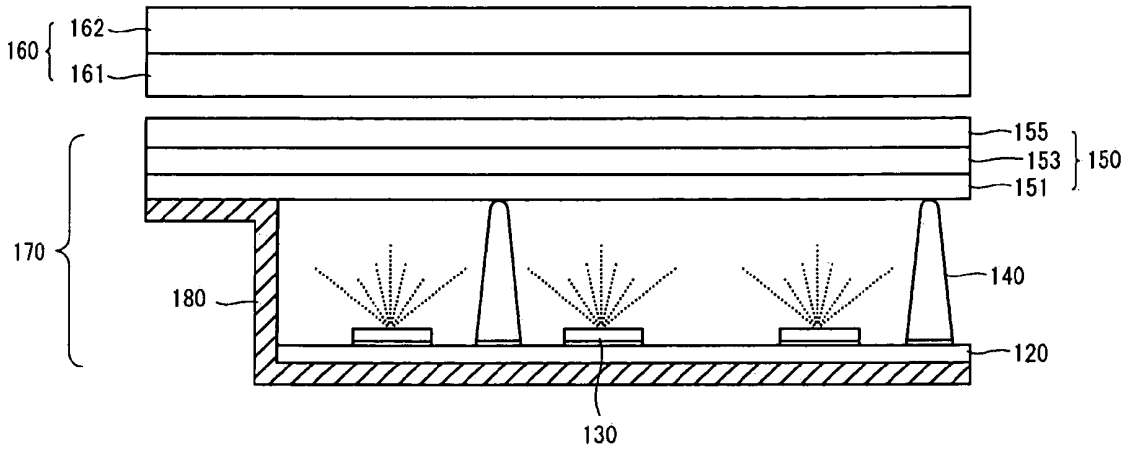


Fig. 1

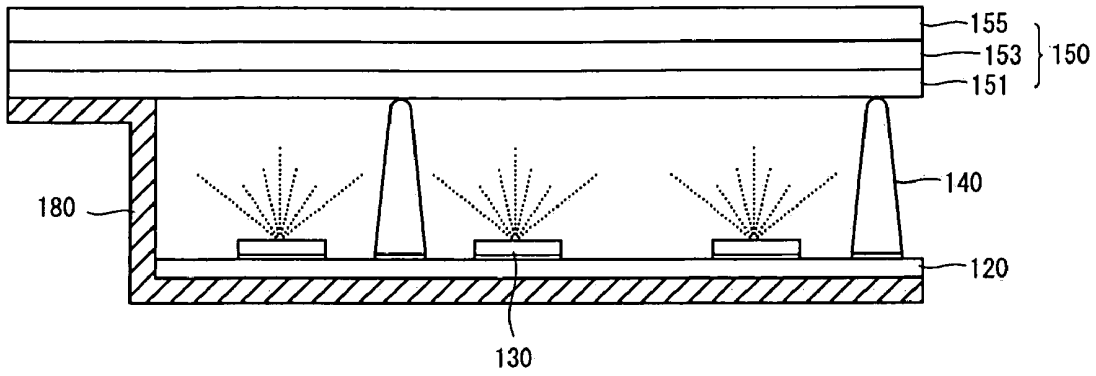


Fig. 2

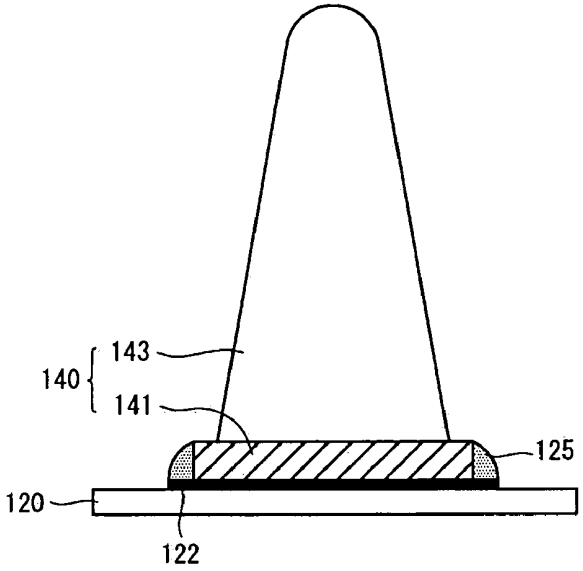


Fig. 3

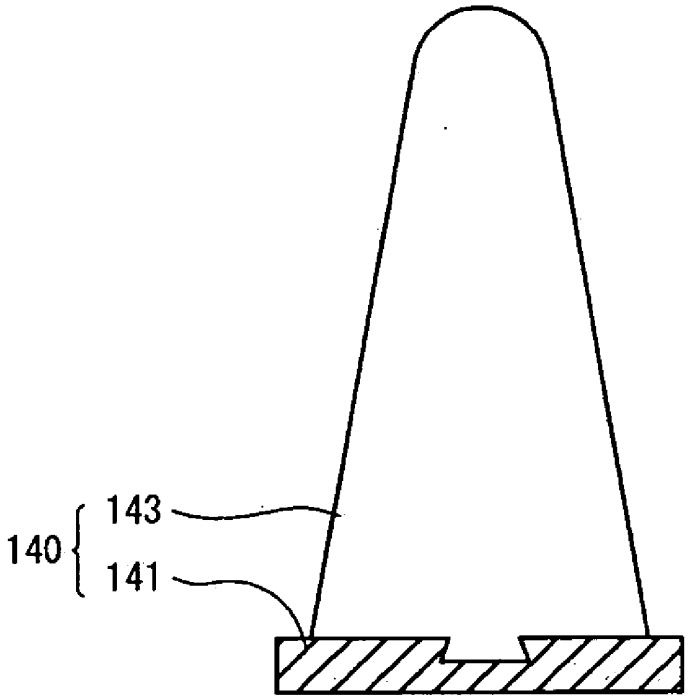


Fig. 4

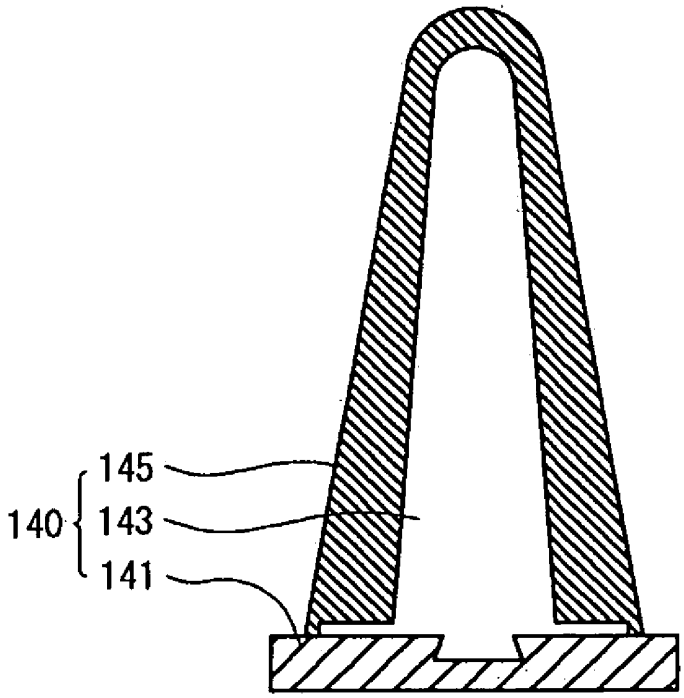


Fig. 5

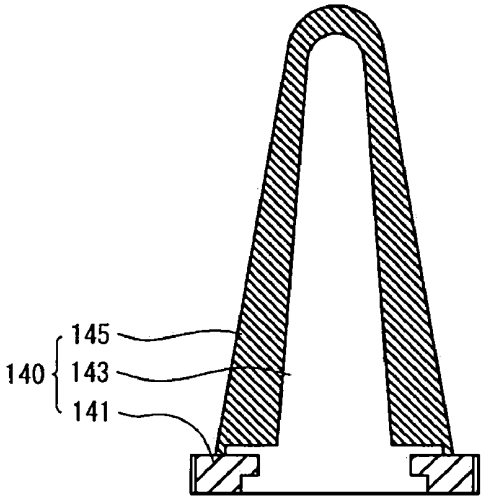


Fig. 6

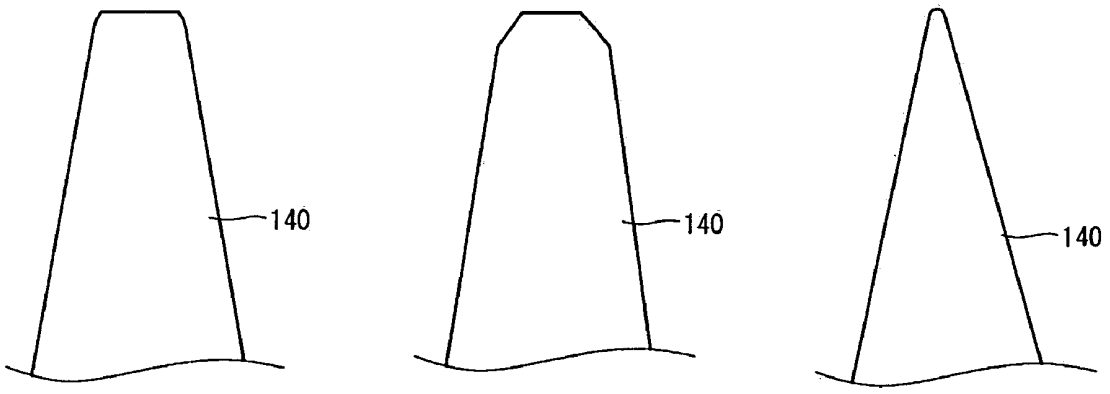


Fig. 7

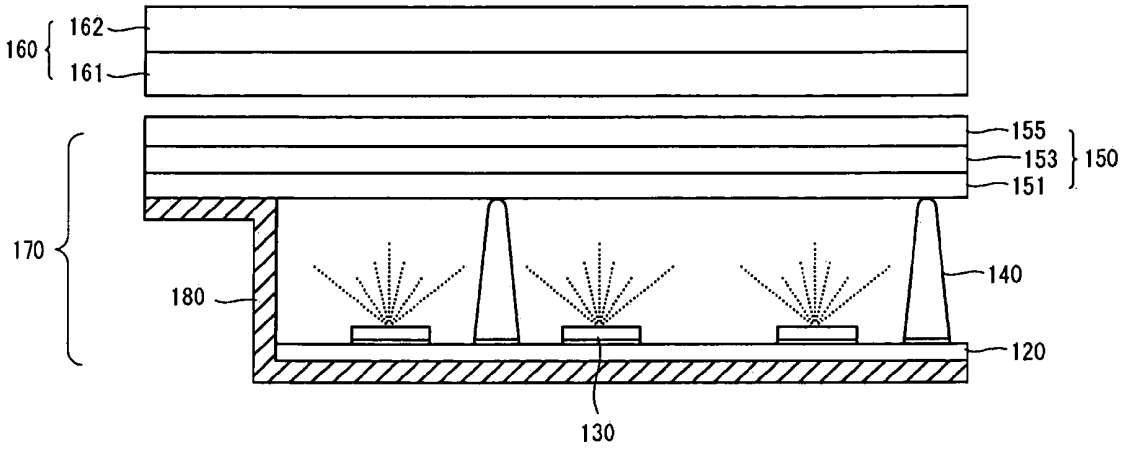
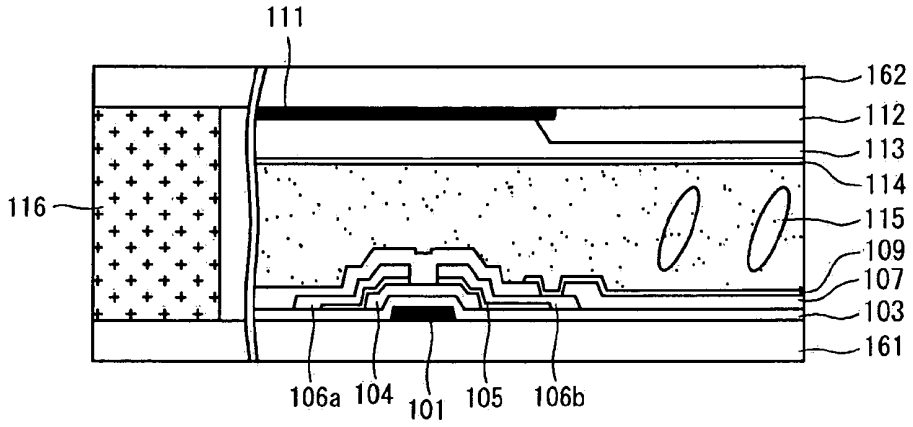

160
162
161
155
153
151
150
170
180
140
120
130

Fig. 8


111
162
112
113
114
115
109
107
103
161
116
106a
104
101
105
106b

BACK LIGHT UNIT AND LIQUID CRYSTAL DISPLAY USING THE SAME

[0001] This application claims the benefit of Korean Patent Application No. 10-2008-089235 filed on Sep. 10, 2008 which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND

[0002] 1. Field of Invention

[0003] This document relates to a backlight unit and a liquid crystal display using the same.

[0004] 2. Discussion of the Related Art

[0005] As research in information-oriented technology develops, a market of a display device, which is a connection medium between a user and information increases. Accordingly, use of a flat panel display (FPD) such as a liquid crystal display (LCD), an organic light emitting diode (OLED), and a plasma display panel (PDP) increases. The LCD that can embody high resolution and that can increase a size as well as decrease a size is widely used.

[0006] The LCD is classified as a light receiving display device. The LCD receives light from a backlight unit positioned at a lower part of a liquid crystal panel and expresses an image.

[0007] The backlight unit comprises a printed circuit board (PCB) supported by a cover bottom and an optical film layer positioned on the PCB. A light emitting element is positioned on the PCB and light emitted from the light emitting element is transferred to the liquid crystal panel through the optical film layer. The optical film layer positioned on the PCB is formed in a plurality of layers and requires a guide for supporting the layers.

[0008] Conventionally, the optical film layer was supported by making a hole in the cover bottom and installing the guide, and because this was performed by a manual operation, as the quantity of the guides increases, there was a problem that an installation time period is extended and a production yield is deteriorated. In a related art guide, due to installation restrictions or various factors, as a diffusion plate substantially supported by the guide is bent, a problem such as lattice mura occurs and thus improvement of the problem is requested.

SUMMARY OF THE INVENTION

[0009] Accordingly, the present invention is directed to a backlight unit and liquid crystal display that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0010] In accordance with the purpose of the present invention, as embodied and broadly described, a backlight unit comprises: a cover bottom; a PCB that is supported by the cover bottom; a light emitting element that is positioned on the PCB; an optical film layer that is supported by the cover bottom and that is positioned on the PCB; and a guide that is mounted separately from the light emitting element in a surface of the PCB in order to support the optical film layer.

[0011] In another aspect, a LCD comprises: a backlight unit that comprises a PCB that is supported by a cover bottom, a light emitting element that is positioned on the PCB, an optical film layer that is supported by the cover bottom and that is positioned on the PCB, and a guide that is mounted separately from the light emitting element in a surface of the PCB in order to support the optical film layer; and a liquid crystal panel that displays an image using light emitted from the backlight unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The accompany drawings, which are included to provide a further understanding of the invention and are incorporated on 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.

[0013] FIG. **1** is a schematic cross-sectional view of a backlight unit according to an embodiment of this document;

[0014] FIG. **2** is a view illustrating a guide mounted in a surface of a PCB;

[0015] FIGS. **3** to **5** are diagrams illustrating an internal structure of the guide;

[0016] FIG. **6** is a diagram illustrating an external shape of the guide;

[0017] FIG. **7** is a schematic cross-sectional view of a LCD according to another embodiment of this document; and

[0018] FIG. **8** is a cross-sectional view of a liquid crystal panel.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

[0019] Reference will now be made in detail to embodiments of the present invention examples of which are illustrated in the accompanying drawings.

[0020] As shown in FIG. **1**, a backlight unit according to an embodiment of this document includes a cover bottom **180**. Further, the backlight unit includes a printed circuit board (PCB) **120** that is supported by the cover bottom **180**. Further, the backlight unit includes a light emitting element **130** that is positioned on the PCB **120**. Further, the backlight unit comprises an optical film layer **150** that is supported by the cover bottom **180** and that is positioned on the PCB **120**. Further, the backlight unit comprises a guide **140** that is mounted separately from the light emitting element **130** on a surface of the PCB **120** in order to support the optical film layer **150**.

[0021] The cover bottom **180** is made of a material having high durability and heat resistance. The cover bottom **180** may have steps corresponding to constituent elements in order to receive constituent elements comprised in the backlight unit.

[0022] The PCB **120** may be attached and fixed to a floor surface of the cover bottom **180**. A pad in which an element is mounted and a wire connected to the pad may be positioned at the PCB **120**.

[0023] The light emitting element **130** may be attached to the pad positioned on the PCB **120** and emit light by power supplied through the wire. The light emitting element **130** may use a light emitting diode (LED) and an OLED.

[0024] When the light emitting element **130** is an LED, the light emitting element **130** may be formed on a surface mount device mounted on a surface of the PCB **120**. Because the surface mount device mounted on the surface of the PCB **120** is automatically inserted and soldered by surface mount technology, a process time period is effectively shortened.

[0025] The optical film layer **150** may be formed to have a plurality of layers for performing an optical function. The optical film layer **150** may comprise a diffusion plate **151**, a diffusion sheet **153**, and an optical sheet **155**. The optical sheet **155** may use a sheet having a shape such as a prism

shape, a lenticular lens shape, and a micro lens shape. In order to improve an optical effect, the optical sheet **155** may comprise a sub-material such as a bead.

[0026] In order to support the optical film layer **150**, the guide **140** is mounted separately from the light emitting element **130** on a surface of the PCB **120**. Light is generally emitted from the light emitting element **130** through the optical film layer **150**, and in order to improve an optical effect, an optical gap required between the light emitting element **130** and the optical film layer **150**. When an optical gap between the light emitting element **130** and the optical film layer **150** is sustained, the guide **140** performs a function of preventing the optical film layer **150** formed in a plurality of layers from being decreased or deformed. The guide **140** together with the light emitting element **130** is formed on a surface mount device on order to mount in the surface of the PCB **120** by surface mount technology. The guide **140** is mounted separately from the light emitting element **130** on a surface of the PCB **120** and has a different quantity and disposition according to a size of the backlight unit.

[0027] The guide **140** is described in detail hereinafter.

[0028] As shown in FIG. **2**, the guide **140** that is mounted on the surface of the PCB **120** comprises a base **141** that is made of a metal material and a body **143** that is protruded from the base **141**. As described above, when the light emitting element **130** and the guide **140** are formed on a surface mount device mounted in the surface of the PCB **120**, a first pad (not shown) patterned to mount the light emitting element **130** and a second pad **122** patterned to mount the guide **140** are formed on the surface of the PCB **120**.

[0029] When the light emitting element **130** and the guide **140** are formed on a surface mount device, the light emitting element **130** and the guide **140** are automatically inserted and soldered on the surface of the PCB **120** by a surface mount technology, and thus a process time period can be shortened and a production yield of the backlight can be improved. FIG. **2** illustrates the guide **140** soldered by a lead **125**.

[0030] Referring to FIGS. **3** to **5**, the guide **140** may be formed in various structures.

[0031] Referring to FIG. **3**, the guide **140** includes a body **143** that is protruded to be attached to a groove formed in the base **141**. The body **143** that is parts of the guide **140** may have an upper part of a round conical shape.

[0032] The base **141** that is included as part of the guide **140** shown in FIG. **3** may be made of a metal material, and the body **143** may be made of an organic material or an inorganic material.

[0033] Referring to FIG. **4**, the guide **140** includes a first body **143** that is protruded and attached to a groove formed in the base **141** and a second body **145** that covers the first body **143**. The first body **143** and the second body **145** that are comprised in the guide **140** may have an upper part of a round conical shape.

[0034] The base **141** that is comprised in the guide **140** shown in FIG. **4** may be made of a metal material, and the first body **143** and the second body **145** may be made of an organic material or an inorganic material.

[0035] Referring to FIG. **5**, the guide **140** comprises a first body **143** that is protruded to be attached to a hole formed in the base **141** and a second body **145** that covers the first body **143**. The first body **143** and the second body **145** that are comprised in the guide **140** may have an upper part of a round conical shape.

[0036] The base **141** that is comprised in the guide **140** shown in FIG. **5** may be made of a metal material, and the first body **143** and the second body **145** may be made of an organic material or an inorganic material. For example, the first body **143** may be made of an organic material such as polyphthalamide (PPA), and the second body **145** may be made of an inorganic material such as silicon, however the first body **143** and the second body **145** are not limited thereto.

[0037] The guide **140** of FIG. **5** is not limited to the above form and may be formed in a form in which the first body **143** is inserted into a lower part of the base **141** and the second body **145** is coupled to the first body **143**.

[0038] The guide **140** is not limited to an upper part of a round conical shape and may be formed in the following shape.

[0039] As shown in FIG. **6**(*a*), the guide **140** may be formed in a conical shape having a wide lower part, a narrow upper part, and a flat upper end.

[0040] As shown in FIG. **6**(*b*), the guide **140** may be formed in a conical shape having a wide lower part, a narrow upper part, and a polygonal upper end.

[0041] As shown in FIG. **6**(*c*), the guide **140** may be formed in a conical shape having a wide lower part, a narrow upper part, and a relatively pointed upper end.

[0042] However, a shape of the guide **140** is not limited thereto and may be formed in various forms such as a round cylindrical shape, a quadrangular pillar shape, and a polygonal pillar shape other than a conical shape.

[0043] According to the embodiment, the guide **140** may be formed in a structure that can prevent a scratch problem of a surface of a layer directly contacting with the guide **140** as well as a strong resisting force on an external impact.

[0044] Referring to FIG. **7**, a LCD according to an embodiment of this invention includes a backlight unit comprising the PCB **120** that is supported by the cover bottom **180**, the light emitting element **130** that is positioned on the PCB **120**, the optical film layer **150** that is supported by the cover bottom **180** and that is positioned on the PCB **120**, and the guide **140** that is mounted separately from the light emitting element **130** on the surface of the PCB **120** in order to support the optical film layer **150**. Further, the LCD may comprise a liquid crystal panel **160** that is positioned on a backlight unit **170** and that displays an image using light emitted from the backlight unit **170**.

[0045] The optical film layer **150** that is comprised in the backlight unit **170** may be formed in a plurality of layers for performing an optical function. The optical film layer **150** may comprise the diffusion plate **151**, the diffusion sheet **153**, and the optical sheet **155**. Here, the optical sheet **155** may use a sheet having a prism shape, a lenticular lens shape, or a micro lens shape. In order to improve an optical effect, a sub-material such as a bead may be comprised in the optical sheet **155**.

[0046] In order to support the optical film layer **150**, the guide **140** may be mounted separately from the light emitting element **130** in a surface of the PCB **120**.

[0047] Light is generally emitted from the light emitting element **130** through the optical film layer **150**, and in order to improve an optical effect, an optical gap requires between the light emitting element **130** and the optical film layer **150**. When an optical gap between the light emitting element **130** and the optical film layer **150** is sustained, the guide **140** performs a function of preventing the optical film layer **150** formed in a plurality of layers from being drooped or

deformed. The guide **140** together with the light emitting element **130** is formed in a surface mount device in order to mount in the surface of the PCB **120** by a surface mount technology.

[0048] When the light emitting element **130** and the guide **140** are formed on a surface mount device on the surface of the PCB **120**, the light emitting element **130** and the guide **140** are automatically inserted and soldered in the surface of the PCB **120** by a surface mount technology, and thus a process time period can be shortened and a production yield of the LCD can be improved.

[0049] Referring to FIGS. **2** to **5**, the guide **140** may be formed in various structures.

[0050] Therefore, as shown in FIG. **2**, the guide **140** that is mounted on the surface of the PCB **120** comprises a base **141** that is made of a metal material and a body **143** that is protruded from the base **141**. As described above, when the light emitting element **130** and the guide **140** are formed in a surface mount device in the surface of the PCB **120**, a first pad (not shown) patterned to mount the light emitting element **130** and a second pad **122** patterned to mount the guide **140** are formed in the surface of the PCB **120**.

[0051] When the light emitting element **130** and the guide **140** are formed on a surface mount device, the light emitting element **130** and the guide **140** are automatically inserted and soldered in the surface of the PCB **120** by a surface mount technology, and thus a process time period can be shortened and a production yield of the backlight can be improved. FIG. **2** illustrates the guide **140** soldered by a lead **125**.

[0052] Further, as shown in FIGS. **3** to **5**, the guide **140** may be formed in various structures.

[0053] First, referring to FIG. **3**, the guide **140** may comprise the body **143** protruded to be attached to a groove that is formed in the base **141**. The body **143** that is comprised in the guide **140** may have an upper part of a round conical shape.

[0054] The base **141** that is comprised in the guide **140** shown in FIG. **3** may be made of a metal material, and the body **143** may be made of an organic material or an inorganic material.

[0055] Next, as shown in FIG. **4**, the guide **140** comprises a first body **143** that is protruded to be attached to a groove formed in the base **141** and a second body **145** that covers the first body **143**. The first body **143** and the second body **145** that are comprised in the guide **140** may have an upper part of a round conical shape.

[0056] The base **141** that is comprised in the guide **140** shown in FIG. **4** may be made of a metal material, and the first body **143** and the second body **145** may be made of an organic material or an inorganic material.

[0057] Next, as shown in FIG. **5**, the guide **140** comprises a first body **143** that is protruded to be attached to a hole formed in the base **141** and a second body **145** that covers the first body **143**. The first body **143** and the second body **145** that are comprised in the guide **140** may have an upper part of a round conical shape.

[0058] The base **141** that is comprised in the guide **140** shown in FIG. **5** may be made of a metal material, and the first body **143** and the second body **145** may be made of an organic material or an inorganic material. For example, the first body **143** may be made of an organic material such as PPA, and the second body **145** may be made of an inorganic material such as silicon, however the first body **143** and the second body **145** are not limited thereto.

[0059] The guide **140** of FIG. **5** is not limited to the above form and may be formed in a form in which the first body **143** is inserted into a lower part of the base **141** and the second body **145** is coupled to the first body **143**.

[0060] Referring to FIG. **6**, the guide **140** is not limited to have an upper part of a round conical shape and may be formed in various shapes.

[0061] Therefore, as shown in FIG. **6**(*a*), the guide **140** may be formed in a conical shape having a wide lower part, a narrow upper part, and a flat upper end.

[0062] Further, as shown in FIG. **6**(*b*), the guide **140** may be formed in a conical shape having a wide lower part, a narrow upper part, and a polygonal upper end.

[0063] Further, as shown in FIG. **6**(*c*), the guide **140** may be formed in a conical shape having a wide lower part, a narrow upper part, and a relatively pointed upper end.

[0064] However, a shape of the guide **140** is not limited thereto and may be formed in various forms such as a round cylindrical shape, a quadrangular pillar shape, and a polygonal pillar shape other than a conical shape.

[0065] According to the embodiment, the guide **140** may be formed in a structure that can prevent a scratch problem of a surface of a layer directly contacting with the guide **140** as well as a strong resisting force on an external impact.

[0066] As shown in FIG. **8**, the liquid crystal panel comprises a gate electrode **101** that is positioned on a first substrate **161**. Further, the liquid crystal panel may comprise a first insulating film **103** that is positioned on the gate electrode **101**. Further, the liquid crystal panel may comprise an active layer **104** that is positioned on the first insulating film **103**. Further, the liquid crystal panel may comprise an ohmic contact layer **105** that is positioned on the active layer **104**. Further, the liquid crystal panel may comprise a source electrode **106***a* and a drain electrode **106***b* that are positioned on the ohmic contact layer **105**. Further, the liquid crystal panel may comprise a second insulating film **107** that is positioned on the source electrode **106***a* and the drain electrode **106***b*. Further, the liquid crystal panel may comprise a pixel electrode **109** that is positioned on the second insulating film **107** and that is connected to the source electrode **106***a* or the drain electrode **106***b*. As a material of the pixel electrode **109**, indium tin oxide (ITO) or indium zinc oxide (IZO) may be used, but the material of the pixel electrode **109** is not limited thereto.

[0067] A black matrix **111** may be positioned on a second substrate **162** opposite to the first substrate **161**. The black matrix **111** may comprise a photosensitive organic material to which a black pigment is added, and as the black pigment, carbon black or titanium oxide, etc. may be used, but the black pigment is not limited thereto. Further, a color filter **112** comprising a red color, a green color, and a blue color may be positioned between the black matrixes **111**. The color filter **112** may have other colors as well as a red color, a green color, and a blue color. Further, an overcoating layer **113** may be formed to cover the black matrix **111** and the color filter **112**, and in some cases, the overcoating layer **113** may be omitted. Further, in order to connect to a common voltage wiring, a common electrode **114** may be positioned on the overcoating layer **113**.

[0068] The first substrate **161** and the second substrate **162** may be bonded by a sealant **116**, and the liquid crystal layer **115** may be positioned between the first substrate **161** and the second substrate **162**.

[0069] In the foregoing description, an example in which the common electrode **114** is positioned on the overcoating layer **113** that is positioned on the second substrate **162** is illustrated, but the common electrode **114** may be positioned in at least one of the first substrate **161**, the second insulating film **107**, and the second substrate **162**.

[0070] Although not shown in FIG. **8**, a spacer for sustaining a cell gap may be positioned between the first substrate **161** and the second substrate **162**. The spacer may be positioned at an upper part of a transistor that is positioned on the first substrate **161**, but a position of the spacer is not limited thereto.

[0071] Although not shown in FIG. **8**, a scan wiring, a data wiring, and a common voltage wiring may be positioned on the first substrate **161**. One transistor and capacitor may be positioned at an intersecting region of the scan wiring and the data wiring, and this is defined as one subpixel.

[0072] In the liquid crystal panel **160** formed in this way, when a transistor is driven by a scan signal and a data signal that are supplied to a scan driver and a data driver, light emitted from the backlight unit **170** is controlled by the liquid crystal layer **115** and an image is expressed using light emitted through the color filter **112**.

[0073] As described above, in an embodiment of this document, by effectively supporting and supporting the optical film layer, a problem that lattice mura occurs can be prevented and a guide that can shorten a process time period can be provided. Further, a guide that can solve a problem that a scratch occurs in a diffusion plate that is comprised in the optical film layer can be provided. Further, because the guide can be automatically inserted and mounted, when the guide is installed, a problem that the guide is damaged can be prevented. Further, by improving a structure of the guide, a quality and reliability of a backlight unit and a LCD can be improved.

[0074] It will be apparent to those skilled in the art that various modifications and variation can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A backlight unit comprising:
- a cover bottom:
- a printed circuit board (PCB) that is supported by the cover bottom;
- a light emitting element positioned on the PCB;
- an optical film layer that is supported by the cover bottom and that is positioned on the PCB; and
- a guide mounted separately from the light emitting element on a surface of the PCB to support the optical film layer.

2. The backlight unit of claim **1**, wherein the guide is formed on a surface mount device.

3. The backlight unit of claim **1**, wherein the guide comprises a base that is made of a metal material and a body that is protruded from the base.

4. The backlight unit of claim **1**, wherein the guide comprises a base that is made of a metal material, a first body that is protruded from the base, and a second body that covers the first body.

5. The backlight unit of claim **1**, wherein the guide comprises a base that is made of a metal material, a first body that is protruded from the base and that is made of an organic material, and a second body that is made of an inorganic material to cover the first body.

6. The backlight unit of claim **1**, wherein the PCB comprises a first pad that is patterned in a surface of the PCB to mount the light emitting element and a second pad that is patterned in a surface of the PCB to mount the guide.

7. The backlight unit of claim **1**, wherein the guide has an upper end of a round conical shape.

8. The backlight unit of claim **1**, wherein the guide has an upper end of a flat conical shape.

9. The backlight unit of claim **1**, wherein the guide has an upper end of a polygonal conical shape.

10. The backlight unit of claim **1**, wherein the guide has an upper end of a pointed conical shape.

11. A liquid crystal display (LCD) comprising:
- a backlight unit that comprises a PCB that is supported by a cover bottom, a light emitting element that is positioned on the PCB, an optical film layer that is supported by the cover bottom and that is positioned on the PCB, and a guide that is mounted separately from the light emitting element in a surface of the PCB in order to support the optical film layer; and
- a liquid crystal panel that displays an image using light emitted from the backlight unit.

12. The LCD of claim **11**, wherein the guide is formed in a surface mount device.

13. The LCD of claim **11**, wherein the guide comprises a base that is made of a metal material and a body that is protruded from the base.

14. The LCD of claim **11**, wherein the guide comprises a base that is made of a metal material, a first body that is protruded from the base, and a second body that covers the first body.

15. The LCD of claim **11**, wherein the guide comprises a base that is made of a metal material, a first body that is protruded from the base and that is made of an organic material, and a second body that is made of an inorganic material to cover the first body.

16. The LCD of claim **11**, wherein the guide has an upper end of a round conical shape.

17. The LCD of claim **11**, wherein the guide has an upper end of a flat conical shape.

18. The LCD of claim **11**, wherein the guide has an upper end of a polygonal conical shape.

19. The LCD of claim **11**, wherein the guide has an upper end of a pointed conical shape.

* * * * *

专利名称(译)	背光单元和使用它的液晶显示器		
公开(公告)号	US20100061084A1	公开(公告)日	2010-03-11
申请号	US12/318278	申请日	2008-12-23
[标]申请(专利权)人(译)	LEE YONGKON KIM KISEONG		
申请(专利权)人(译)	LEE YONGKON KIM KISEONG		
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摘要(译)

提供一种背光单元。背光单元包括：盖底：由盖底支撑的印刷电路板（PCB）;发光元件，位于PCB上;光学薄膜层，由底盖支撑并位于PCB上;以及在PCB的表面中与发光元件分开安装的引导件，以支撑光学膜层。