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(54) **BACKLIGHT UNIT WITH COUPLING HOLE AND LIQUID CRYSTAL DISPLAY HAVING THE SAME**

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(75) Inventor: **Sung Soo Jung**, Suwon-si (KR)

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(73) Assignee: **Samsung Electronics Co., Ltd.**,
Suwon-si (KR)

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Primary Examiner — Huyen Ngo

(74) *Attorney, Agent, or Firm* — Stanzione & Kim, LLP

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(57) **ABSTRACT**

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A backlight unit and a liquid crystal display having the same. The backlight unit includes a lower cover, an interconnection coupling hole, an inverter board, and an interconnection. The lower cover accommodates a printed circuit board, which mounts at least one light emitting diode thereon and is provided at one side thereof with a first connector. The interconnection coupling hole is formed in a bottom surface of the lower cover at a position corresponding to the first connector. The inverter board is disposed on a rear surface of the lower cover to apply a driving voltage to the at least one light emitting diode. The interconnection is provided at one end thereof with a second connector to electrically connect the printed circuit board to the inverter board. A coupling part of the first connector coupled to the second connector is directed to the interconnection coupling hole, so the assembling time of the backlight unit and the liquid crystal display is reduced, thereby improving the productivity of the backlight unit and the liquid crystal display.

(52) **U.S. Cl.**
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USPC **349/65**; 349/58; 349/62; 349/64; 349/68; 445/29; 362/231; 362/249

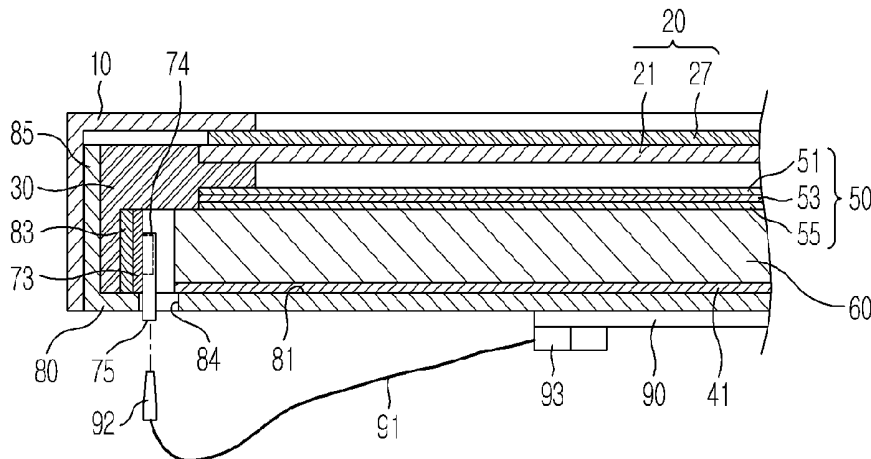
(58) **Field of Classification Search**
CPC G02F 1/133608; G02F 2001/133612
USPC 349/58, 68; 362/231, 249; 445/29
See application file for complete search history.

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37 Claims, 5 Drawing Sheets



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FIG. 1

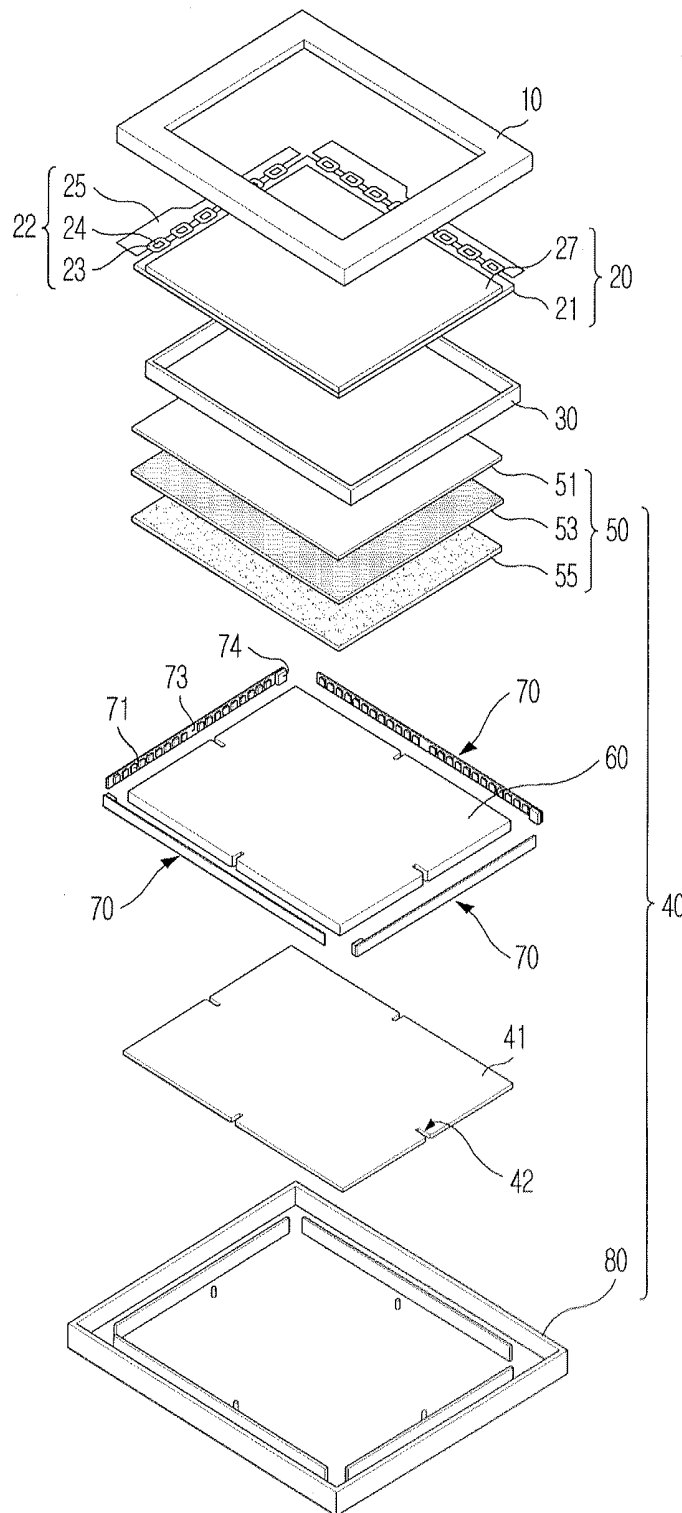


FIG. 2

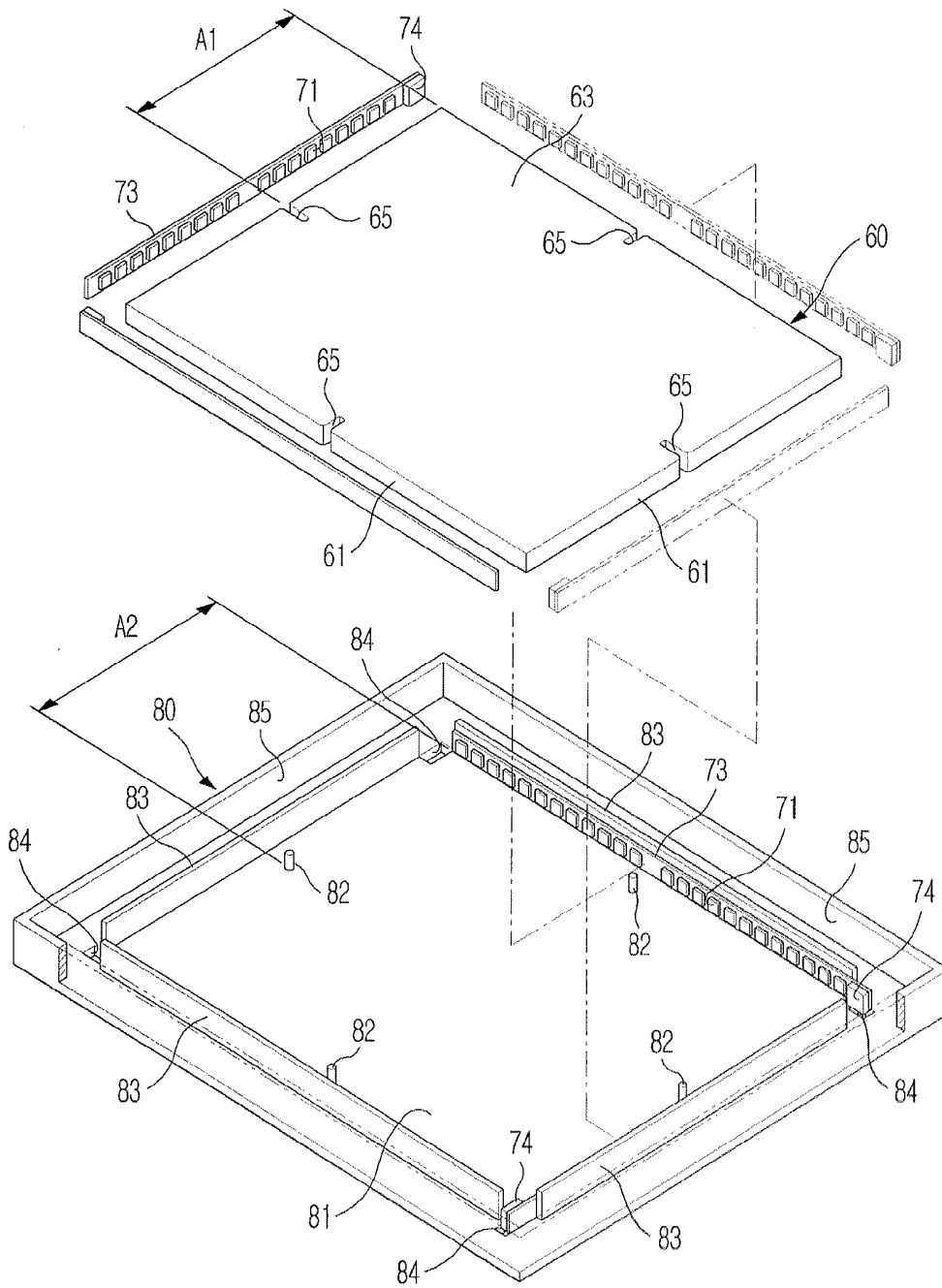


FIG. 3

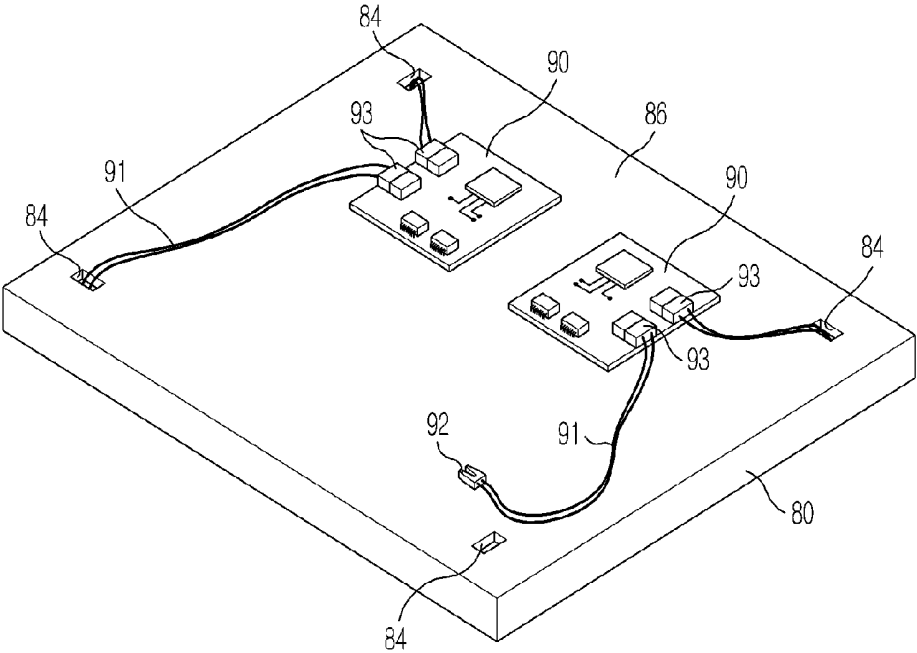


FIG. 4

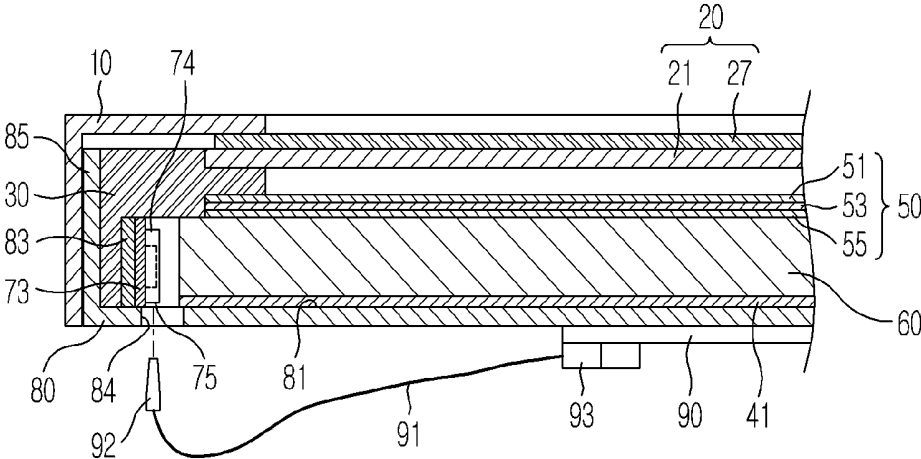
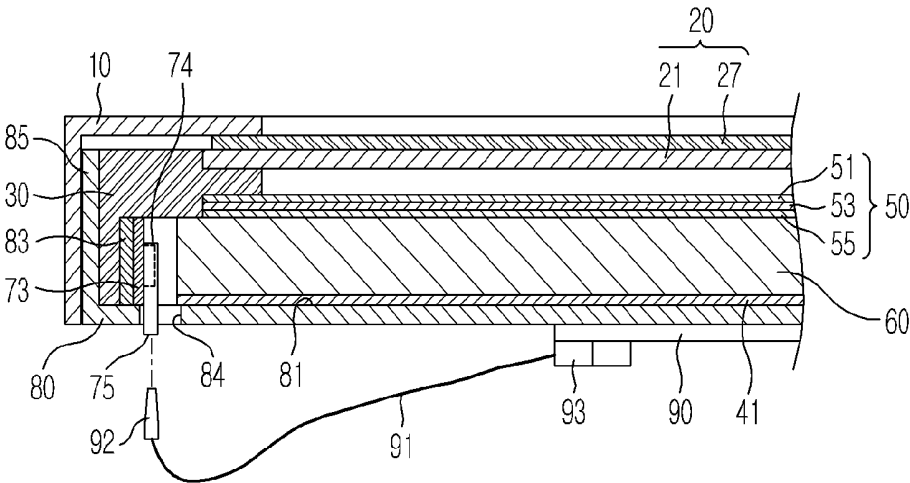


FIG. 5



BACKLIGHT UNIT WITH COUPLING HOLE AND LIQUID CRYSTAL DISPLAY HAVING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority under 35 U.S.C. §119 of Korean Patent Application No. 10-2008-0136259, filed on Dec. 30, 2008, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND

1. Field of the Invention

The present general inventive concept relates to a backlight unit and a liquid crystal display having the same. More particularly, the present general inventive concept relates to a backlight unit to improve efficiency and reliability through an interconnection structure, which applies power to a printed circuit board on which a light emitting diode is mounted, and a liquid crystal display having the same.

2. Description of the Related Art

A liquid crystal display (LCD) displays images using electrical and optical properties of liquid crystal. Since the LCD has advantages of slimness, lightweight, low power consumption, and low driving voltage as compared with other display apparatuses, the LCD has been extensively employed in various industrial fields.

The LCD includes a liquid crystal display panel, in which liquid crystal is interposed between two transparent substrates and voltage is usable with the liquid crystal to change a direction of liquid crystal molecules to optically display images, and a backlight assembly for providing light to the liquid crystal display panel.

A CCFL (Cold Cathode Fluorescent Lamp), an EEFL (External Electrode Fluorescent Lamp), and an FFL (Flat Fluorescent Lamp) are used as light sources of the backlight assembly. However, the CCFL represents limitations in terms of high definition, light weight, slim structure and compact size, so an LED (Light Emitting Diode) has been recently used as the light source of the backlight assembly because the LED represents improved performance such as high brightness, long life span, and high color purity. In addition, as restriction on dumping of dangerous substances, such as mercury, have become widely enforced, the CCFL is less used, and the LED, which is an environmentally friendly device, is widely used instead of the CCFL.

The backlight assembly having such an LED as the light source is classified into a direct-type backlight assembly and an edge-type backlight assembly according to the arrangement of the LED and the type of the light guide plate. The direct-type backlight assembly having the LED has a structure in which the LED is disposed in front of the backlight assembly, so the direct-type backlight assembly has a difficulty in achieving slimness and requires a large number of LEDs, increasing the manufacturing cost.

In contrast, the edge-type backlight assembly has a structure in which the LED is mounted at both sides of the backlight assembly and light is introduced into the front surface of the backlight assembly through a light guide plate, so the edge-type backlight assembly may have a thickness smaller than that of the direct-type backlight assembly, thereby realizing the slimness structure.

A backlight unit provided with the LED includes a box-shape bottom chassis having an open upper surface to sequentially receive a reflection plate, the light guide plate, and

optical sheets therein. In addition, a plurality of LEDs mounted on the printed circuit board are provided adjacent to a side of the light guide plate in the backlight unit.

The LEDs are connected to an inverter board, which is mounted on a rear surface of the bottom chassis, through a wire or an interconnection to receive drive voltage, so the LEDs emit light.

In general, the printed circuit board, on which the LEDs are mounted, is connected to the interconnection inside the bottom chassis, so extra space for such a connection is required. In addition, when the backlight assembly is coupled to the bottom chassis, short circuit or ground failure of the interconnection connected to the printed circuit board may occur. In this case, the backlight assembly needs to be separated from the bottom chassis and then connected to the bottom chassis again. Accordingly, the assembling work is complicated and the working time is increased.

SUMMARY

Accordingly, it is a feature of the present general inventive concept to provide a backlight unit, capable of improving assembling efficiency and reliability of the liquid crystal display, and a liquid crystal display having the same.

Additional features and/or advantages of the present general inventive concept will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the general inventive concept.

Embodiments of an exemplary embodiment of the present general inventive concept are achieved by providing a backlight unit. The backlight unit may include a lower cover, an interconnection hole, an inverter board, and an interconnection. The lower cover may accommodate a printed circuit board, which mounts at least one light emitting diode thereon and is provided at one side thereof with a first connector. The interconnection coupling hole is formed in a bottom surface of the lower cover at a position corresponding to the first connector. The inverter board is disposed on a rear surface of the lower cover to apply a driving voltage to the at least one light emitting diode. The interconnection may be provided at one end thereof with a second connector to electrically connect the printed circuit board to the inverter board. A coupling part of the first connector coupled to the second connector may be directed to the interconnection coupling hole.

The second connector is coupled to the first connector through the interconnection coupling hole.

The first connector may be provided in a socket type and the second connector may be provided in a plug type.

The printed circuit board is fixed to a fixing member, which is provided on the lower cover and may include thermal conductive metal.

The coupling part of the first connector protrudes through the interconnection coupling hole.

Embodiments of another exemplary embodiment of the present general inventive concept provide a backlight unit. The backlight unit may include a light guide plate, a printed circuit board, a lower cover, and an inverter board. At least one light emitting diode radiating light to one side surface of the light guide plate is mounted on the printed circuit board. The lower cover accommodates the light guide plate and the printed circuit board therein. The inverter board is disposed at a rear surface of the lower cover to apply a driving voltage to the light emitting diode. An interconnection coupling hole may be formed at one side of a bottom surface of the lower cover, and an interconnection for electrical connection between the printed circuit board and the inverter board

passes through the interconnection coupling hole to connect the printed circuit board to the inverter board.

A plug-type connector may be provided at one end of the interconnection connected to the printed circuit board, and a socket-type connector having a coupling part, into which the plug type connector is inserted, may be provided on the printed circuit board.

The interconnection coupling hole is formed at a position corresponding to the plug type connector, and the coupling part is directed to the interconnection coupling hole.

Embodiments of another exemplary embodiment of the present general inventive concept provides a liquid crystal display. The liquid crystal display includes a liquid crystal display panel, a backlight unit, a lower cover, an inverter board and an interconnection. The backlight unit includes a light guide plate to provide light to the liquid crystal display panel and a printed circuit board, on which a plurality of light emitting diodes are mounted to radiate light toward the light guide plate and a first connector is provided at one side of the printed circuit board. The lower cover may accommodate the liquid crystal display panel and the backlight unit, and has an interconnection installation hole formed at a position corresponding to the first connector.

The inverter board may be installed on a rear surface of the lower cover to apply a driving voltage to the light emitting diodes. The interconnection has one end, which may be connected to the inverter board, and an opposite end, which may be connected to the first connector through the interconnection installation hole.

A coupling part of the first connector coupled to the second connector is directed to the interconnection installation hole.

The first connector may be provided in a socket type and the second connector may be provided in a plug type.

The coupling part of the first connector may protrude from the rear surface of the lower cover through the interconnection installation hole.

A fixing member including thermal conductive metal may be provided on the lower cover to fix the printed circuit board.

As described above, according to the backlight unit and the liquid crystal display having the same of the disclosure, the printed circuit board may be easily connected to the inverter board, and the interconnection may be prevented from being broken during assembling work, thereby reducing the assembling time. Accordingly, the productivity and reliability of the liquid crystal display can be improved.

Embodiments of the present general inventive concept also provide for an image display apparatus, comprising a panel disposed in a direction to display an image, a light guide plate disposed in a direction to guide light in a second direction towards the panel, a printed circuit board having one or more light emitting diodes disposed to emit light in the direction, a lower cover mounted with a power unit disposed opposite to the light guide plate with respect to the lower cover, and a hole formed on the lower cover to connect the printed circuit board and the power unit.

Embodiments of the present general inventive concept also provide for an image display apparatus, comprising an upper cover and lower cover, a panel disposed between the upper cover and the lower cover, an optical film disposed between the panel and the lower cover, a light guide plate disposed between the optical film and the lower cover, a power unit disposed on the lower cover opposite to the guide plate, a printed circuit board having one or more light emitting diodes, and disposed to face a side of the light guide plate, a connector mounted on the printed circuit board and connected to the one or more light emitting diodes, a hole formed

on the lower cover to correspond to the connector, and an interconnection disposed in the hole to connect the power unit to the connector.

BRIEF DESCRIPTION OF THE DRAWINGS

These and/or other features and utilities of the present general inventive concept will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is an exploded perspective view showing a liquid crystal display according to an exemplary embodiment of the present general inventive concept;

FIG. 2 is a perspective view showing a part of the liquid crystal display of FIG. 1;

FIG. 3 is a perspective view showing a rear surface of a lower cover of the liquid crystal display according to the exemplary embodiment of the present general inventive concept;

FIG. 4 is a sectional view showing the liquid crystal display according to the exemplary embodiment of the present general inventive concept; and

FIG. 5 is a sectional view showing a liquid crystal display according to another exemplary embodiment of the present general inventive concept.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Reference will now be made in detail to the embodiments of the present general inventive concept, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below to explain the present general inventive concept by referring to the figures

As illustrated in FIG. 1, a liquid crystal display according to an exemplary embodiment of the present general inventive concept includes a liquid crystal display panel 20 and a backlight unit 40 disposed at a rear surface of the liquid crystal display panel 20.

The liquid crystal display panel 20 and the backlight unit 40 are accommodated between an upper cover 10 and a lower cover 80.

That is, the liquid crystal display panel 20 is mounted on a mold frame 30, and may be fixed on the backlight unit 40 by the upper cover 10, which is coupled to the backlight unit 40.

The upper cover 10 may be coupled to the lower cover 80 through a hook structure or a fastening member such as a screw.

The liquid crystal display panel 20 includes a thin film transistor substrate 21, on which a thin film transistor may be formed, a color filter substrate 27 facing the thin film transistor substrate 21 and a liquid crystal layer (not illustrated) provided between the thin film transistor 21 and the color filter substrate 27.

A driver 22 is provided at a side of the thin film transistor substrate 21 to apply a driving signal.

The driver 22 may include an FPC (Flexible Printed Circuit) 23, a driving chip 24 mounted on the FPC 23, and a PCB (Printed Circuit Board) 25 connected to one side of the FPC.

Although the driver 22 according to the exemplary embodiment is provided through a COF (Chip On Film) scheme, the disclosure is not limited thereto. According to another exemplary embodiment, the driver can be provided through a TCP (Tape Carrier Package) scheme or a COG (Chip On Glass) scheme, which are generally known in the

art. In addition, according to another exemplary embodiment of the present general inventive concept, the driver 22 may be mounted on the thin film transistor substrate 21.

Such a liquid crystal display panel 20 forms an image by adjusting an alignment of the liquid crystal layer. However, the liquid crystal display panel 20 is a non-emissive device, so the liquid crystal display panel 20 requires light provided from the backlight unit 40 disposed at the rear surface of the liquid crystal display panel 20.

The backlight unit 40 may include a plurality of optical films 50 disposed at the rear surface of the liquid crystal display panel 20, a light guide plate 60 disposed at a rear surface of the optical films 50, a light source unit 70 disposed along both opposite sides of the light guide plate 60, and a reflection plate 41 disposed below the light guide plate 60.

The optical films 50 disposed at the rear surface of the liquid crystal display panel 20 may include a protection film 51, a prism film 53, and a diffusion film 55.

The diffusion film 55 may be provided with a base plate and a coating layer, which is formed on the base plate in a bead pattern such that light from the light source unit 70 can be diffused and then provided to the liquid crystal display panel 20.

The prism film 53 is provided at an upper surface thereof with triangular prisms regularly arranged such that light diffused by the diffusion film 55 is collected vertically to a plane of the liquid crystal display panel 20 disposed above the prism film 53. In general, two prism films 53 may be used, and micro prisms of each prism film 53 form a predetermined angle with each other. Most light passing through the prism film 53 travel vertically, thereby providing uniform light brightness.

The protection film 51 may be disposed on the prism film 53 to protect the prism film 53, which is sensitive to scratch or dust.

The light guide plate 60 includes acryl based resin, such as polymethylmethacrylate, or polymethylstyrene (copolymer of methylmethacrylate and styrene). The light guide plate 60 uniformly guides light from the light source unit 70 to the diffusion film 55.

The light source unit 70 may include a plurality of light emitting diodes 71 to generate light, a printed circuit board 73 on which the light emitting diodes 71 are mounted, and a first connector 74, which is formed at one side of the printed circuit board 73 and is connected to the light emitting diodes 71 to provide power to the light emitting diodes 71.

The light emitting diodes 71 may include a plurality of white light emitting diodes to emit white light, or may be provided in a combination of light emitting diodes to emit red light, green light, and blue light, respectively.

The printed circuit board 73 may be provided in the form of a metal PCB (Printed Circuit Board) including a silicon steel plate, a galvanized steel plate, or an aluminum disk which has superior thermal conductivity.

The printed circuit board 73 provides the driving signal to the light emitting diode 71 and emits heat generated from the light emitting diodes 71 to the outside.

Such a light source unit 70 may be installed at a position adjacent to the side of the light guide plate 60 to radiate light to the side of the light emitting plate 60. The light introduced to the side of the light guide plate 60 is transferred to the optical films 50 mounted on the light guide plate 60.

Although the light source unit 70 according to the exemplary embodiment of the present general inventive concept may be disposed around the light guide plate 60 adjacent to sides of the light guide plate 60, the disclosure is not limited thereto. According to another exemplary embodiment of the present general inventive concept, the light source unit 70

may be disposed at one side of the light guide plate 60 or may be disposed at two opposite sides of the light guide plate 60.

The reflection plate 41 is disposed below the light guide plate 60 such that light directed downward through the light guide plate 60 is reflected to the light guide plate 60. A reflection plate slit 42 is formed in the reflection plate 41 at a position corresponding to a fixing protrusion 82 such that the fixing protrusion 82 is inserted into the slit 65, wherein the fixing protrusion 82 formed on the bottom surface 81 of the lower cover 80 to fix the reflection plate 41 to the lower cover 80.

The reflection plate 41 may include plastic such as PET (polyethyleneterephthalate) or PC (polycarbonate).

The light guide plate 60, light source unit 70, and reflection plate 41 are accommodated in the lower cover 80, which accommodates the mold frame 30 and is coupled to the upper cover 10.

Hereinafter, the light guide plate and the light source unit accommodated in the lower cover will be described with reference to FIGS. 2 and 3.

FIG. 2 is a perspective view showing a part of the liquid crystal display of FIG. 1, and FIG. 3 is a perspective view schematically showing a rear surface of the lower cover of the liquid crystal display according to the exemplary embodiment of the present general inventive concept.

Referring to FIG. 2, the light guide plate 60 accommodated in the lower cover 80 may be provided in a rectangular shape having a predetermined thickness and faces the light source unit 70. The light guide plate 60 includes an incident surface 61 to receive light emitted from the light source unit 70, an exit surface 63 to discharge light introduced through the incident surface 61, and a reflection surface (not illustrated) facing the exit surface 63.

The lower cover 80 may be provided in a box shape having an open upper part. Such a lower cover 80 includes a bottom surface 81, on which the light guide plate 60 is mounted, and a sidewall 85 extending upward from the edge of the bottom surface 81 such that the light guide plate 60 and the light source unit 70 are fixedly accommodated within the sidewall 85.

A fixing protrusion 82 is formed on the bottom surface 81 of the lower cover 80 to fix the light guide plate 60 to the lower cover 80. A slit 65 is formed in the light guide plate 60 at a position corresponding to the fixing protrusion 82 such that the fixing protrusion 82 is inserted into the slit 65. A1 illustrates the distance between slit 65 and the end of the side edge of the light guide plate 60 which slit 65 opens up thereto. A2 illustrates the distance between fixing protrusion 82 and an end of a side edge of the bottom surface of the lower cover 80.

Therefore, when the light guide plate 60 is accommodated in the lower cover 80, the fixing protrusion 82 is inserted into the slit 65, so the movement of the light guide plate 60 is restricted.

Meanwhile, a fixing member 83 to install the light source unit 70 is provided at a position spaced apart from the sidewall 85 of the lower cover 80 to fix the light source unit 70 provided at a position adjacent to the incident surface 61.

The fixing member 83 faces the incident surface 61 of the light guide plate 60, and may include metal having superior thermal conductivity. Thus, heat generated from the light emitting diode 71 is transferred to the lower cover 80 through the fixing member 83 and then is discharged to the outside.

In addition, the fixing member 83 may be formed by fixing an extrusion member including aluminum to the lower cover 80. Otherwise, the fixing member 83 may be integrally formed with the lower cover 80.

The printed circuit board **73** of the light source unit **70** may be fixed to the fixing member **83** through a fastening member such as a screw or an adhesion member. Therefore, the light emitting diode **71** mounted on the printed circuit board **73** emits light toward the incident surface **61** of the light guide plate **60**.

Although the light source unit **70** according to the exemplary embodiment of the present general inventive concept is installed on the fixing member **83**, the disclosure is not limited thereto. According to another exemplary embodiment of the present general inventive concept, the light source unit **70** may be installed on the sidewall **85** of the lower cover **80**.

The first connector **74** provided in a socket type may be installed at one end of the printed circuit board **73** to provide power to the light emitting diode **71**.

A coupling part **75** (see FIG. 4) of the first connector **74** is directed to the bottom surface **81** of the lower cover **80**. An interconnection coupling hole **84** is formed in the bottom surface **81** of the lower cover **80** at a position corresponding to the coupling part **75** of the first connector **74**. The coupling part **75** refers to a part at which the first connector **74** is coupled to a second connector **92**, which will be described later. That is, the coupling part **75** may be directed in a second direction crossing a first direction parallel with the bottom surface **81** of the lower cover **80**. The second direction crossing the first direction may be perpendicular to the bottom surface **81** of the lower cover **80**, but is not limited thereto.

Referring to FIG. 3, a power unit **300** is mounted on to the lower cover **80**. The power unit **300** includes an inverter board **90**, a second connector **92**, an interconnection **91**, and a third connector **93**. The inverter board **90** and a PCB may be installed on the rear surface **86** of the lower cover **80**. The inverter board **90** transforms external power such that the external power has a predetermined voltage level and then provides the transformed power to the light emitting diode **71**. The PCB may convert an analog data signal into a digital data signal and provides the digital data signal to the liquid crystal display panel **20**.

The inverter board **90** is connected to the light source unit **70** through the third connector **93**, connecting the inverter board **90** to the interconnection **91**. The second connector **92** and the third connector **93** provided at either end of the interconnection **91** may be provided in a plug type and may be identical to each other in construction.

Thus, one end of the interconnection **91** is connected to a connector mounted on the inverter board **90** and the remaining end of the interconnection **91** is connected to the socket type first connector **74** provided on the printed circuit board **73** through the interconnection coupling hole **84**.

In general, the connectors **74** and **92** are connected to each other to provide electric connection. The plug type second connector **92** has a coupling protrusion, and the socket type first connector **74** has a coupling groove into which the coupling protrusion is inserted. Accordingly, if the coupling protrusion of the second connector **92** is inserted into the coupling groove of the first connector **74**, the interconnection is electrically connected.

Although the exemplary embodiment of the present general inventive concept has been described wherein the socket type first connector **74** is installed on the printed circuit board **73** and the plug type second connector **73** is installed at the end of the interconnection **91**, this description is for illustrative purposes only. According to another exemplary embodiment of the present general inventive concept, a plug type first connector may be installed on the printed circuit board **73** and a socket type second connector may be installed at the end of the interconnection **91**.

In addition, the coupling part **75** of the first connector **74** installed on the printed circuit board **73** may be provided inside the lower cover **80**. Otherwise, as illustrated in FIG. 5, the coupling part **75** of the first connector **74** may protrude out of the rear surface **86** of the lower cover **80**.

Hereinafter, the assembling structure and operation of the liquid crystal display according to the exemplary embodiment of the present general inventive concept will be described with reference to FIG. 4. FIG. 4 is a sectional view showing the liquid crystal display according to the exemplary embodiment of the present general inventive concept.

First, the light source unit **70** is fixed to the fixing member **83** provided in the lower cover **80**. In a state that the light source unit **70** is fixed to the fixing member **83**, the coupling part **75** of the first connector **74** installed at the end of the printed circuit board **73** faces the bottom surface **81** of the lower cover **80**, and the interconnection coupling hole **84** of the lower cover **80** is provided at a position corresponding to the coupling part **75** of the first connector **74**.

After that, the backlight unit **40** is accommodated in a space formed in the sidewall **85** of the lower cover **80**. In detail, the reflection plate **41** is mounted on the bottom surface **81** of the lower cover **80**, the light guide plate **60** is mounted on an upper surface of the reflection plate **41**, and the optical films **50** are mounted on the upper surface of the light guide plate **60**.

The mold frame **30** is mounted on the backlight unit **40**. The mold frame **30** is coupled to the lower cover **80** while supporting the edge of the light source unit **70**, the light guide plate **60** and the optical films **50**. Accordingly, the movement of the backlight unit **40** is restricted.

The liquid crystal display panel **20** is mounted on the mold frame **30**. As the upper cover **10**, which surrounds the edge of the upper surface of the liquid crystal display panel **20**, is coupled to the sidewall **85** of the lower cover **80**, the liquid crystal display panel **20** is fixed above the backlight unit **40**.

After the liquid crystal display has been assembled, the plug type second connector **92**, which may be formed at the end of the interconnection **91** connected to the inverter board **90**, passes through the interconnection coupling hole **84** and then is coupled to the socket type first connector **74** installed on the printed circuit board **73**.

Accordingly, the light source unit **70** is electrically connected to the inverter board **90** through the interconnection **91**, so driving voltage may be transferred from the inverter board **90** to the light emitting diode **71**.

Therefore, the interconnection **91**, which is provided to connect the printed circuit board **73** having the light emitting diode **73** to the inverter board **90**, passes through the interconnection coupling hole **84** and then is coupled to the inverter board **90** along the rear surface of the lower cover **80**. As a result, the first and second connectors **74** and **92** may be prevented from being separated from each other when the liquid crystal display is assembled, so reliability of the liquid crystal display can be improved and the assembling process can be effectively performed.

In addition, the first connector **74** provided at one side of the printed circuit board **73** may be connected to the interconnection **91** at the rear surface **86** of the lower cover **80**, so an additional space to connect the interconnection is not required inside the lower cover **80**.

Further, as illustrated in FIG. 5, if the coupling part **75** of the first connector **74** protrudes from the rear surface **86** of the lower cover **80**, the first connector **74** can be more easily connected to the second connector **92**.

Although few embodiments of the present general inventive concept have been illustrated and described, it would be

appreciated by those skilled in the art that changes may be made in these exemplary embodiments without departing from the principles and spirit of the present general inventive concept, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. An edge-type backlight unit, comprising:
a printed circuit board having a plurality of light emitting diodes (LEDs) mounted along a longitudinal direction of the printed circuit board, and a first connector provided on a side of the printed circuit board;
a lower cover provided with an interconnection coupling hole;
a light guide plate, an edge surface of which receives light from the plurality of LEDs;
an inverter board disposed on a rear surface of the lower cover to apply a driving voltage to the plurality of light emitting diodes; and
an interconnection having a second connector provided at an end thereof to electrically connect the printed circuit board to the inverter board,
wherein the first connector is provided with a coupling opening to receive the second connector, the coupling opening extending in a direction different from the longitudinal direction of the printed circuit board.
2. The backlight unit of claim 1, wherein the interconnection coupling hole is formed at a position corresponding to the first connector, and the coupling opening of the first connector is disposed to face the interconnection coupling hole.
3. The backlight unit of claim 1, wherein the first connector is directed in an outward direction of a bottom surface of the lower cover.
4. The backlight unit of claim 1, wherein the printed circuit board is fixed to a fixing member, the fixing member being provided on the lower cover and including thermally conductive metal.
5. The backlight unit of claim 1, wherein the interconnection coupling hole is formed at a position corresponding to the first connector, and the first connector protrudes through the interconnection coupling hole.
6. The backlight unit of claim 1, wherein the interconnection passes through the interconnection coupling hole and is extended toward the first connector, and the second connector is coupled to the first connector in a direction perpendicular to the longitudinal direction of the printed circuit board.
7. The backlight unit of claim 1, wherein the coupling opening extends in a direction perpendicular to the longitudinal direction of the printed circuit board.
8. The backlight unit of claim 1, wherein at least one of the first connector and the second connector is disposed in the interconnection coupling hole.
9. A liquid crystal display, comprising:
an upper cover and a lower cover;
a liquid crystal display panel disposed between the upper cover and the lower cover;
an optical film disposed between the liquid crystal display panel and the lower cover;
a light guide plate disposed between the optical film and the lower cover;
an inverter board installed on a rear surface of the lower cover;
a printed circuit board having a plurality of light emitting diodes mounted along a longitudinal direction of the printed circuit board and disposed to face an edge surface of the light guide plate;
a first connector mounted on the printed circuit board so as to be connected to the plurality of light emitting diodes,

- and provided with a coupling opening extending in a direction different from the longitudinal direction of the printed circuit board so as to be directed in an outward direction of the bottom surface of the lower cover;
- 5 an interconnection having one end which is connected to the inverter board, and an opposite end which is connected to the coupling opening, so as to connect the inverter board and the first connector; and
an interconnection coupling hole formed at one side of a bottom surface of the lower cover to pass the interconnection.
 - 10 10. The backlight unit of claim 1, wherein the interconnection further comprises a third connector provided at an opposite end thereof to connect to the inverter board.
 - 15 11. The backlight unit of claim 1, wherein the coupling opening of the first connector extends in a direction that is substantially orthogonal to the longitudinal direction of the printed circuit board.
 12. The backlight unit of claim 1, wherein the second connector passes at least partially through the interconnection coupling hole and is inserted in the first connector, and the interconnection coupling hole formed in the lower cover faces the coupling opening of the first connector.
 13. The backlight unit of claim 1, wherein the second connector passes completely through the interconnection coupling hole and is inserted in the first connector, and the interconnection coupling hole formed in the lower cover faces the coupling opening of the first connector.
 14. The backlight unit of claim 1, wherein the first connector passes at least partially through the interconnection coupling hole, and the interconnection coupling hole formed in the lower cover faces the coupling opening of the first connector.
 15. The backlight unit of claim 1, wherein the first connector and the plurality of light emitting diodes are disposed on a same surface of the printed circuit board.
 16. A backlight unit, comprising:
a light guide plate;
a printed circuit board including a plurality of light emitting diodes mounted along a longitudinal direction of the printed circuit board to radiate light to an edge surface of the light guide plate;
a lower cover provided with an interconnection coupling hole formed at one side of a bottom surface thereof to accommodate the light guide plate;
an inverter board disposed at a rear surface of the lower cover to apply a driving voltage to the plurality of light emitting diodes; and
a first connector formed on the printed circuit board to connect the inverter board and the plurality of light emitting diodes,
wherein the first connector includes a coupling opening to receive an interconnection which is connected to the inverter board, the coupling opening extending in a direction different from the longitudinal direction of the printed circuit board.
 17. The backlight unit of claim 16, further comprising a second connector provided at one end of the interconnection so as to be coupled to the first connector.
 18. The backlight unit of claim 17, wherein the second connector is coupled to the first connector via the interconnection coupling hole.
 19. The backlight unit of claim 17, wherein the interconnection coupling hole is formed at a position to face the first connector.
 20. The backlight unit of claim 19, wherein the first connector protrudes through the interconnection coupling hole.

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21. The backlight unit of claim 19, wherein the first connector is directed to the interconnection coupling hole.

22. The backlight unit of claim 16, wherein the first connector and the plurality of light emitting diodes are disposed on a same surface of the printed circuit board.

23. A liquid crystal display, comprising:

a liquid crystal display panel;

a backlight unit, comprising:

a light guide plate to provide light to the liquid crystal display panel; and

a printed circuit board comprising:

a plurality of light emitting diodes mounted along a longitudinal direction of the printed circuit board to radiate light toward an edge surface of the light guide plate; and

a first connector provided at one side of the printed circuit board, the first connector including a coupling opening extending in a direction different from the longitudinal direction of the printed circuit board;

a lower cover to accommodate the liquid crystal display panel and the backlight unit and having an interconnection coupling hole formed at a position corresponding to the first connector;

an inverter board installed on a rear surface of the lower cover to apply a driving voltage to the light emitting diodes; and

an interconnection having one end connected to the inverter board, and an opposite end connected to the first connector through the interconnection coupling hole.

24. The liquid crystal display of claim 23, wherein a coupling part of the first connector coupled to the second connector is directed to the interconnection coupling hole.

25. The liquid crystal display of claim 24, wherein the first connector is provided in a socket type and the second connector is provided in a plug type.

26. The liquid crystal display of claim 24, wherein the coupling part of the first connector protrudes from the rear surface of the lower cover through the interconnection coupling hole.

27. The liquid crystal display of claim 24, wherein a fixing member including thermally conductive metal is provided on the lower cover to fix the printed circuit board.

28. The liquid crystal display of claim 23, wherein the first connector and the plurality of light emitting diodes are disposed on a same surface of the printed circuit board.

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29. The backlight unit of claim 1, wherein the first connector is provided on an end portion of the printed circuit board.

30. The liquid crystal display according to claim 9, wherein the interconnection coupling hole is formed at a position corresponding to the first connector.

31. The liquid crystal display according to claim 30, wherein the first connector is disposed at the inside of the lower cover to face the interconnection coupling hole.

32. The liquid crystal display according to claim 30, wherein first connector is disposed at the outside of the lower cover through the interconnection coupling hole.

33. The liquid crystal display according to claim 9, wherein first connector is disposed perpendicular to the plane parallel to the bottom surface of the lower cover.

34. The liquid crystal display of claim 9, wherein the first connector and the plurality of light emitting diodes are disposed on a same surface of the printed circuit board.

35. An edge-type backlight unit comprising:

a lower cover provided with a bottom surface, the bottom surface including an interconnection coupling hole;

a printed circuit board including a plurality of light emitting diodes (LEDs) mounted along a longitudinal direction of the printed circuit board, and a first connector provided on at least one side of the printed circuit board;

a light guide plate, an edge surface of which receives light from plurality of LEDs;

an inverter board which is disposed on a rear surface of the lower cover, and which applies a driving voltage to the plurality of light emitting diodes; and

an interconnection having a second connector provided at an end thereof which electrically connects the printed circuit board to the inverter board,

wherein the first connector is provided with a coupling opening to receive the second connector, the coupling opening extending in a direction different from the longitudinal direction of the printed circuit board.

36. The backlight unit of claim 35, wherein the coupling opening extends in a direction perpendicular to the longitudinal direction of the printed circuit board.

37. The backlight unit of claim 35, wherein the first connector and the plurality of light emitting diodes are disposed on a same surface of the printed circuit board.

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专利名称(译)	具有耦合孔的背光单元和具有该耦合孔的液晶显示器		
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摘要(译)

背光单元和具有该背光单元的液晶显示器。背光单元包括下盖，互连耦合孔，逆变器板和互连。下盖容纳印刷电路板，该印刷电路板在其上安装至少一个发光二极管，并且在其一侧设置有第一连接器。互连接孔形成在下盖的底表面中与第一连接器对应的位置处。逆变器板设置在下盖的后表面上，以将驱动电压施加到至少一个发光二极管。互连在其一端设置有第二连接器，以将印刷电路板电连接到逆变器板。耦合到第二连接器的第一连接器的耦合部分指向互连耦合孔，因此减少了背光单元和液晶显示器的组装时间，从而提高了背光单元和液晶显示器的生产率。

