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Lee

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(54) **LIQUID CRYSTAL DISPLAY MODULE AND ASSEMBLING METHOD THEREOF**

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Nov. 13, 2007 (KR) 2007-115240

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G02F 1/1333 (2006.01)

(52) **U.S. Cl.** 349/58; 362/633

(58) **Field of Classification Search** 349/58
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,460,194 B2	12/2008	Tsakamoto	
7,573,540 B2 *	8/2009	Katsuda et al.	349/58
7,671,936 B2	3/2010	Chang	
7,724,316 B2	5/2010	Maruyama et al.	
7,782,419 B2	8/2010	Hahm et al.	
2003/0234895 A1	12/2003	Sugawara et al.	

* cited by examiner

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(57) **ABSTRACT**

A liquid crystal display module and an assembling method thereof are disclosed. The liquid crystal display module includes a panel guide for supporting a liquid crystal panel, the panel guide including a first fastening portion, support side members for holding opposite sides of a lamp irradiating light to the liquid crystal panel, respectively, each of the support side members including a second fastening portion having a foreign substance shield, and a bottom case including a third fastening portion having a case hole formed through a side surface of the bottom case, to receive the foreign substance shield.

5 Claims, 3 Drawing Sheets

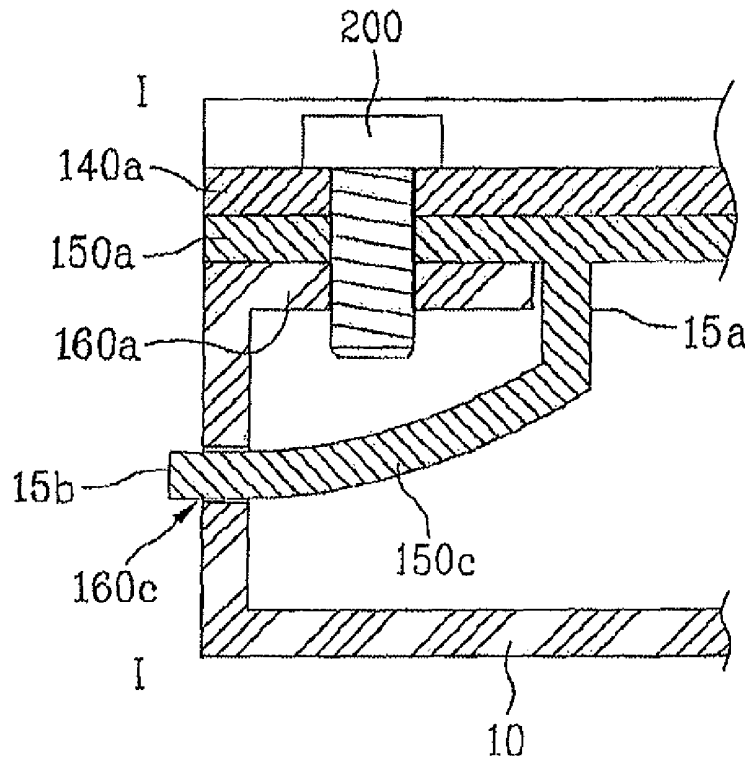


Figure 1

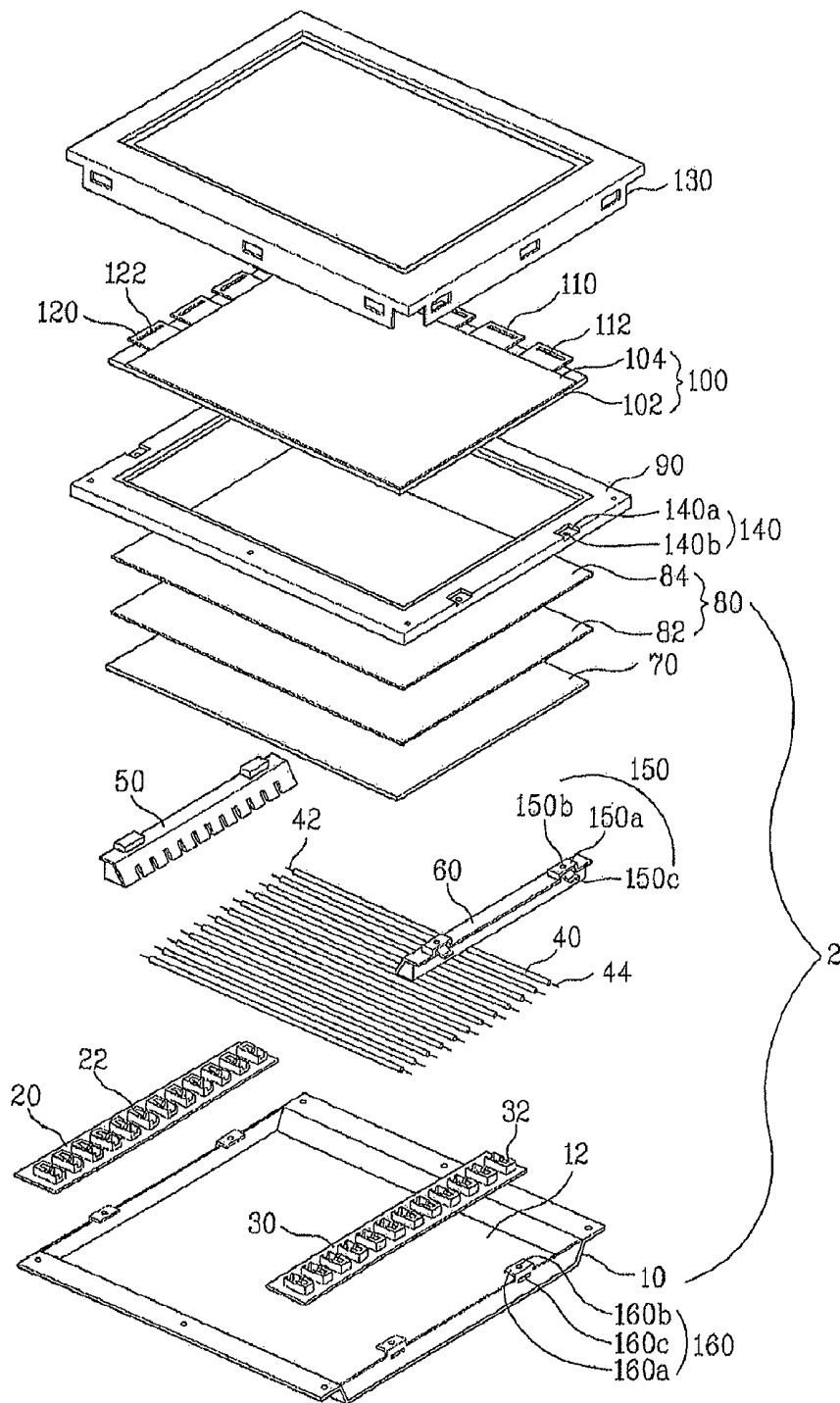


Figure 2

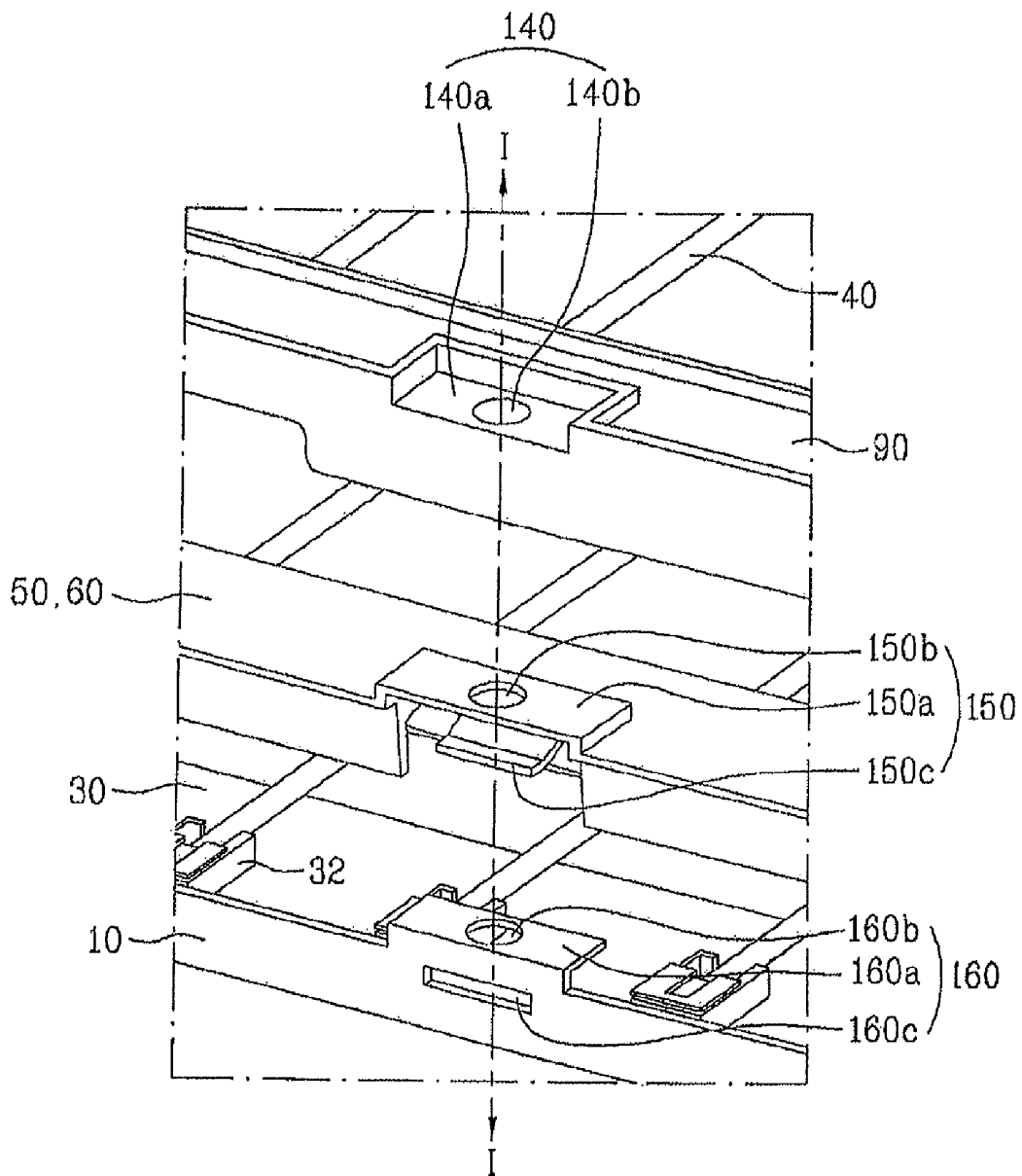
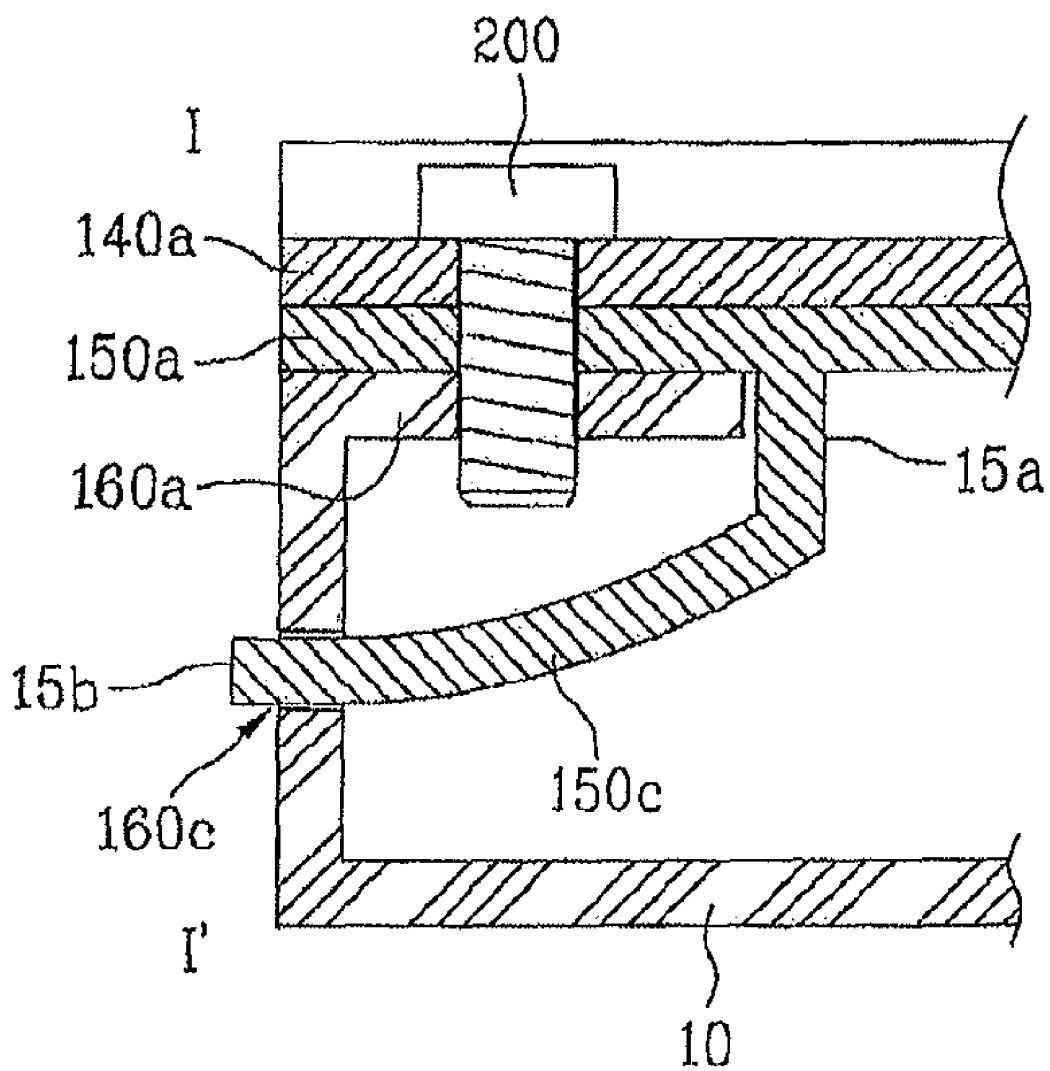


Figure 3



LIQUID CRYSTAL DISPLAY MODULE AND ASSEMBLING METHOD THEREOF

The present patent document is a divisional of U.S. patent application Ser. No. 12/265,856, filed Nov. 6, 2008 now U.S. Pat. No. 7,929,075, which claims priority to Korean Patent Application No. P2007-115240 filed in Korea on Nov. 13, 2007, which is hereby incorporated by reference.

BACKGROUND

1. Field of the Invention

The present invention relates to a liquid crystal display module, and more particularly, to a liquid crystal display module and an assembling method thereof which are capable of simplifying an assembling process for the liquid crystal display module while preventing foreign substance from entering the interior of the liquid crystal display module upon fastening screws to the liquid crystal display module.

2. Discussion of the Related Art

With the progress of an information-dependent society, the demand for various display devices has increased. To meet such a demand, efforts have recently been made to research flat panel display devices such as liquid crystal display (LCD) devices, plasma display panels (PDPs), electro-luminescent display (ELD) devices, vacuum fluorescent display (VFD) devices, and the like. Some types of such flat panel display devices are being practically applied to various appliances for display purposes.

In particular, LCDs have been used as a substitute for cathode ray tubes (CRTs) in association with mobile image display devices because LCDs have advantages of superior picture quality, lightness, thinness, and low power consumption. Thus, LCDs are currently most widely used. Various applications of LCDs are being developed in association with not only mobile image display devices such as monitors of notebook computers, but also monitors of TVs to receive and display broadcasting signals, and monitors of laptop computers.

Generally, an LCD device includes a liquid crystal display module or LCM, and a driving circuit for driving the liquid crystal display module.

The liquid crystal display module includes a liquid crystal panel, and a backlight unit for irradiating light to the liquid crystal panel. The liquid crystal display module also includes top and bottom cases defining a space for receiving the backlight unit and liquid crystal panel.

The liquid crystal display module further includes a panel guide enclosing respective edges and respective side surfaces of a diffusion plate and a plurality of optical sheets, which are included in the backlight unit, and a support side member enclosing opposite ends of lamps included in the backlight unit. The panel guide and support side member are fastened to the bottom case by screws.

In detail, the support side member is fastened to the bottom case, and the panel guide is then fastened to both the bottom case and the support side member fastened to the bottom case. In this case, accordingly, a fastening process needs to be carried out twice. In the fastening process, insert nuts are also used. This increases the cost. Furthermore, a metallic foreign substance, which may be formed during the screw-fastening process, may enter the interior of the liquid crystal display module. The metallic foreign substance may generate an electrical short circuit with a printed circuit board mounted in the liquid crystal display module.

BRIEF SUMMARY

A liquid crystal display module comprises: a panel guide for supporting a liquid crystal panel, the panel guide includ-

ing a first fastening portion; support side members for holding opposite sides of a lamp irradiating light to the liquid crystal panel, respectively, each of the support side members including a second fastening portion having a foreign substance shield; and a bottom case including a third fastening portion having a case hole formed through a side surface of the bottom case, to receive the foreign substance shield.

In another aspect of the present invention, a method for assembling a liquid crystal module comprises: preparing a panel guide for supporting a liquid crystal panel, the panel guide including a first fastening portion, support side members for holding opposite sides of a lamp irradiating light to the liquid crystal panel, respectively, each of the support side members including a second fastening portion having a foreign substance shield, and a bottom case including a third fastening portion having a case hole formed through a side surface of the bottom case, to receive the foreign substance shield; aligning the panel guide, the support side members, and the bottom case such that the first to third fastening portions overlap; and fastening the first to third fastening portions by screws, and inserting the foreign substance shield into the case hole.

With the disclosed structure and method, the assembling process can be simplified because the panel guide, support side members, and bottom case are fastened at one time by screws or the like. Also, it is possible to prevent metallic foreign substance formed during the fastening of the screws from entering the interior of the liquid crystal display module, and thus to prevent printed circuit boards from being short-circuited by metallic foreign substance because the foreign substance shield is fitted in the case hole of the bottom case.

It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and along with the description serve to explain the principle of the invention. In the drawings:

FIG. 1 is an exploded perspective view schematically illustrating a liquid crystal display (LCD) device according to an exemplary embodiment of the present invention, which includes a backlight unit;

FIG. 2 is an exploded perspective view for explaining a fastening process for a panel guide, support side members, and a bottom case; and

FIG. 3 is a cross-sectional view taken along the line I-I in FIG. 2, illustrating the fastened panel guide, support side members, and bottom case.

DETAILED DESCRIPTION OF THE DRAWINGS AND THE PRESENTLY PREFERRED EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

Hereinafter, a liquid crystal display module and an assembling method thereof according to an exemplary embodiment of the present invention will be described with reference to the accompanying drawings.

FIG. 1 is an exploded perspective view schematically illustrating a liquid crystal display (LCD) device according to an exemplary embodiment of the present invention, which includes a backlight unit.

The LCD device shown in FIG. 1 includes a liquid crystal panel **100** for displaying an image, and a backlight unit **2** for supplying light to the liquid crystal panel **100**. The LCD device also includes a top case **130** and a bottom case **10**, which receive the liquid crystal panel **100** and backlight unit **2**.

The top case **130** has a bent structure to enclose a non-display area of the liquid crystal panel **100** and side surfaces of the bottom case **10**. The top case **130** is fastened to a panel guide **90**, which encloses the side surfaces of the bottom case **10**.

The liquid crystal panel **100** is seated on the panel guide **90**. The liquid crystal panel **100** controls the transmittance of light supplied from the backlight unit **2** in accordance with an input image signal, to display an image. The liquid crystal panel **100** includes a lower substrate **102**, an upper substrate **104**, a liquid crystal layer (not shown) formed between the lower substrate **102** and the upper substrate **104**, and spacers (not shown) for maintaining a certain spacing between the lower substrate **102** and the upper substrate **104**.

The upper substrate **104** includes color filters, a black matrix, and common electrodes.

The lower substrate **102** includes thin film transistors, and pixel electrodes respectively connected to the thin film transistors. The common electrodes, which are provided at the upper substrate in the illustrated case, may be formed at the lower substrate **102** in accordance with a liquid crystal mode different from that of the illustrated case.

Formed on the non-display area of the lower substrate **102** are data pad areas respectively connected to data lines (not shown) and gate pad areas respectively connected to gate lines (not shown). A plurality of data circuit films **110**, on which data integrated circuits **112** are mounted to supply image signals to the data lines, are attached to the data pad areas, respectively. A plurality of gate circuit films **120**, on which gate integrated circuits **122** are mounted to supply gate scan signals to the gate lines, are attached to the gate pad areas, respectively.

Otherwise, the data integrated circuits **112** and gate integrated circuits **122** may be directly mounted on the lower substrate **102** in accordance with a chip-on-glass (COG) method, or may be formed together with the thin film transistors of the lower substrate **102** such that they are built in the lower substrate **102**.

The backlight unit **2** includes a plurality of lamps **40** each having first and second electrodes **42** and **44**, a first socket unit including a plurality of first sockets **22** connected to respective first electrodes **42** of the lamps **40**, and a second socket unit including a plurality of second sockets **32** connected to respective second electrodes **44** of the lamps **40**. The backlight unit **2** also includes a diffusion plate **70** arranged beneath the panel guide **90** such that the diffusion plate **70** faces the lamps **40**, at least one optical sheet **80** arranged on the diffusion plate **70**, a first support side member **50** arranged at one side of the bottom case **10**, to enclose the first socket unit and one end of each lamp **40**, and a second support side member **60** arranged at the other side of the bottom case **10**, to enclose the second socket unit and the other end of each lamp **40**.

The diffusion plate **70** diffuses light irradiated from the lamps **40** over the entire region of the liquid crystal panel **100**.

The optical sheet **80** functions to cause the light diffused by the diffusion plate **70** to be vertically irradiated to the liquid crystal panel **100**. To this end, the optical sheet **80** may include at least one prism sheet for condensing the light diffused by the diffusion plate **70**. In the illustrated case, the optical sheet **80** includes two prism sheets **82** and **84**.

The first and second socket units are arranged on first and second printed circuit boards (PCBs) **20** and **30**, respectively. Each of the PCBs **20** and **30** is provided with a common line to supply a lamp driving voltage.

The lamps **40** are separably mounted between the sockets **22** and **32** respectively mounted on the first and second PCBs **20** and **30** such that the lamps **40** face the liquid crystal panel **100**. Each lamp **40** may be a cold cathode fluorescent lamp (CCFL). Each lamp **40** is turned on by a lamp driving voltage supplied from the associated sockets **22** and **32**, to irradiate light to the liquid crystal panel **100**.

Although not shown, a lamp tube, in which phosphors emit light in accordance with gas discharge, or an external electrode fluorescent lamp (EEFL), in which electrodes are arranged on an outer surface of a lamp tube body at opposite ends of the lamp tube body, may be used for each lamp **40**. In this case, the structure of each socket may be changed.

The panel guide **90** is mounted on a seat portion of the bottom case **10** such that the panel guide **90** can enclose not only the edges and side surfaces of the diffusion plate **70** and optical sheets **80**, but also the side surfaces of the bottom case **10**. The panel guide **90** also functions to support the liquid crystal panel **100**, to prevent the backlight unit **2** from moving, and to absorb external impact applied to the backlight unit **2**.

The bottom case **10** is manufactured to have a bottom surface facing the lamps **40**, and inclined surfaces upwardly inclined from the bottom surface by a certain inclination. A reflection sheet **12** is attached to the bottom surface and inclined surfaces of the bottom case **10**, in order to reflect light irradiated from each lamp **40** toward the liquid crystal panel **100**. Alternatively, a reflective material may be coated over the bottom surface and inclined surfaces of the bottom case **10**.

FIG. 2 is an exploded perspective view for explaining a fastening process for the panel guide **90**, support side members **50** and **60**, and bottom case **10**.

As shown in FIG. 2, the panel guide **90** includes at least one first fastening portion **140** formed on at least one side surface of the panel guide **90**, in order to enable the panel guide **90** to be fastened with the support side members **50** and **60**, and bottom case **10**. The first fastening portion **140** has a first fastening surface **140a** recessed from the upper surface of the panel guide **90** in a stepped state, and a first fastening hole **140b** formed through the first fastening surface **140a**.

Each of the support side members **50** and **60** includes a second fastening portion **150**, which will be fastened to the first fastening portion **140**. The second fastening portion **150** has a second fastening surface **150a** protruded from the surface of the associated support side member **50** or **60** in a stepped state such that the second fastening surface **150a** corresponds to the first fastening surface **140a**, a second fastening hole **150b** formed through the second fastening surface **150a** such that the second fastening hole **150b** corresponds to the first fastening hole **140b**, and a foreign substance shield **150c** extending inclinedly from the second fastening surface **150a** toward the bottom case **10**, to prevent foreign substance from entering the interior of the liquid crystal display module. One end **15a** of the foreign substance shield **150c** is arranged

to be nearer to a light emitting region of the lamps **40** than the second fastening hole **150b**. The other end **15b** of the foreign substance shield **150c** is inserted into a case hole **160c** provided at the bottom case **10**.

The bottom case **10** includes a third fastening portion **160** formed on at least one side surface of the bottom case **10**, in order to enable the bottom case **10** to be fastened with the first and second fastening portions **140** and **150**. The third fastening portion **160** has a third fastening surface **160a** extending from one surface of the bottom case **10** to the interior of the liquid crystal display module in a bent state such that the third fastening surface **160a** corresponds to the first and second fastening surfaces **140a** and **150a**, and a third fastening hole **160b** formed through the third fastening surface **160a** such that the third fastening hole **160b** corresponds to the first and second fastening holes **140b** and **150b**. The case hole **160c** is also included in the third fastening portion **160**. The case hole **160c** is formed through one side surface of the bottom case **10** such that the foreign substance shield **150c** can be inserted into the case hole **160c**.

The fastening portions **140** and **160** of the panel guide **90** and bottom case **10** may be formed at four side surfaces, in order to obtain a maximum fastening force.

The corresponding first to third fastening holes **140b**, **150b**, and **160b** are fastened at one time by a screw **200** or the like, as shown in FIG. 3. At the same time, the other end **15b** of the foreign substance shield **150c** is inserted into the case hole **160c** of the bottom case **10**.

Thus, the assembling process can be simplified because the panel guide **90**, support side members **50** and **60**, and bottom case **10** are fastened at one time by a screw or the like, as described above. Also, it is possible to prevent metallic foreign substance formed during the fastening of the screw **200** from entering the interior of the liquid crystal display module, because the foreign substance shield **150c** is fitted in the case hole **160c** of the bottom case **10**. Since the fastening of the screw **200** is achieved through the fastening holes **140b**, **150b**, and **160b**, it is unnecessary to additionally use an insert net for the fastening of the screw **200**, as compared to related art's cases. Accordingly, a reduction in material costs is achieved.

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

The invention claimed is:

1. A method for assembling a liquid crystal module, comprising:

preparing a panel guide that supports a liquid crystal panel, the panel guide including a first fastening portion having a first fastening surface and a first fastening hole, support side members for holding opposite sides of a lamp irradiating light to the liquid crystal panel, respectively, each of the support side members including a second fastening portion having a second fastening surface, a second fastening hole corresponding to the first fastening hole, and a foreign substance shield, and a bottom case including a third fastening portion having a third fastening surface, a third fastening hole corresponding to the first and second fastening holes, and a case hole formed through a side surface of the bottom case, to receive the foreign substance shield;

aligning the panel guide, the support side members, and the bottom case such that the first to third fastening portions overlap; and

inserting screws into the first to third fastening holes to fasten the first to third fastening portions by the screws, and

inserting the foreign substance shield extending from the second fastening surface toward the bottom case into the case hole such that an end portion of the screws inserted into the first to third fastening holes is surrounded by the foreign substance shield, at the same time inserting screws into the first to third fastening holes.

2. The method according to claim 1, wherein the first fastening surface is recessed from an upper surface of the panel guide in a stepped state; and the first fastening hole is formed through the first fastening surface.

3. The method according to claim 2, wherein the second fastening surface is protruded from an upper surface of the support side member in a stepped state such that the second fastening surface corresponds to the first fastening surface; and the second fastening hole is formed through the second fastening surface.

4. The method according to claim 3, wherein the foreign substance shield has one end nearer to a light emitting region of the lamp than the second fastening hole, and the other end inserted into the case hole.

5. The method according to claim 3, wherein the third fastening surface is extending from the side surface of the bottom case to the lamp in a bent state; and the third fastening hole is formed through the third fastening surface.

* * * * *

专利名称(译)	液晶显示模块及其组装方法		
公开(公告)号	US8125587	公开(公告)日	2012-02-28
申请号	US13/049577	申请日	2011-03-16
[标]申请(专利权)人(译)	乐金显示有限公司		
申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
当前申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
[标]发明人	LEE SANG BUM		
发明人	LEE, SANG BUM		
IPC分类号	G02F1/1333		
CPC分类号	G02F1/133308 G02F2001/133311 G02F2001/133314 Y10T29/49963 G02F2001/133325 G02F2201/46 G02F2201/503 G02F2001/133317		
代理机构(译)	BRINKS霍费尔GILSON & LIONE		
审查员(译)	黄, ERIC		
优先权	1020070115240 2007-11-13 KR		
其他公开文献	US20110162192A1		
外部链接	Espacenet USPTO		

摘要(译)

公开了一种液晶显示模块及其组装方法。液晶显示模块包括用于支撑液晶面板的面板引导件，面板引导件包括第一紧固部分，用于将灯的相对侧分别保持到液晶面板的支撑侧构件，每个支撑侧所述构件包括具有异物屏蔽的第二紧固部分，以及包括第三紧固部分的底壳，所述第三紧固部分具有穿过所述底壳的侧表面形成的壳孔，以接收所述异物屏蔽。

