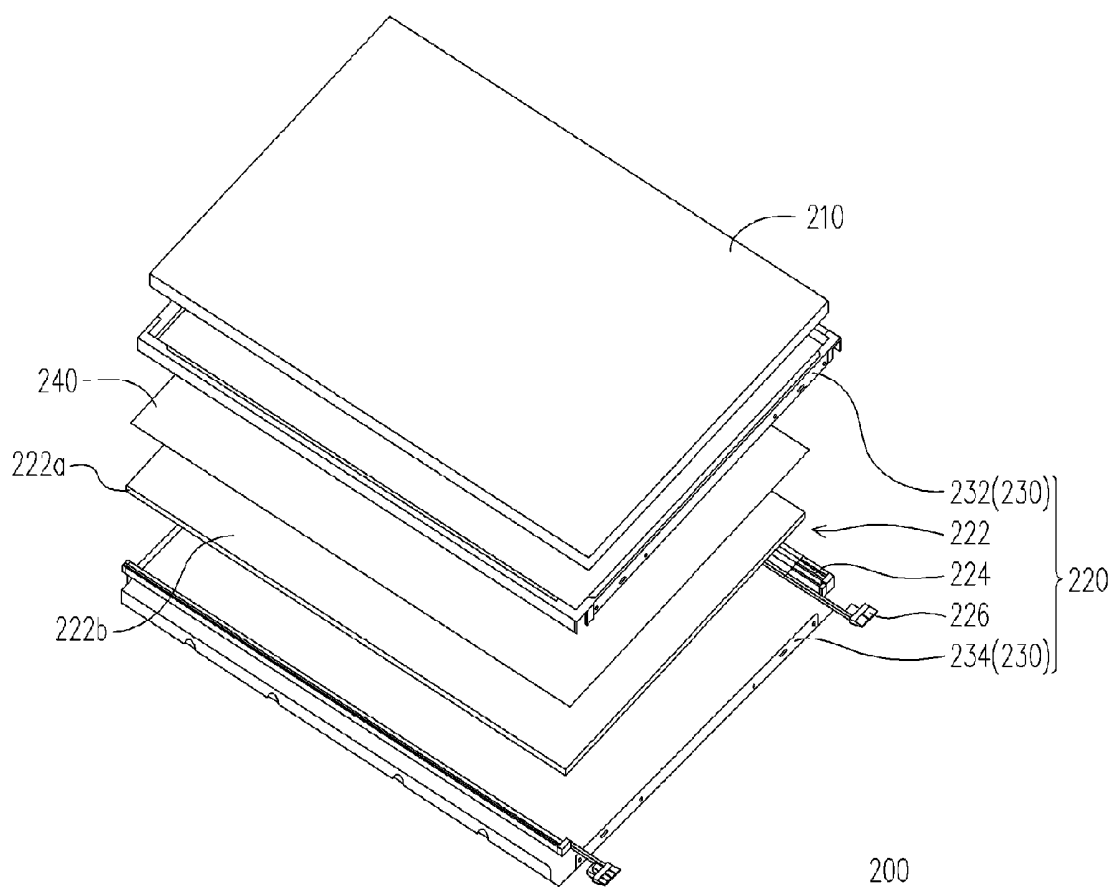




US 20060187376A1

(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2006/0187376 A1**
Wang et al. (43) **Pub. Date: Aug. 24, 2006**(54) **BACKLIGHT MODULE AND LIQUID CRYSTAL DISPLAY MODULE**(52) **U.S. Cl. 349/62**(76) Inventors: **Yun-Shih Wang**, Taoyuan County (TW); **Kuo-Liang Chu**, Taoyuan County (TW)(57) **ABSTRACT**Correspondence Address:
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A backlight module including a frame, a light guide, at least one reflective cover and at least one light source is provided. The frame includes an upper frame having at least one first fastener thereon and a lower frame having at least one second fastener thereon. The light guide is disposed inside the frame and has at least one light incident surface and a light emitting surface. The reflective cover is placed inside the frame at one side of the frame. The reflective cover has at least one third fastener and at least one fourth fastener thereon, wherein the third fastener and the first fastener of the upper frame are fastened together while the fourth fastener and the second fastener of the lower frame are fastened together. The light source is disposed between the light incident surface of the light guide and the reflective cover.

(21) Appl. No.: **10/906,498**(22) Filed: **Feb. 23, 2005****Publication Classification**(51) **Int. Cl.**
G02F 1/135 (2006.01)

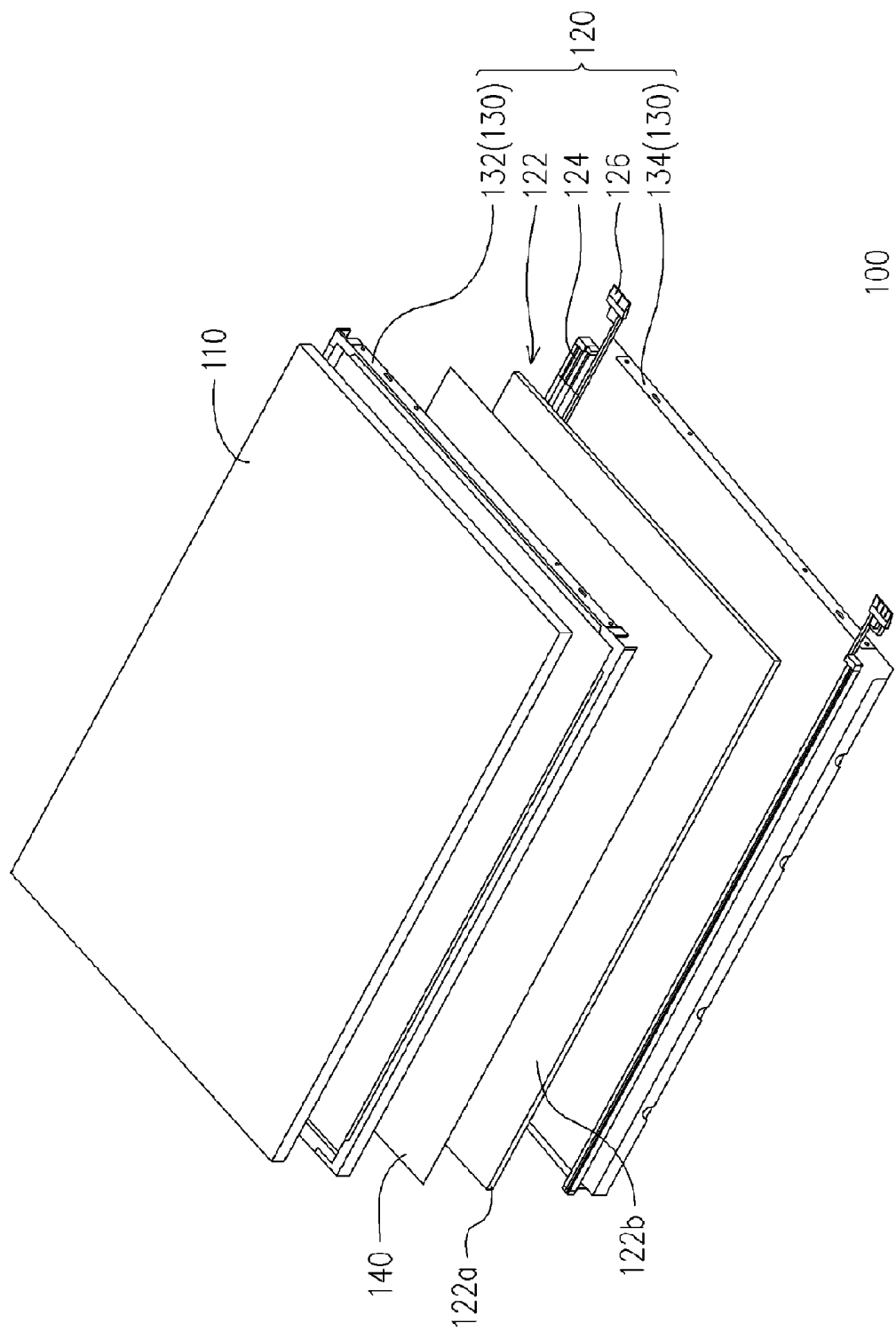


FIG. 1 (PRIOR ART)

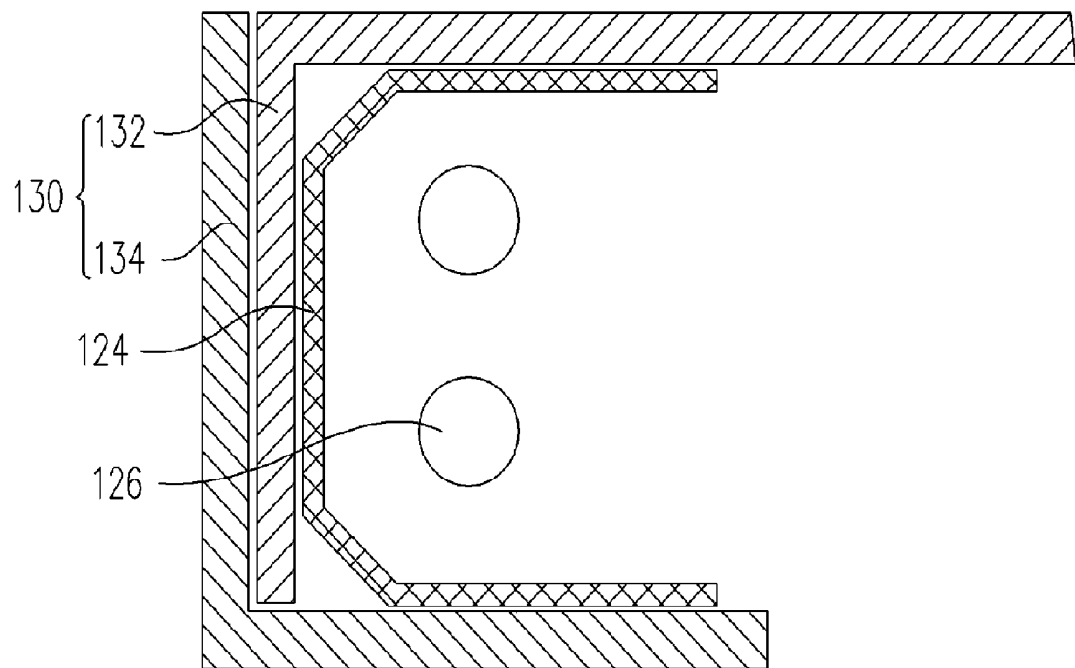


FIG. 2 (PRIOR ART)

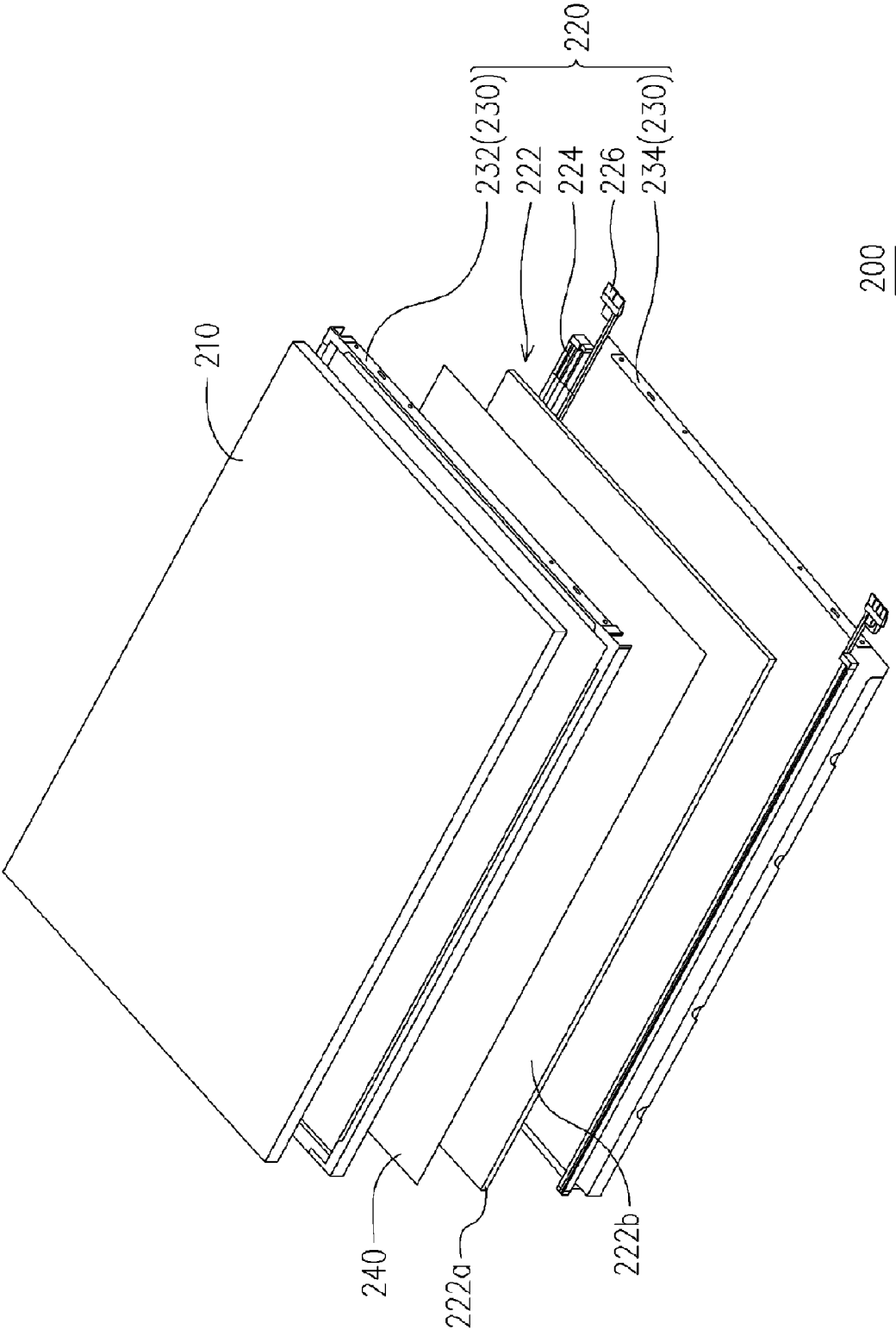


FIG. 3

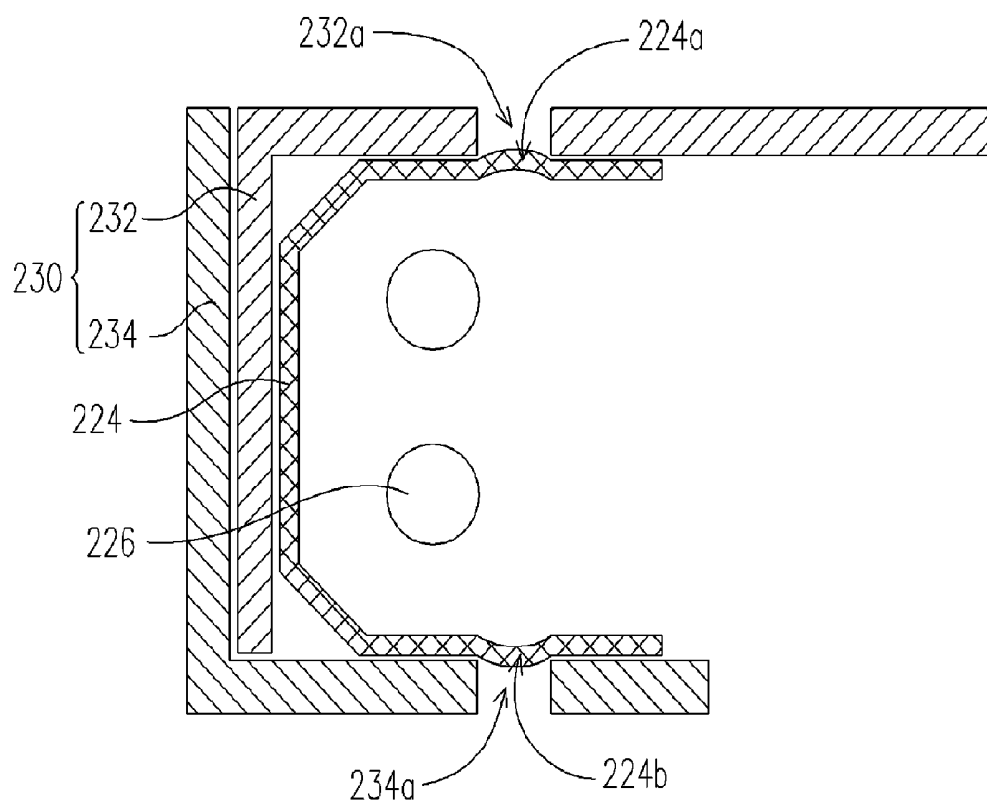


FIG. 4A

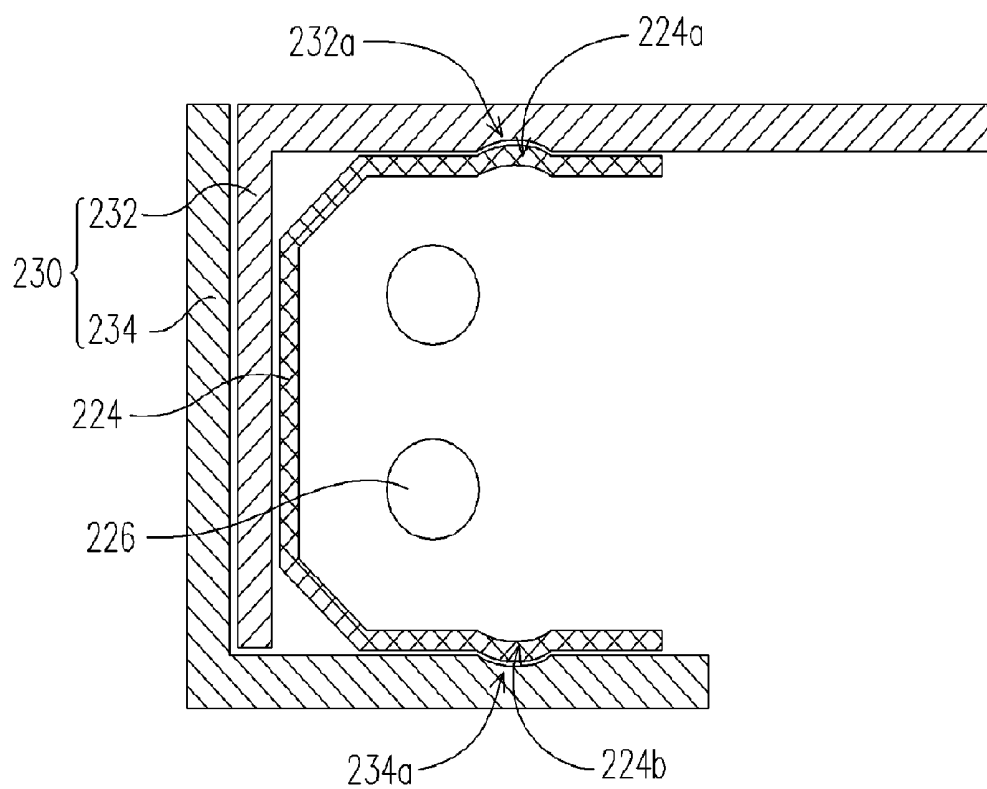


FIG. 4B

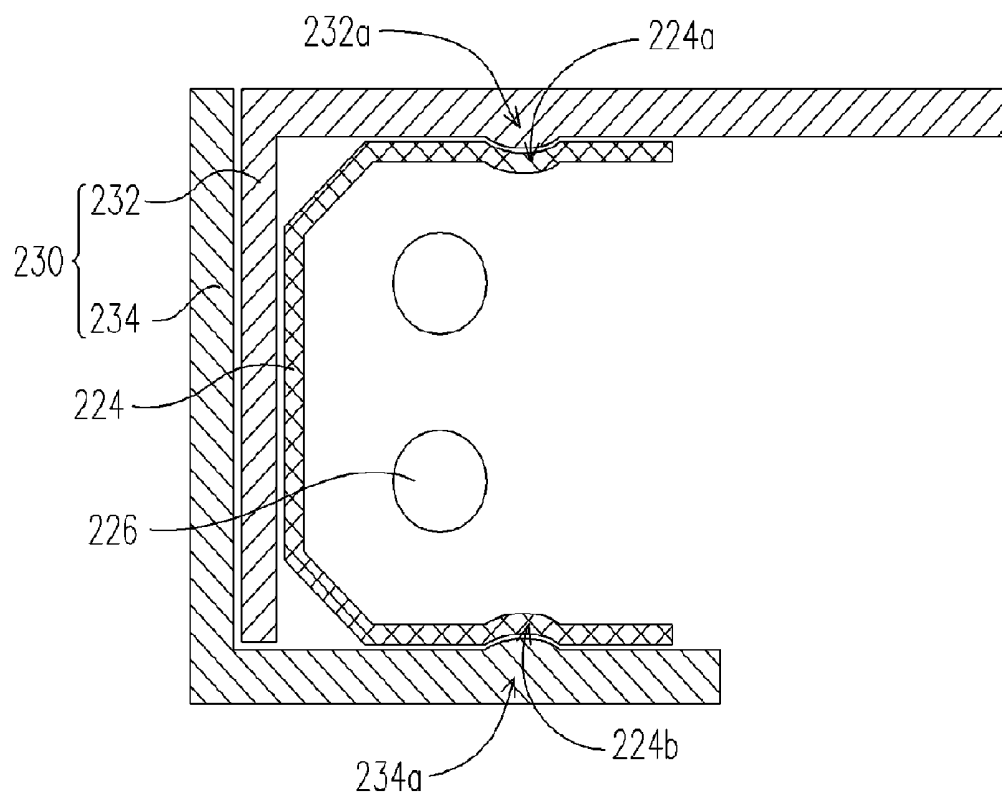


FIG. 4C

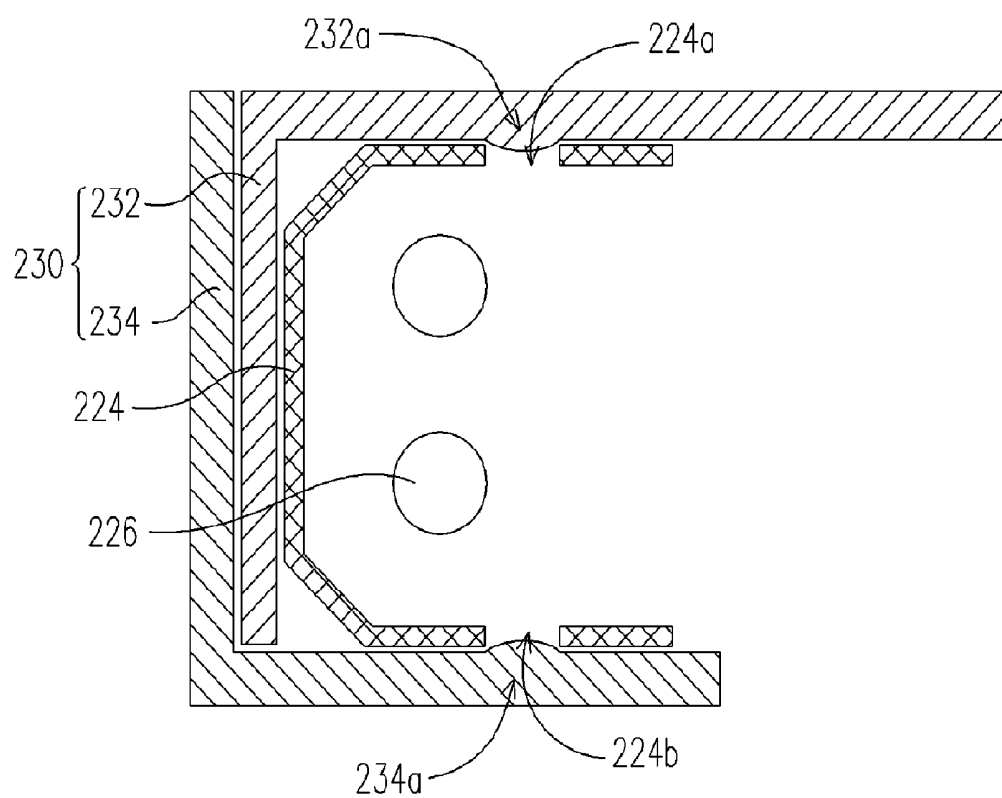


FIG. 4D

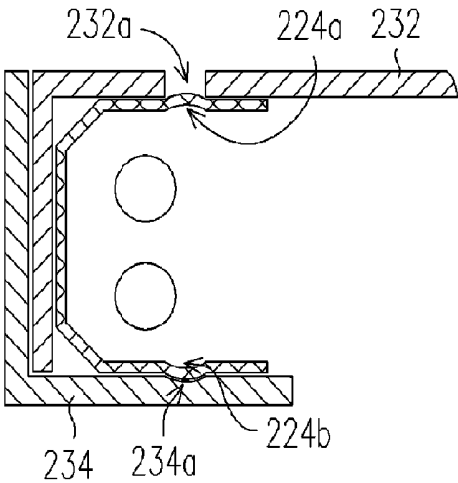


FIG. 5A

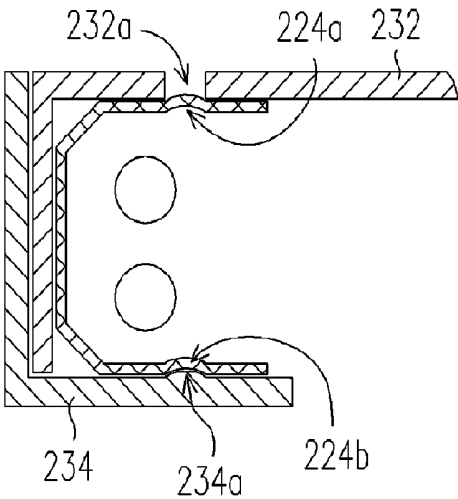


FIG. 5B

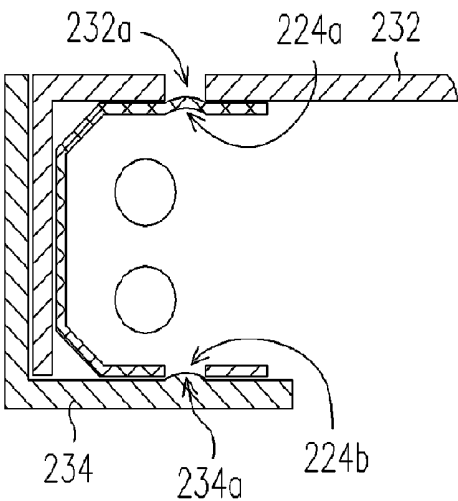


FIG. 5C

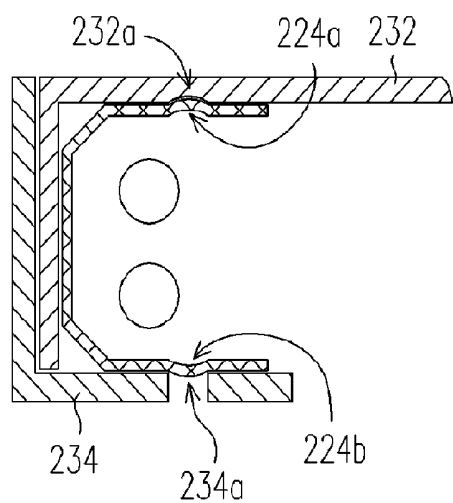


FIG. 5D

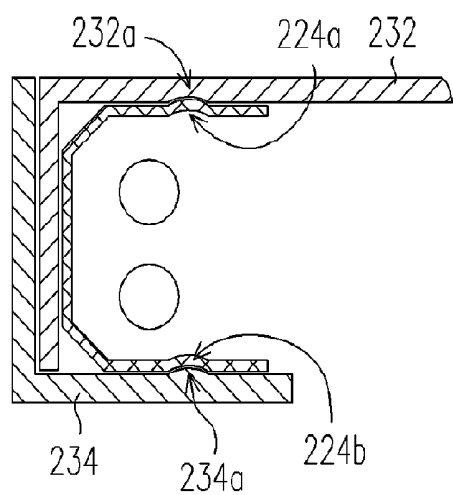


FIG. 5E

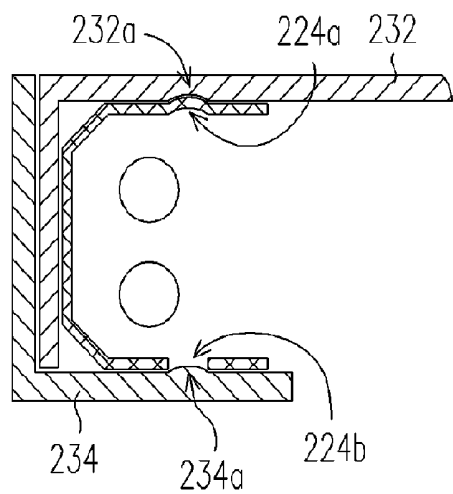


FIG. 5F

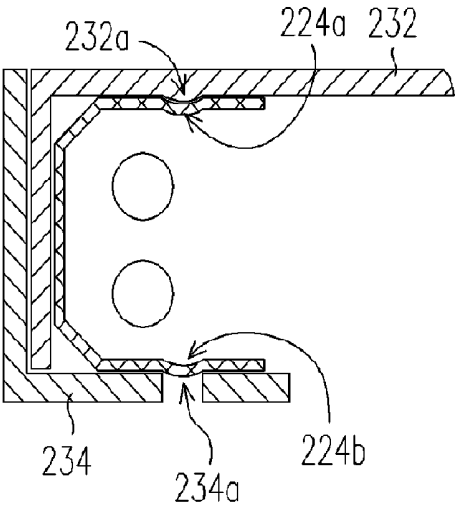


FIG. 5G

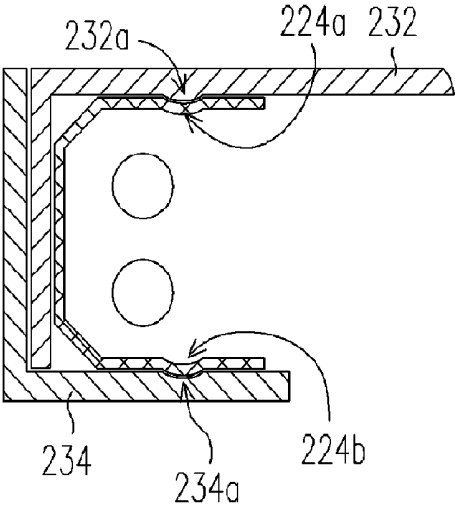


FIG. 5H

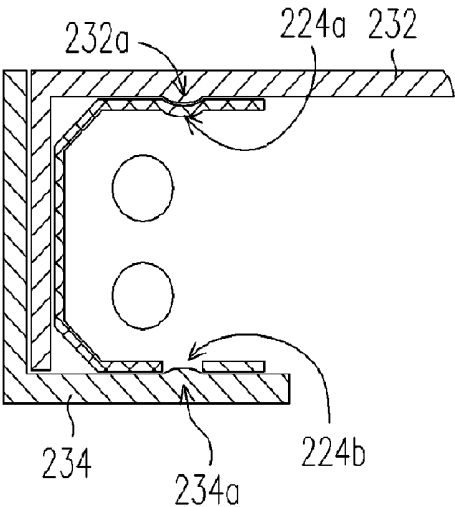


FIG. 5I

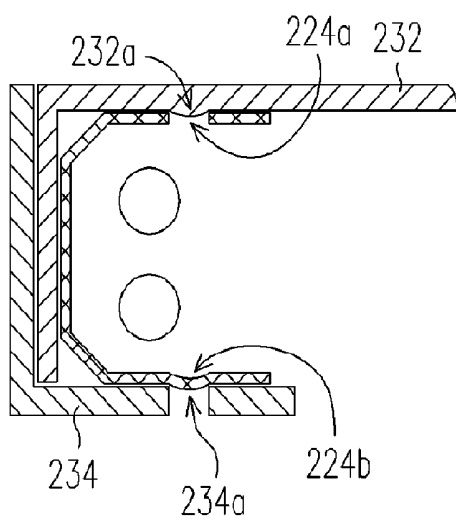


FIG. 5J

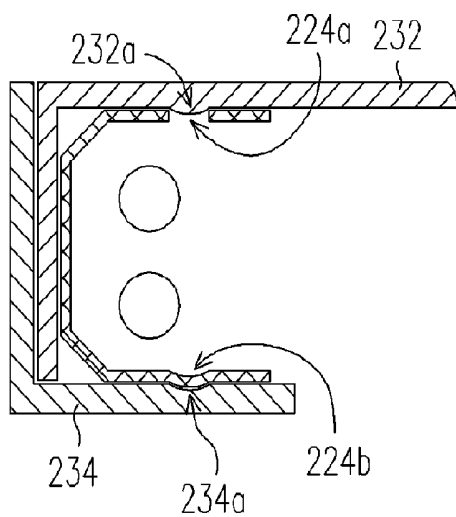


FIG. 5K

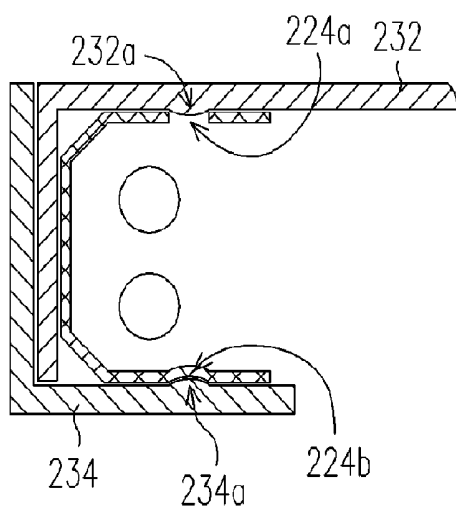


FIG. 5L

BACKLIGHT MODULE AND LIQUID CRYSTAL DISPLAY MODULE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention generally relates to a backlight module and a liquid crystal display module. More particularly, the present invention relates to a backlight module capable of firmly fixing a reflective cover inside a frame and a liquid crystal display module using the same.

[0003] 2. Description of Related Art

[0004] With recent advancement in opto-electronic fabricating techniques and the maturity of semiconductor manufacturing processes, the development of flat panel display devices, such as liquid crystal displays, organic light emitting diode displays and plasma displays, have proceeded quite rapidly. Usually, liquid crystal displays are applied to cell phones, digital cameras, digital video cameras, notebooks and personal computers. In a liquid crystal display, a backlight module is required to supply a surface light source to a liquid crystal display panel so that images are displayed on the liquid crystal display panel.

[0005] FIG. 1 is a drawing showing a conventional liquid crystal display module. FIG. 2 is a cross-sectional view showing a frame and a reflective cover of a conventional backlight module. As shown in FIG. 1 and FIG. 2, a liquid crystal display module 100 is constituted of a liquid crystal display panel 110 and a backlight module 120. The backlight module 120 includes a light guide 122, a reflective cover 124, a light source 126 and a frame 130. The frame 130 is composed of an upper frame 132 and a lower frame 134. The light guide 122 is placed inside the frame 130 and has a light incident surface 122a and a light emitting surface 122b. The reflective cover 124 is disposed inside the frame 130 and at one side of the frame 130.

[0006] As shown in FIG. 1, the light source 126 is disposed between the light incident surface 122a of the light guide 122 and the reflective cover 124. In addition, the liquid crystal display panel 110 is placed over the light emitting surface 122b of the light guide 122. Light from the light source 126 enters into the light guide 122 through the light incident surface 122a and forms a surface light source when emitting out the light guide 122 from the light emitting surface 122b, and then the surface light source is transmitted into the liquid crystal display panel 110. Besides, several optical films are further disposed between the light emitting surface 122b of the light guide and the liquid crystal display panel 110.

[0007] As shown in FIG. 2, the reflective cover 124 is sandwiched between the upper frame 132 and the lower frame 134 so as to firmly position the reflective cover 124. However, no fixture element is designed on the upper and lower frames 132, 134 and the reflective cover 124. The reflective cover 124 is merely sandwiched between the upper frame 132 and the lower frame 134 so that the reflective cover 124 may slant or shift when the backlight module 120 or the liquid crystal display module 100 is impacted by external force. If the reflective cover 124 slants or shifts inside the frame 130, several optical properties, such as surface light source brightness, light source utilization

and the like, may deteriorate, so that the display quality of the liquid crystal display module 100 is also deteriorated.

SUMMARY OF THE INVENTION

[0008] Accordingly, the present invention is directed to a backlight module capable of reducing deterioration of surface light source brightness and improving light source utilization.

[0009] The present invention is directed to a liquid crystal display module in which the backlight module has good surface light source brightness and light source utilization so as to maintain display quality of the liquid crystal display module.

[0010] According to an embodiment of the present invention, a backlight module comprising a frame, a light guide, at least one reflective cover and at least one light source is provided. The frame includes an upper frame having at least one first fastener thereon and a lower frame having at least one second fastener thereon. The light guide is disposed inside the frame and has at least one light incident surface and a light emitting surface. The reflective cover is placed inside the frame at one side of the frame. The reflective cover has at least one third fastener and at least one fourth fastener thereon, wherein the third fastener and the first fastener of the upper frame are fastened together while the fourth fastener and the second fastener of the lower frame are fastened together. The light source is disposed between the light incident surface of the light guide and the reflective cover.

[0011] According to an embodiment of the present invention, the light source and the reflective cover are disposed at one side of the frame so that the backlight module forms a single-edge type backlight module. According to another embodiment of the present invention, the light source and the reflective cover are disposed at a plurality of the sides of the frame so that the backlight module forms a multi-edge type backlight module.

[0012] According to an embodiment of the present invention, the first fastener may be a hole, a recession or a protrusion. The second fastener may be a hole, a recession or a protrusion. The third fastener may be a hole, a recession or a protrusion. The fourth fastener may be a hole, a recession or a protrusion.

[0013] According to an embodiment of the present invention, the backlight module further comprises at least one optical film disposed over the light emitting surface of the light guide. In addition, the light source is constituted of cold cathode fluorescent lamps or light emitting diodes.

[0014] According to an embodiment of the present invention, a liquid crystal display module comprising a backlight module and a liquid crystal display panel is provided. The backlight module includes a frame, a light guide, at least one reflective cover and at least one light source. The frame includes an upper frame having at least one first fastener thereon and a lower frame having at least one second fastener thereon. The light guide is disposed inside the frame and has at least one light incident surface and a light emitting surface. The reflective cover is placed inside the frame at one side of the frame. The reflective cover has at least one third fastener and at least one fourth fastener thereon, wherein the third fastener and the first fastener of the upper frame are

fastened together while the fourth fastener and the second fastener of the lower frame are fastened together. The light source is disposed between the light incident surface of the light guide and the reflective cover. In addition, the liquid crystal display panel is disposed over the light emitting surface of the light guide.

[0015] According to an embodiment of the present invention, the light source and the reflective cover are disposed at one side of the frame so that the backlight module forms a single-edge type backlight module. According to another embodiment of the present invention, the light source and the reflective cover are disposed at a plurality of the sides of the frame so that the backlight module forms a multi-edge type backlight module.

[0016] According to an embodiment of the present invention, the first fastener may be a hole, a recession or a protrusion. The second fastener may be a hole, a recession or a protrusion. The third fastener may be a hole, a recession or a protrusion. The fourth fastener may be a hole, a recession or a protrusion.

[0017] According to an embodiment of the present invention, the backlight module further comprises at least one optical film disposed between the light emitting surface of the light guide and the liquid crystal display panel. In addition, the light source is constituted of cold cathode fluorescent lamps or light emitting diodes.

[0018] In the present invention, the upper frame and the lower frame of the backlight module have first and second fasteners thereon and the reflective cover has third and fourth fasteners thereon so that the reflective cover can be firmly fixed between the upper frame and the lower frame. Hence, surface light source brightness and light source utilization of the backlight module is not deteriorated even if the backlight module or the liquid crystal display module is impacted by any external force so that the liquid crystal display module has good display quality.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

[0020] **FIG. 1** is a drawing showing a conventional liquid crystal display module.

[0021] **FIG. 2** is a cross-section view showing a frame and a reflective cover of a conventional backlight module.

[0022] **FIG. 3** is a drawing showing a liquid crystal display module according to an embodiment of the present invention.

[0023] **FIG. 4A** is a cross-sectional view showing a reflective cover having protrusions thereon assembled to a frame having holes thereon according to a first embodiment of the present invention.

[0024] **FIG. 4B** is a cross-sectional view showing a reflective cover having protrusions thereon assembled to a frame having recessions thereon according to a second embodiment of the present invention.

[0025] **FIG. 4C** is a cross-sectional view showing a reflective cover having recessions thereon assembled to a frame having protrusions thereon according to a third embodiment of the present invention.

[0026] **FIG. 4D** is a cross-sectional view showing a reflective cover having holes thereon assembled to a frame having protrusions thereon according to a fourth embodiment of the present invention.

[0027] **FIGS. 5A~5L** are cross-sectional views showing various fasteners on the frame and the reflective cover according to other embodiments of the present invention.

DESCRIPTION OF THE EMBODIMENTS

[0028] Reference will now be made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

[0029] **FIG. 3** is a drawing showing a liquid crystal display module according to an embodiment of the present invention. **FIG. 4A** is a cross-sectional view showing a reflective cover having protrusions thereon assembled to a frame having holes thereon according to a first embodiment of the present invention. As shown in **FIG. 3** and **FIG. 4A**, a liquid crystal display module **200** is constituted of a liquid crystal display panel **210** and a backlight module **220**. The backlight module **220** includes a frame **230**, a light guide **222**, at least one reflective cover **224** and at least one light source **226**. The frame **230** is composed of an upper frame **232** having at least one first fastener **232a** thereon and a lower frame **234** having at least one second fasteners **234a**. For example, if the first fasteners **232a** comprise one or more holes, the second fasteners **234a** also correspondingly comprise one or more holes. Furthermore, the reflective cover **224** has at least one third fastener **224a** and at least one fourth fastener **224b**. The third and fourth fasteners **224a**, **224b** comprise protrusions, for example.

[0030] The third fastener **224a** and the fourth fastener **224b** are respectively correspond to the first fastener **232a** of the upper frame **232** and the second fastener **234a** of the lower frame **234**. In other words, the third fastener **224a** (protrusion) and the first fastener **232a** (hole) of the upper frame **232** are fastened together while the fourth fastener **224b** (protrusion) and the second fastener **234a** (hole) of the lower frame **234** are fastened together by structurally engaging with each other when the reflective cover **224** and the frame **230** are assembled together. Hence, the reflective cover **224** can be firmly fixed between the upper and lower frame **232**, **234** through the third/fourth fastener **224a/224b** and the first/second fastener **232a/234a**. Even if the backlight module **220** or the liquid crystal display module **200** is impacted by external force, the reflective cover **224** does not slant or shift easily.

[0031] As shown in **FIG. 3**, the light guide **222** is disposed inside the frame **230** and has at least one light incident surface **222a** and a light emitting surface **222b**. The liquid crystal display module **200** further comprises at least one optical film **240** disposed over the light emitting surface **222b** of the light guide **222**. The optical film **240** may include a diffusion film, a collection film and the like, for example. The light source **226** is disposed between the light

incident surface **222a** of the light guide **222** and the reflective cover **224**. The light source **226** is constituted of cold cathode fluorescent lamps or light emitting diodes, for example. The liquid crystal display panel **210** is placed over the light emitting surface **222b** of the light guide **222**. Light emitted from the light source **226** enters into the light guide **222** through the light incident surface **222a** and forms a surface light source when emitting out of the light guide **222** from the light emitting surface **222b**, and then the surface light source is transmitted into the liquid crystal display panel **210**.

[0032] In particular, the backlight module **220** of the liquid crystal display module **200** may be a single-edge type backlight module or a multi-edge type backlight module. If the backlight module **220** is a single-edge type backlight module, the light source **226** and the reflective cover **224** are disposed at one side of the frame **230**. If the backlight module **220** is a multi-edge type backlight module, the light source **226** and the reflective cover **224** are disposed at a plurality of sides, such as two sides or four sides, of the frame **230**.

[0033] It should be noted the first fastener **232a** of the upper frame **232** and the second fastener **234a** of the lower frame **234** and the third and fourth fasteners **224a**, **224b** of the reflective cover **224** have various modification and combination different from the first embodiment of FIG. 4A. For example, FIG. 4B is a cross-sectional view showing a reflective cover having protrusions thereon assembled to a frame having recessions thereon according to a second embodiment of the present invention. FIG. 4C is a cross-sectional view showing a reflective cover having recessions thereon assembled to a frame having protrusions thereon according to a third embodiment of the present invention. FIG. 4D is a cross-sectional view showing a reflective cover having holes thereon assembled to a frame having protrusions thereon according to a fourth embodiment of the present invention.

[0034] In FIG. 4B, the first fastener **232a** of the upper frame **232** and the second fastener **234a** of the lower frame **234** comprise holes while the corresponding third and fourth fasteners **224a**, **224b** of the reflective cover **224** comprise protrusions. As shown in FIG. 4C, the first fastener **232a** of the upper frame **232** and the second fastener **234a** of the lower frame **234** comprise protrusions while the corresponding third and fourth fasteners **224a**, **224b** of the reflective cover **224** comprise recessions. As shown in FIG. 4D, the first fastener **232a** of the upper frame **232** and the second fastener **234a** of the lower frame **234** comprise protrusions while the corresponding third and fourth fasteners **224a**, **224b** of the reflective cover **224** comprise holes.

[0035] As mentioned above, the first fastener **232a** of the upper frame **232** and the second fastener **234a** of the lower frame **234** may comprise holes, recessions or protrusions. The third and fourth fasteners **224a**, **224b** of the reflective cover **224** may also comprise holes, recessions or protrusions correspondingly so that the reflective cover **224** can be firmly fixed between the upper frame **232** and the lower frame **234**. For example, when the third fastener **224a** of the reflective cover **224** comprises protrusion, the corresponding first fastener **232a** of the upper frame **232** may comprise a hole or a recession. Similarly, when the third fastener **224a** of the reflective cover **224** comprises recession, the corre-

sponding first fastener **232a** of the upper frame **232** may comprise a protrusion. When the third fastener **224a** of the reflective cover **224** comprises hole, the corresponding first fastener **232a** of the upper frame **232** may comprise a protrusion. The fourth fastener **224b** and the corresponding second fastener **234a** may also comprise similar arrangement as described with reference to third fastener **224a** and the first fastener **232a**.

[0036] FIGS. 5A~5L are cross-sectional views showing various fasteners on the frame and the reflective cover according to other embodiments of the present invention. As shown in FIG. 5A, the first fastener **232a** of the upper frame **232** comprises a hole and the second fastener **234a** of the lower frame **234** comprises a recession while the third and fourth fasteners **224a**, **224b** comprise protrusions correspondingly. As shown in FIG. 5B, the first fastener **232a** of the upper frame **232** comprises a hole and the second fastener **234a** of the lower frame **234** comprises a protrusion while the third fastener **224a** comprises a protrusion and the fourth fastener **224b** comprises a recession correspondingly.

[0037] As shown in FIG. 5C, the first fastener **232a** of the upper frame **232** comprises a hole and the second fastener **234a** of the lower frame **234** comprises a protrusion while the third fastener **224a** comprises a protrusion and the fourth fastener **224b** comprises a hole correspondingly. As shown in FIG. 5D, the first fastener **232a** of the upper frame **232** comprises a recession and the second fastener **234a** of the lower frame **234** comprises a hole while the third fastener **224a** comprises a protrusion and the fourth fastener **224b** comprises a protrusion correspondingly. As shown in FIG. 5E, the first fastener **232a** of the upper frame **232** comprises a recession and the second fastener **234a** of the lower frame **234** comprises a protrusion while the third fastener **224a** comprises a protrusion and the fourth fastener **224b** comprises a recession correspondingly.

[0038] As shown in FIG. 5F, the first fastener **232a** of the upper frame **232** comprises a recession and the second fastener **234a** of the lower frame **234** comprises a protrusion while the third fastener **224a** comprises a protrusion and the fourth fastener **224b** comprises a hole correspondingly. As shown in FIG. 5G, the first fastener **232a** of the upper frame **232** comprises a protrusion and the second fastener **234a** of the lower frame **234** comprises a hole while the third fastener **224a** comprises a recession and the fourth fastener **224b** comprises a protrusion correspondingly. As shown in FIG. 5H, the first fastener **232a** of the upper frame **232** comprises a protrusion and the second fastener **234a** of the lower frame **234** comprises a recession while the third fastener **224a** comprises a recession and the fourth fastener **224b** comprises a protrusion correspondingly.

[0039] As shown in FIG. 5I, the first fastener **232a** of the upper frame **232** comprises a protrusion and the second fastener **234a** of the lower frame **234** comprises a protrusion while the third fastener **224a** comprises a recession and the fourth fastener **224b** comprises a hole correspondingly. As shown in FIG. 5J, the first fastener **232a** of the upper frame **232** comprises a protrusion and the second fastener **234a** of the lower frame **234** comprises a hole while the third fastener **224a** comprises a hole and the fourth fastener **224b** comprises a protrusion correspondingly. As shown in FIG. 5K, the first fastener **232a** of the upper frame **232** comprises a protrusion and the second fastener **234a** of the lower frame

234 comprises a recession while the third fastener **224a** comprises a hole and the fourth fastener **224b** comprises a protrusion correspondingly. As shown in **FIG. 5L**, the first fastener **232a** of the upper frame **232** comprises a protrusion and the second fastener **234a** of the lower frame **234** comprises a protrusion while the third fastener **224a** is a hole and the fourth fastener **224b** comprises a recession correspondingly.

[0040] It should be noted that the first fastener **232a** of the upper frame **232** and the second fastener **234a** of the lower frame **234** and the third and fourth fasteners **224a**, **224b** of the reflective cover **224** are not limited to the above embodiments. Other modified fasteners may also be applied to the upper and lower frame **232**, **234** and the reflective cover **224**. Since the upper and lower frame **232**, **234** and the reflective cover **224** have the fasteners thereon, the reflective cover **224** can be firmly fixed between the upper frame **232** and the lower frame **234**. Even if the backlight module **220** or the liquid crystal display module **200** is impacted by external force, the reflective cover **224** does not slant or shift. Therefore, the deterioration of the surface light source brightness can be effectively reduced and light source of the backlight module **220** can be fully utilized so that the liquid crystal display module **200** has good display quality.

[0041] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the present invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.

What is claimed is:

1. A backlight module, comprising:
 - a frame, comprising an upper frame and a lower frame, wherein the upper frame comprises at least one first fastener thereon while the lower frame comprises at least one second fastener thereon;
 - a light guide, disposed inside the frame, wherein the light guide comprises at least one light incident surface and a light emitting surface;
 - at least one reflective cover, disposed inside the frame at one side of the frame, wherein the reflective cover comprises at least one third fastener and at least one fourth fastener, and the third fastener and the first fastener are fastened together while the fourth fastener and the second fastener are fastened together; and
 - at least one light source, disposed between the light incident surface of the light guide and the reflective cover.
2. The backlight module according to claim 1, wherein the light source and the reflective cover are disposed at one side of the frame.
3. The backlight module according to claim 1, wherein the light source and the reflective cover are disposed at a plurality of the sides of the frame.
4. The backlight module according to claim 1, wherein the first fastener comprises a hole, a recession or a protrusion.
5. The backlight module according to claim 1, wherein the second fastener comprises a hole, a recession or a protrusion.

6. The backlight module according to claim 1, wherein the third fastener comprises a hole, a recession or a protrusion.

7. The backlight module according to claim 1, wherein the fourth fastener comprises a hole, a recession or a protrusion.

8. The backlight module according to claim 1, further comprising at least one optical film, disposed over the light emitting surface of the light guide.

9. The backlight module according to claim 1, wherein the light source is constituted of cold cathode fluorescent lamps or light emitting diodes.

10. A liquid crystal display module, comprising:

a backlight module, comprising:

a frame, comprising an upper frame and a lower frame, wherein the upper frame has at least one first fastener thereon while the lower frame has at least one second fastener thereon;

a light guide, disposed inside the frame, wherein the light guide comprises at least one light incident surface and a light emitting surface;

at least one reflective cover, disposed inside the frame at one side of the frame, wherein the reflective cover comprises at least one third fastener and at least one fourth fastener, and the third fastener and the first fastener are fastened together while the fourth fastener and the second fastener are fastened together;

at least one light source, disposed between the light incident surface of the light guide and the reflective cover; and

a liquid crystal display panel, placed over the light emitting surface of the light guide.

11. The liquid crystal display module according to claim 10, wherein the light source and the reflective cover are disposed at one side of the frame.

12. The liquid crystal display module according to claim 10, wherein the light source and the reflective cover are disposed at a plurality of the sides of the frame.

13. The liquid crystal display module according to claim 10, wherein the first fastener comprises a hole, a recession or a protrusion.

14. The liquid crystal display module according to claim 10, wherein the second fastener is a hole, a recession or a protrusion.

15. The liquid crystal display module according to claim 10, wherein the third fastener comprises a hole, a recession or a protrusion.

16. The liquid crystal display module according to claim 10, wherein the fourth fastener comprises a hole, a recession or a protrusion.

17. The liquid crystal display module according to claim 10, further comprising at least one optical film, disposed between the light emitting surface of the light guide and the liquid crystal display panel.

18. The liquid crystal display module according to claim 10, wherein the light source is constituted of cold cathode fluorescent lamps or light emitting diodes.

专利名称(译)	背光模块和液晶显示模块		
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摘要(译)

一种背光模组，包括框架，光导，至少一个反射罩和至少一个光源。框架包括上框架和下框架，上框架上具有至少一个第一紧固件，下框架上具有至少一个第二紧固件。光导设置在框架内并具有至少一个光入射表面和光发射表面。反射罩在框架的一侧放置在框架内。反射罩上具有至少一个第三紧固件和至少一个第四紧固件，其中第三紧固件和上框架的第一紧固件紧固在一起，而下框架的第四紧固件和第二紧固件紧固在一起。光源设置在光导的光入射表面和反射盖之间。

