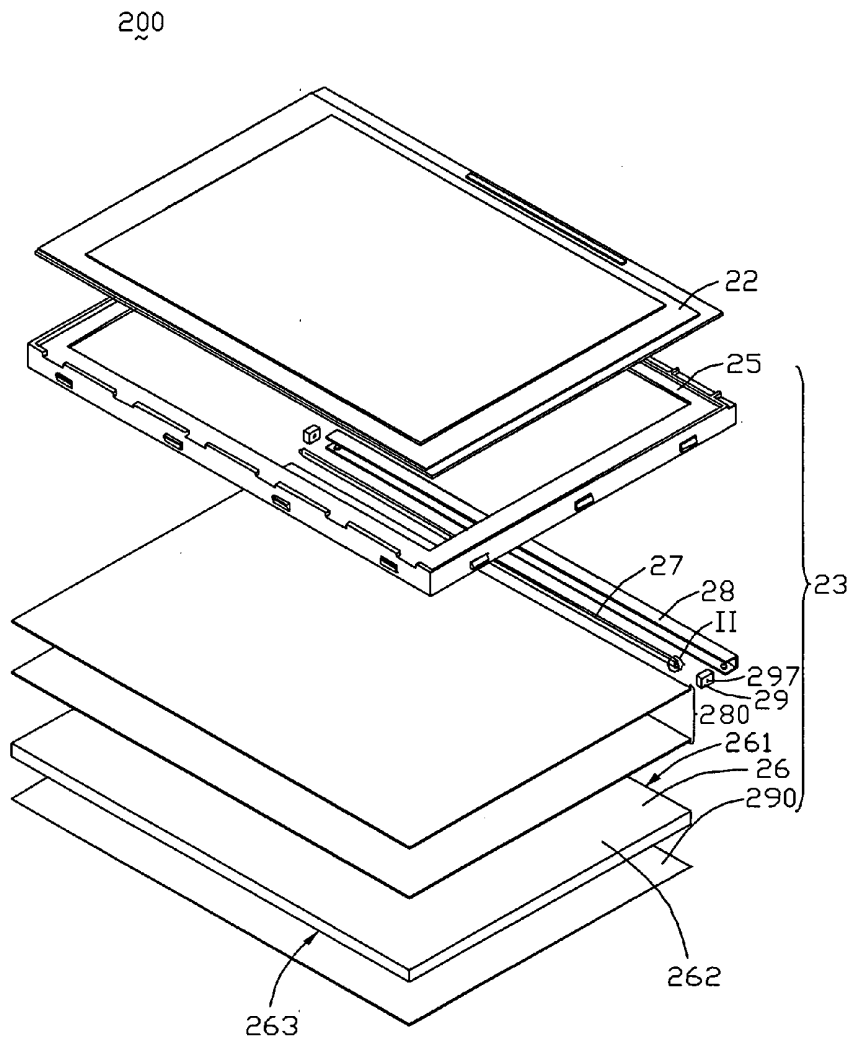


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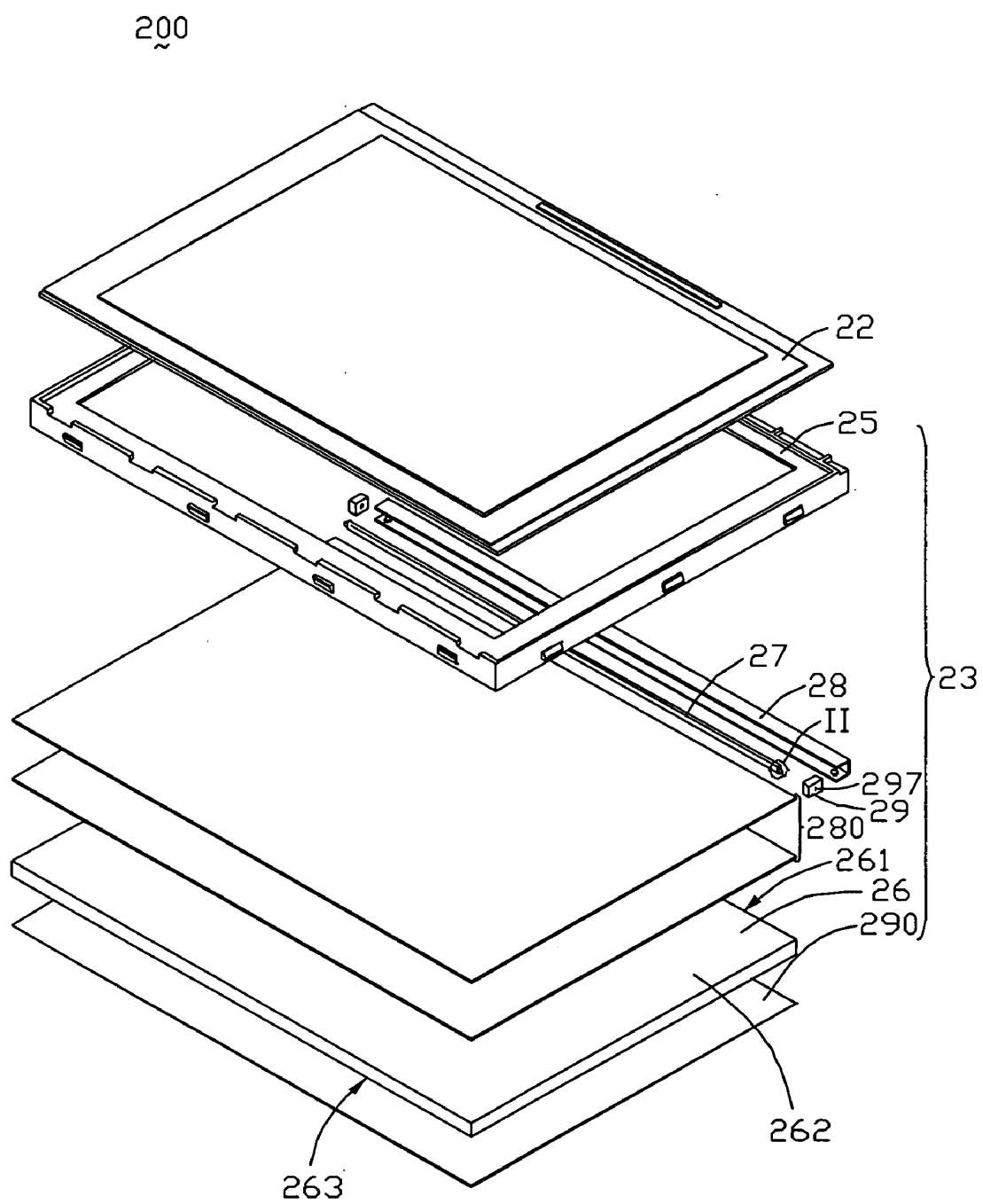


FIG. 1

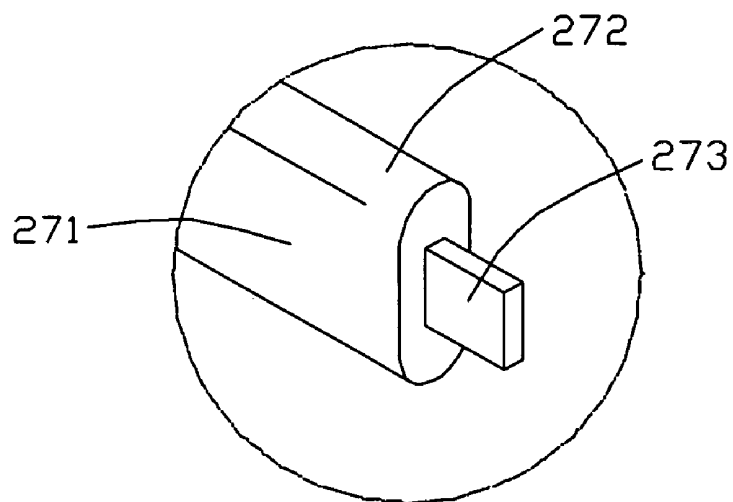


FIG. 2

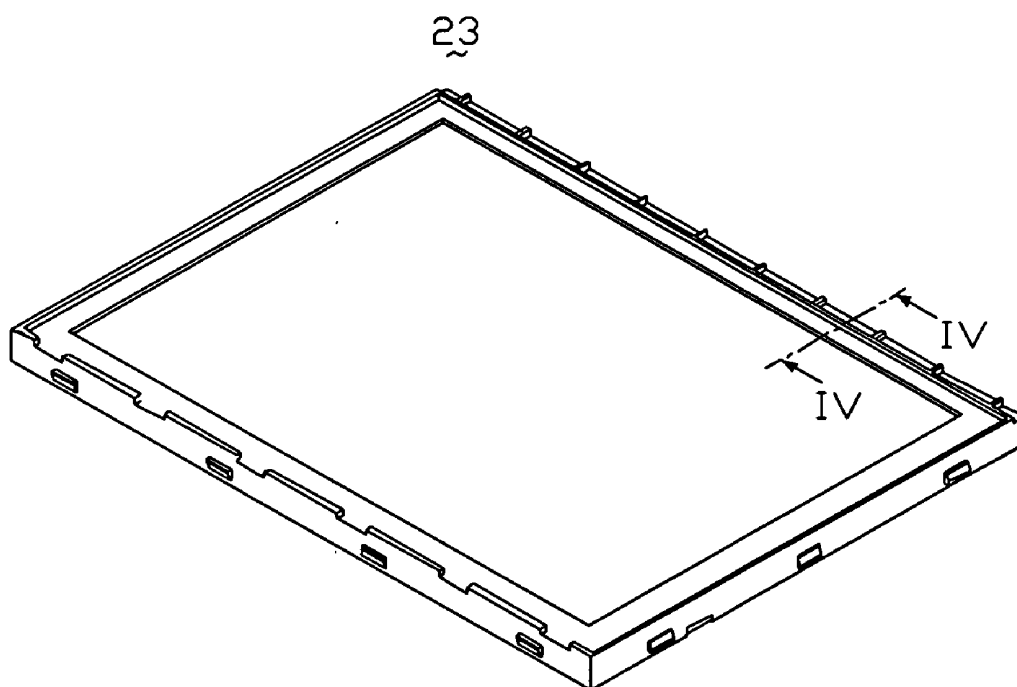


FIG. 3

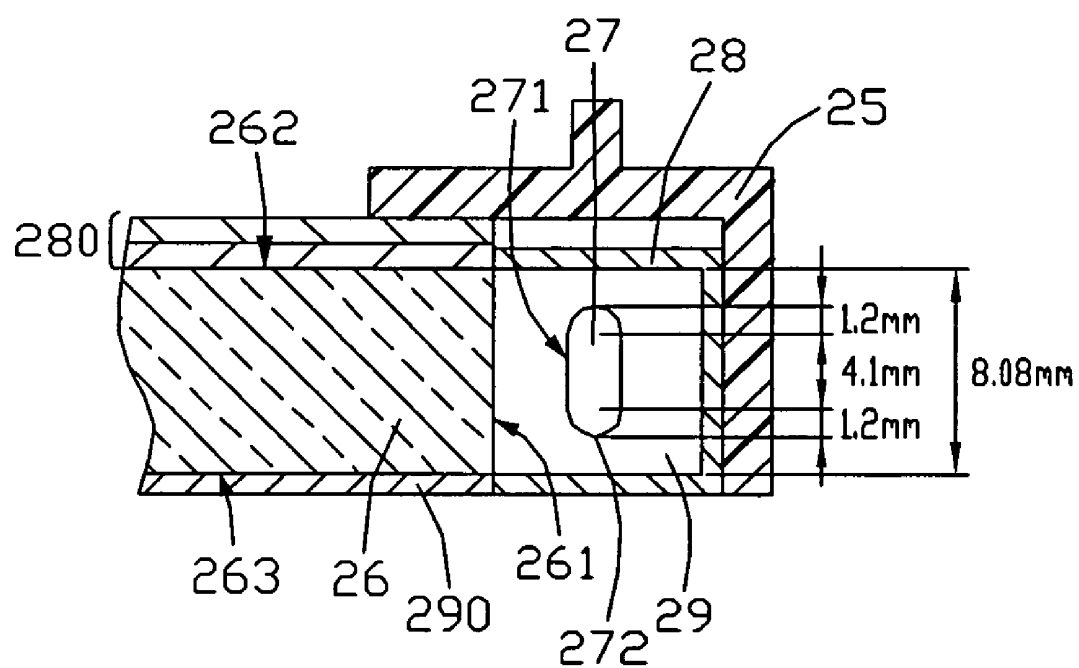


FIG. 4



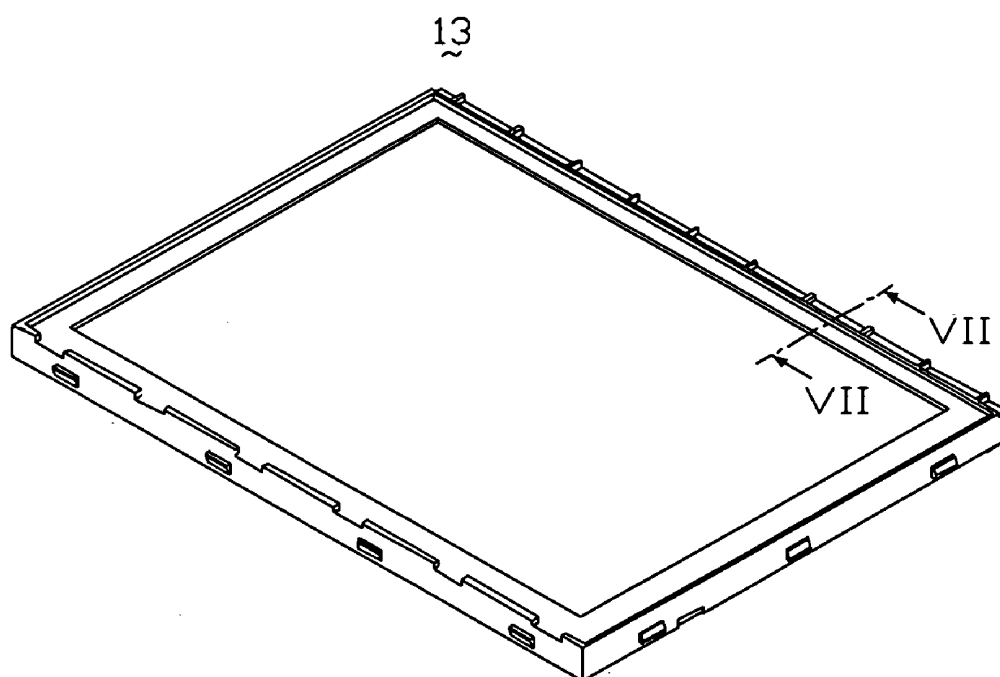


FIG. 6
(RELATED ART)

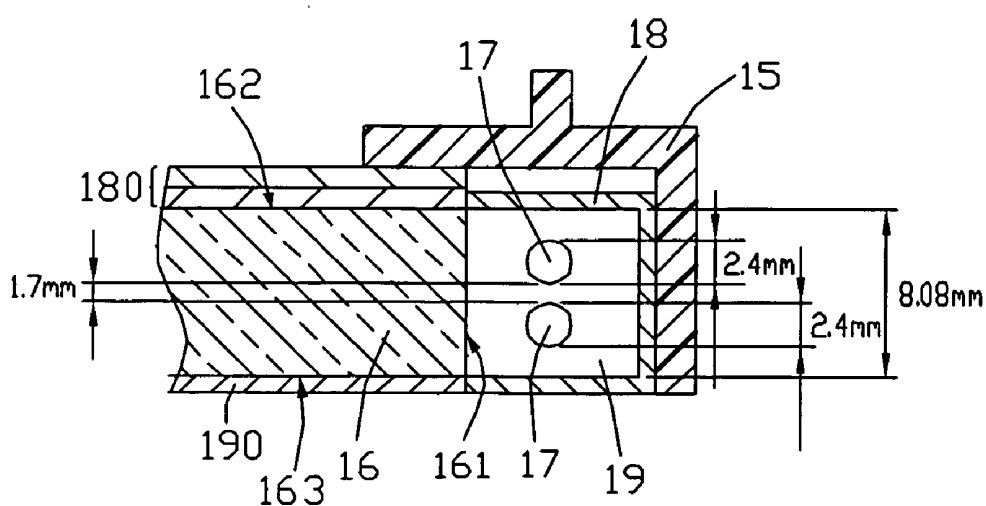


FIG. 7
(RELATED ART)

BACKLIGHT MODULE WITH FLAT LAMP AND LIQUID CRYSTAL DISPLAY HAVING SAME

FIELD OF THE INVENTION

[0001] The present invention relates to backlight modules such as those used in liquid crystal displays (LCDs); and more particularly to a backlight module with a flat lamp, and an LCD with the backlight module installed therein.

GENERAL BACKGROUND

[0002] LCDs are commonly used as displays for compact electronic apparatuses. This is because they not only provide good quality images with little power consumption, but also they are very thin. The liquid crystal in a liquid crystal display does not emit any light itself. The liquid crystal has to be lit by a light source so as to clearly and sharply display text and images. Thus, a backlight module is generally needed for a liquid crystal display.

[0003] Referring to FIG. 5, a typical LCD 100 includes an LCD panel 12 and a backlight module 13. The backlight module 13 provides a planar light source to illuminate the LCD panel 12.

[0004] The backlight module 13 includes a frame 15, a set of optical films 180, a light guide plate (LGP) 16, two lamps 17, a lamp reflector 18, two rubber pieces 19, and a reflective film 190. The LGP 16 has a rectangular shape, and includes a light incident surface 161, a top light emitting surface 162 adjoining the light incident surface 161, and a bottom surface 163 adjoining the light incident surface 161. Each rubber piece 19 has two openings 197 corresponding with the two lamps 17.

[0005] Referring also to FIGS. 6 and 7, a cross-section of each lamp 17 is circular, and a cross-section of the lamp reflector 18 is generally U-shaped. A height of the lamp reflector 18 is 8.08 mm (millimeters). A diameter of each lamp 17 is 2.4 mm, and a length of the lamp 17 is 347 mm (not shown). The two lamps 17 are separated by a gap of 1.7 mm. Thus a total height spanned by the combination of the two lamps 17 is 6.5 mm. The four openings 197 of the two rubber pieces 19 receive corresponding ends of the two lamps 17. The lamp reflector 18 receives the lamps 17 with the rubber pieces 19. The lamp reflector 18 is disposed adjacent to the light incident surface 161 of the LGP 16. The reflective film 190 is disposed adjacent to the bottom surface 163 of the LGP 16. The set of optical films 180 is disposed adjacent to the light emitting surface 162 of the LGP 16. The frame 15 receives the set of optical films 180, the LGP 16, the reflective film 190, and the lamp reflector 18.

[0006] The two lamps 17 need to be spaced apart a certain distance in order to prevent heat generated by each lamp 17 unduly heating up the other lamp 17. Therefore when the size of the lamp reflector 18 is constant, the diameters of the lamps 17 are limited to a certain maximum safe size. This means a total light-emitting area of the lamps 17 is also limited. Accordingly, the brightness of light provided by the backlight module 13 is limited. This can be particularly problematic in the case of a large sized LCD 100 having a large LCD panel 12 and requiring a large backlight module 13. In such case, the backlight module 13 may not be able to provide sufficient brightness to illuminate the LCD panel 12.

[0007] What is needed, therefore, is a backlight module and an LCD incorporating the backlight module which can overcome the above-described deficiencies.

SUMMARY

[0008] A backlight module includes a light guide plate and a flat lamp. The light guide plate includes a light incident surface. The flat lamp includes a plane surface. The plane surface of the flat lamp is adjacent and substantially parallel to the light incident surface of the light guide plate.

[0009] A liquid crystal display includes an LCD panel and a backlight module located adjacent to the LCD panel. The backlight module includes a light guide plate and a flat lamp. The light guide plate includes a light incident surface. The flat lamp includes a plane surface. The plane surface of the flat lamp is adjacent and substantially parallel to the light incident surface of the light guide plate.

[0010] Other aspects, novel features, and advantages will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is an exploded, isometric view of an LCD according to a preferred embodiment of the present invention, the LCD including a backlight module.

[0012] FIG. 2 is an enlarged view of a circled portion II of FIG. 1.

[0013] FIG. 3 is an assembled view of the backlight module of FIG. 1.

[0014] FIG. 4 is an enlarged, cross-sectional view taken along line IV-IV of FIG. 3.

[0015] FIG. 5 is an exploded, isometric view of a conventional LCD, the LCD including a backlight module.

[0016] FIG. 6 is an assembled view of the backlight module of FIG. 5.

[0017] FIG. 7 is an enlarged, cross-sectional view taken along line VII-VII of FIG. 6.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0018] Reference will now be made to the drawings to describe the preferred and exemplary embodiments in detail.

[0019] Referring to FIG. 1, an LCD according to a preferred embodiment of the present invention is shown. The LCD 200 includes an LCD panel 22 and a backlight module 23. The backlight module 23 provides a planar light source to illuminate the LCD panel 22.

[0020] The backlight module 23 includes a frame 25, a set of optical films 280, a light guide plate (LGP) 26, a flat lamp 27, a lamp reflector 28, two rubber pieces 29, and a reflective film 290. Each rubber piece 29 has an opening 297 corresponding with an end of the flat lamp 27. The LGP 26 has a rectangular shape, and includes a light incident surface 261, a top light emitting surface 262 adjoining the light incident surface 261, and a bottom surface 263 adjoining the light incident surface 261.

[0021] FIG. 2 is an enlarged view of a circled portion II of FIG. 1. The flat lamp 27 includes two rectangular surfaces 271 at two opposite sides thereof respectively, and two semi-circle surfaces 272 at another two opposite sides thereof respectively. The two rectangular surfaces 271 and two semi-circle surfaces 272 are arranged end-to-end to cooperatively

form a generally four-surface closed lamp. Each end of the flat lamp 27 is coupled with an electrode 273. A cross-section of the electrode 273 is rectangular. The flat lamp 27 may be a cold cathode fluorescent lamp.

[0022] Referring also to FIGS. 3 and 4, a cross-section of the lamp reflector 28 is generally U-shaped. A height of the lamp reflector 28 is 8.08 mm. A height of the rectangular surface 271 is 4.1 mm, and a length of the rectangular surface 271 is 347 mm (not shown). A radius of the semicircle surface 272 is 1.2 mm. Thus a maximum height of the flat lamp 17 is 6.5 mm. The two openings 297 of the two rubber pieces 29 receive the ends of the flat lamp 27. The lamp reflector 28 receives the flat lamp 27 with the rubber pieces 29. The lamp reflector 28 is disposed adjacent to the light incident surface 261 of the LGP 26. One of the rectangular surfaces 271 of the flat lamp 27 is parallel to the light incident surface 261 of the LGP 26. The reflective film 290 is disposed adjacent to the bottom surface 263 of the LGP 26. The set of optical films 280 is disposed adjacent to the light emitting surface 262 of the LGP 26. The frame 25 receives the set of optical films 280, the LGP 26, the reflective film 290, and the lamp reflector 28.

[0023] The size of the flat lamp 27 of the backlight module 23 is substantially equal to the total size of the combination of two lamps 17 of the above-described conventional backlight module 13. However, a light-emitting area of the rectangular surface 271 of the flat lamp 27 which is parallel to and directly faces the light incident surface 261 is much larger than that of a corresponding area or areas of the two conventional lamps 17. Therefore the flat lamp 27 efficiently provides light directly entering the light incident surface 261, and the backlight module 23 can provide ample brightness to illuminate the LCD panel 22. This is particularly advantageous when the LCD 200 is a large sized one. Furthermore, there is no light energy wasted in heating up an adjacent lamp 17, as is the case with the conventional backlight module 13. Moreover, there is no associated risk of the adjacent lamp 17 becoming overheated, as is the case with the conventional backlight module 13.

[0024] It is believed that the present embodiments and their advantages will be understood from the foregoing description, and it will be apparent that various changes may be made thereto without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the examples hereinbefore described merely being preferred or exemplary embodiments of the invention.

What is claimed is:

1. A backlight module, comprising:
a light guide plate comprising a light incident surface; and
a flat lamp comprising a plane surface;
wherein the plane surface of the flat lamp is adjacent and substantially parallel to the light incident surface of the light guide plate.
2. The backlight module as claimed in claim 1, wherein the flat lamp is an elongate flat lamp.
3. The backlight module as claimed in claim 1, wherein the plane surface of the flat lamp is a rectangular surface.

4. The backlight module as claimed in claim 3, wherein the flat lamp comprises another rectangular surface, and two curved surfaces, wherein the two rectangular surfaces are parallel to each other at opposite sides of the flat lamp, and the two curved surfaces are symmetrical to each other at opposite sides of the flat lamp.

5. The backlight module as claimed in claim 4, wherein a height of the rectangular surface is approximately 4.1 mm.

6. The backlight module as claimed in claim 5, wherein a length of the rectangular surface is approximately 347 mm.

7. The backlight module as claimed in claim 1, wherein each end of the flat lamp has an electrode extending therefrom.

8. The backlight module as claimed in claim 7, wherein a cross-section of the electrode is rectangular.

9. The backlight module as claimed in claim 4, wherein each of the curved surfaces of the flat lamp is semicylindrical.

10. The backlight module as claimed in claim 9, wherein a radius of the semicylindrical surface is approximately 1.2 mm.

11. The backlight module as claimed in claim 1, wherein the flat lamp is a cold cathode fluorescent lamp.

12. The backlight module as claimed in claim 1, further comprising two rubber pieces, wherein each rubber piece comprises an opening engagingly receiving a respective end of the flat lamp.

13. The backlight module as claimed in claim 1, further comprising a lamp reflector, wherein the lamp reflector receives the flat lamp therein.

14. The backlight module as claimed in claim 13, wherein a cross-section of the lamp reflector is generally U-shaped.

15. The backlight module as claimed in claim 14, wherein a height of the lamp reflector is approximately 8.08 mm.

16. A liquid crystal display, comprising:
a liquid crystal display panel; and
a backlight module located adjacent to the liquid crystal display panel, the backlight module comprising:
a light guide plate comprising a light incident surface; and
a flat lamp comprising a plane surface;
wherein the plane surface of the flat lamp is adjacent and substantially parallel to the light incident surface of the light guide plate.

17. The liquid crystal display as claimed in claim 16, wherein the flat lamp is an elongate flat lamp.

18. The liquid crystal display as claimed in claim 16, wherein the plane surface of the flat lamp is a rectangular surface.

19. The liquid crystal display as claimed in claim 18, wherein the flat lamp further comprises another rectangular surface, and two curved surfaces, wherein the two rectangular surfaces are parallel to each other at opposite sides of the flat lamp, and the two curved surfaces are symmetrical to each other at opposite sides of the flat lamp.

* * * * *

专利名称(译)	具有平板灯的背光模块和具有相同的液晶显示器		
公开(公告)号	US20080137001A1	公开(公告)日	2008-06-12
申请号	US12/001617	申请日	2007-12-11
[标]申请(专利权)人(译)	群康科技(深圳)有限公司 群创光电股份有限公司		
申请(专利权)人(译)	INNOCOM科技 (深圳) 有限公司. 群创光电股份有限公司.		
当前申请(专利权)人(译)	群创光电 INNOCOM科技 (深圳) 有限公司.		
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优先权	095221798 2006-12-11 TW		
外部链接	Espacenet USPTO		

摘要(译)

示例性液晶显示器 (200) 包括LCD面板 (22) 和位于LCD面板附近的背光模块 (23)。背光模块包括导光板 (26) 和平板灯 (27)。导光板包括光入射表面 (261)。平板灯包括平面 (271)。平板灯的平面与导光板的光入射面相邻并基本平行。

