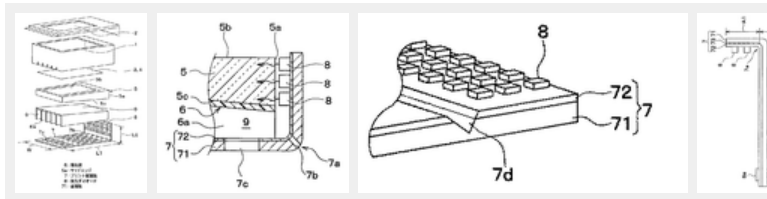


Lighting device for vehicular indicator

Abstract

<P>PROBLEM TO BE SOLVED: To prolong the service life of a light-emitting diode by suppressing the thermal degradation of the light-emitting diode by the improvement of the heat dissipation of a printed circuit board, and to enable to adopt a low-priced vertical light emitting type diode while suppressing enlargement of a lighting device. <P>SOLUTION: In the lighting device radiating beams from the light-emitting diodes 8 arranged oppositely to the side edge 5a of a photo conductive board 5 as lighting beams from the surface of the photo conductive board 5, a metallic wiring plate with a metal plate 71 as a base is adopted in a printed-circuit board 7 having mounted light-emitting diodes 8, and the printed-circuit board 7 is folded so that the board 7 extends from a part opposite to the back of the photo conductive board 5 to a part opposite to the side edge 5a. Consequently, the thermal conductivity of the printed-circuit board 7 is improved by the adopting a metallic wiring plate. The large radiating area of the printed-circuit board 7 can be ensured while suppressing enlargement of the lighting device by folding the printed-circuit board 7 as described above, and then low-priced vertical light emitting type diodes can be adopted. <P>COPYRIGHT: (C)2005,JPO&NCIPI

Images (7)



Landscapes

Details Of Measuring Devices



Instrument Panels



Show more

Claims (10)

Hide Dependent

translated from Japanese

A light guide plate (5), a light emitting diode (8) arranged opposite to a side edge (5a) of the light guide plate (5), and a printed wiring board (7) on which the light emitting diode (8) is mounted. With

A lighting device for a vehicle display, wherein light incident on a side edge (5a) of the light guide plate (5) from the light emitting diode (8) is emitted as illumination light from a surface of the light guide plate (5).

As the printed wiring board (7), a metal-based wiring board based on a metal plate (71) is adopted,

The printed wiring board (7) is bent so as to extend from a portion facing the side edge (5a) of the light guide plate (5) to a portion facing the back surface of the light guide plate (5). Lighting device for a vehicle display. The lighting device for a vehicle display according to claim 1, wherein a plurality of the light emitting diodes (8) are arranged in a direction perpendicular to the light guide plate (5). 3. The vehicle display according to claim 1, wherein the bent portion (7a) of the printed wiring board (7) is provided with one of a through hole (7b), a notch (7d), and a recess. Lighting equipment. The illumination of a vehicle display according to any one of claims 1 to 3, wherein a heat radiation space (9) is formed between the printed wiring board (7) and the light guide plate (5). apparatus. On the back surface of the light guide plate (5), there is provided a reflection plate (6) for reflecting light incident from the side edge (5a) to the front surface side of the light guide plate (5),

The lighting device for a vehicle display according to claim 4, wherein the heat radiation space (9) is formed between the reflection plate (6) and the printed wiring board (7). The vehicle according to claim 5, wherein a plurality of ventilation holes (7c) are formed in a portion of the printed wiring board (7) facing a

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back surface of the light guide plate (5). Illumination device for display. The lighting device for a vehicle display according to any one of claims 1 to 6, wherein the metal plate (71) is made of aluminum. The vehicle according to any one of claims 1 to 7, wherein the printed wiring board (7) is configured by closely attaching a flexible printed board (72) to the metal plate (71). Illumination device for display. In the printed wiring board (7), a region from a portion facing the back surface of the light guide plate (5) to the bent portion (7a) is a configuration in which the flexible printed board (72) is eliminated and the metal plate (71) is omitted. The lighting device for a vehicle display according to claim 8, wherein the lighting device is formed only of: In the printed wiring board (7), a region extending from a portion facing the back surface of the light guide plate (5) to the bent portion (7a) corresponds to the metal plate (71) of the flexible printed board (72). The lighting device for a vehicle display according to claim 8, wherein the close contact is eliminated.

Description

translated from Japanese

[0001]

TECHNICAL FIELD OF THE INVENTION

The present invention relates to a lighting device for a display such as a vehicle instrument.

[0002]

[Prior art]

2. Description of the Related Art Conventionally, there has been known an illumination device in which a light emitting diode is arranged to face a side edge of a light guide plate, and light incident on the side edge of the light guide plate from the light emitting diode is emitted as illumination light from the surface of the light guide plate (for example, see, for example). And Patent Document 1).

[0003]

FIG. 5 shows a lighting device similar to the above-mentioned patent document which the present inventors have studied on a trial basis, in which a light emitting diode 8 is mounted on a printed wiring board 7. The printed wiring board 7 employs a glass-epoxy base wiring board, and the printed wiring board 7 is disposed so as to be parallel to the light guide plate 5. As shown in FIG. 6, which is a cross-sectional view of FIG. 5, the light emitting diode 8 employs a parallel light emitting diode that emits light in a direction parallel to the mounting surface on the printed wiring board 7. .

[0004]

[Patent Document 1]

JP 2003-004492 A

[Problems to be solved by the invention]

Here, the light emitting diode 8 has a property of being deteriorated by heat. If the heat generated by light emission is not efficiently radiated, the heat deterioration is promoted, and the life of the light emitting diode 8 is shortened. I will. However, the printed wiring board 7 studied in the above-mentioned trial production has a poor thermal conductivity because it is made of a glass epoxy base. Therefore, it is disadvantageous for the heat radiation property, and the life of the light emitting diode 8 cannot be extended.

[0006]

Further, when an inexpensive vertical light emitting diode is used as compared with a parallel light emitting diode, the printed wiring board 7 made of glass epoxy is hard and cannot be bent. 7 must be arranged perpendicular to the light guide plate 5.

[0007]

Then, there is a limit in increasing the length L2 of the printed wiring board 7 in the vertical direction (the vertical direction in FIG. 7) of the light guide plate 5 from the viewpoint of suppressing the size of the lighting device from increasing. ($W \times L2$) must be reduced. Therefore, the heat radiation area cannot be sufficiently secured as compared with the heat radiation area ($W \times L1$) of the printed wiring board 7 shown in FIGS. 5 and 6, and the heat deterioration of the light emitting diode 8 is further promoted.

[0008]

In view of the above, the present invention provides a low-cost vertical light-emitting diode while improving the heat dissipation of the printed wiring board to suppress the thermal deterioration of the light-emitting diode and extend the life thereof, and to suppress the enlargement of the lighting device. The purpose is to enable adoption.

[0009]

[Means for Solving the Problems]

In order to achieve the above object, according to the first aspect of the present invention, a light guide plate (5), a light emitting diode (8) arranged to face a side edge (5a) of the light guide plate (5), and a light emitting diode And a printed wiring board (7) on which the light guide diode (8) is mounted. Light incident on the side edge (5a) of the light guide plate (5) from the light emitting diode (8) is illuminated from the surface of the light guide plate (5). As a lighting device for a vehicle display,

As the printed wiring board (7), a metal-based wiring board based on a metal plate (71) is employed, and the printed wiring board (7) starts from a portion facing the side edge (5a) of the light guide plate (5). The light guide plate (5) is bent so as to extend to a portion facing the rear surface of the light guide plate (5).

[0010]

According to this, since a metal-based wiring board is used for the printed wiring board (7), the thermal conductivity of the printed wiring board (7) can be improved as compared with a glass epoxy base wiring board.

[0011]

Further, by bending the printed wiring board (7) as described above, it is possible to secure a large heat radiation area of the printed wiring board (7) while suppressing an increase in the size of the lighting device, and to reduce the cost of the light emitting diode (8). A vertical light emitting diode can be employed.

[0012]

As described above, according to the present invention, the heat dissipation of the light emitting diode (8) can be suppressed by improving the heat dissipation of the printed wiring board (7), the life of the light emitting diode (8) can be extended, and the lighting can be achieved. An inexpensive vertical light emitting diode can be employed while suppressing an increase in the size of the device.

[0013]

By the way, in the lighting device for studying the prototype shown in FIGS. 5 and 6 in which the printed wiring board (7) is arranged so as to be parallel to the light guide plate (5), the light emitting diode (8) is connected to the light guide plate (5).), A plurality of them cannot be arranged side by side in the direction perpendicular to), and it has been difficult to increase the luminance of the illumination light.

[0014]

On the other hand, according to the present invention in which the printed wiring board (7) is bent as described above, a portion of the printed wiring board (7) opposed to the side edge (5a) is formed as described in claim 2. In addition, a plurality of light emitting diodes (8) can be arranged side by side in a direction perpendicular to the light guide plate (5), and the luminance of the illumination light can be easily increased.

[0015]

Further, as the number of light emitting diodes (8) increases, it is required to improve the heat radiation of the printed wiring board (7). It is preferred to use a good invention.

[0016]

The invention according to claim 3 is characterized in that at least one of a through hole (7b), a notch (7d) and a recess is provided in the bent portion (7a) of the printed wiring board (7). The printed wiring board (7) can be easily bent.

[0017]

According to the fourth aspect of the present invention, since the heat radiation space (9) is formed between the printed wiring board (7) and the light guide plate (5), the air in the heat radiation space (9) is naturally convected. Alternatively, the heat dissipation of the printed wiring board (7) can be further improved by circulating by forced convection.

[0018]

According to the fifth aspect of the present invention, on the back surface of the light guide plate (5), there is provided a reflection plate (6) for reflecting light incident from the side edge (5a) to the front surface side of the light guide plate (5). If such a configuration is adopted, it is preferable that a heat radiation space (9) is formed between the reflector (6) and the printed wiring board (7).

[0019]

The invention according to claim 6 is characterized in that a plurality of ventilation holes (7c) are formed in a portion of the printed wiring board (7) facing the back surface of the light guide plate (5). The air can flow through the ventilation holes (7c), and the heat dissipation of the printed wiring board (7) can be further improved.

[0020]

Examples of the material of the metal plate (71) include aluminum, copper, iron, and the like. However, if the metal plate (71) is made of aluminum as in the invention of claim 7, heat dissipation is improved. It is advantageous for.

[0021]

Further, the "metal-based wiring board" according to the present invention includes a well-known metal base wiring board, a metal core wiring board, and an enameled wiring board.) Also includes a printed wiring board (7) in which a flexible printed board (72) is closely attached to the printed wiring board (72).

[0022]

In the implementation of the invention described in claim 8, the flexible printed circuit board (72) is provided at least on a portion of the printed wiring board (7) facing the side edge (5a) of the light guide plate (5). Just fine.

[0023]

Here, when the flexible printed board (72) is provided on the entire surface of the printed wiring board (7), light is emitted to a portion of the flexible printed board (72) facing the back surface of the light guide plate (5). Electronic components other than the diode (8) can be mounted. However, in the above case, a portion corresponding to the bent portion (7a) of the flexible printed board (72) may be damaged by the bending.

[0024]

Therefore, according to the ninth aspect of the present invention, in the printed wiring board (7), the area from the portion facing the back surface of the light guide plate (5) to the bent portion (7a) is eliminated from the flexible printed circuit board (72). And formed only from the metal plate (71).

[0025]

Thereby, the damage due to the bending of the flexible printed board (72) described above can be avoided. In addition, since the metal plate (71) is exposed in the portion of the printed wiring board (7) facing the back surface of the light guide plate (5), the heat dissipation of the printed wiring board (7) is further improved. be able to.

[0026]

According to the tenth aspect of the present invention, in the printed wiring board (7), the region from the portion facing the back surface of the light guide plate (5) to the bent portion (7a) is made of metal of the flexible printed board (72). It is characterized in that the contact with the plate (71) is eliminated.

[0027]

Thereby, as compared with the case where the flexible printed circuit board (72) is brought into close contact with all the regions, the damage due to the bending of the flexible printed circuit board (72) can be suppressed, and the heat dissipation of the printed wiring board (7) can be improved. . Further, other electronic components other than the light source (8) can be mounted on the portion of the printed wiring board 7 facing the back surface 5c of the light guide plate 5, and the space on the back surface side of the light guide plate 5 can be effectively used.

[0028]

It should be noted that reference numerals in parentheses of the above-described units are examples showing the correspondence with specific units described in the embodiments described later.

[0029]

BEST MODE FOR CARRYING OUT THE INVENTION

Hereinafter, embodiments of the present invention will be described with reference to the drawings.

[0030]

(1st Embodiment)

In the present embodiment, the present invention is applied to a lighting device of a display installed on an instrument panel of a vehicle, and the lighting device of the present embodiment functions as a backlight of a liquid crystal panel 2 described later. is there. Specific examples of the display include a meter such as a speedometer and a tachometer, and a display of a navigation device.

[0031]

FIG. 1 is an exploded perspective view of a display according to the present embodiment. The display includes a cover 1, a liquid crystal panel 2, an optical sheet 3, a diffusion sheet 4, a light guide plate 5, a reflection plate 6, a printed wiring board 7, and It comprises a light emitting diode 8 and the like. The lighting device includes at least a light guide plate 5, a printed wiring board 7, and a light emitting diode 8.

[0032]

The liquid crystal panel 2 is supported by a portion of the cover 1 on the vehicle interior side (upper portion in FIG. 1) and employs a well-known STN. Below the liquid crystal panel 2, an optical sheet 3, a diffusion sheet 4, a light guide plate 5, a reflection plate 6, and a printed wiring board 7 are sequentially stacked and arranged, all of which are incorporated and held in the cover 1. I have.

[0033]

The optical sheet 3 reflects light that is perpendicularly incident on the sheet surface from the back surface side of the sheet surface (the lower side in FIG. 1) and does not transmit the light. The light is transmitted to the front side of the sheet while being refracted in the vertical direction. The optical sheet 3 is formed by laminating two optical sheets, and the two optical sheets are arranged such that the specific directions are different by 90 degrees.

[0034]

The diffusion sheet 4 diffuses the light incident from the back side (the lower side in FIG. 1) of the diffusion sheet 4 and transmits the light to the front side (the upper side in FIG. 1). Light of uniform brightness is emitted toward the liquid crystal panel 2.

[0035]

The light guide plate 5 guides light incident from the side edge 5a to the inside, and emits it as illumination light from the surface 5b of the light guide plate. In the present embodiment, light is incident from only one of the four side edges 5a. However, in the embodiment of the present invention, light may be incident from other facing surfaces.

[0036]

The reflection plate 6 is disposed in close contact with the back surface 5c of the light guide plate 5 and, among the light incident from the side edge 5a, the light that is about to leak out from the back surface 5c of the light guide plate 5 and the front surface 5b of the light guide plate 5. The light is reflected to the side, and the luminance of the illumination light to the liquid crystal panel 2 is improved.

[0037]

FIG. 2 is a cross-sectional view of FIG. 1 showing the light guide plate 5, the reflection plate 6, the printed wiring board 7, and the light emitting diode 8, and as shown in FIG. The metal-based wiring board in which the metal plate 71 occupies half or more of the above is adopted.

[0038]

The metal-based wiring board 7 according to the present embodiment is configured such that a flexible printed board 72 is adhered to a metal plate 71, and the flexible printed board 72 and the metal plate 71 are adhered to each other by bonding with an adhesive. Alternatively, the insulating layer of the flexible printed circuit board 72 may be adhered to the metal plate 71 by thermocompression bonding.

[0039]

Examples of the material of the metal plate 71 include aluminum, copper, iron, and the like. In the present embodiment, aluminum, which is advantageous for heat dissipation and bending workability, is employed. The flexible printed board 72 may be a well-known one, for example, one obtained by printing a conductor pattern on an insulating film such as a polyimide film or a polyester film.

[0040]

The printed wiring board 7 configured as described above is bent so as to extend from a portion facing the side edge 5a of the light guide plate 5 to a portion facing the back surface 5c of the light guide plate 5. A plurality of through holes 7b are arranged in the bent portion 7a of the printed wiring board 7 in a bending direction (a direction perpendicular to the paper surface of FIG. 2), thereby facilitating the bending of the printed wiring board 7.

[0041]

Further, a heat radiation space 9 is formed between a portion of the printed wiring board 7 facing the back surface 5c of the light guide plate 5 (a portion corresponding to the reference numeral L4 in FIG. 1) and the reflection plate 6. The reflector 6 has a plurality of ribs 6a extending in the heat radiation space 9 toward the printed wiring board 7. By contacting the ribs 6a with the printed wiring board 7, the printed wiring board 7 and the reflection plate 6 are prevented from being bent and deformed.

[0042]

A plurality of ventilation holes 7c are formed in a portion of the printed wiring board 7 facing the back surface 5c of the light guide plate 5. The ventilation hole 7c is arranged so as not to interfere with the end face of the rib 6a.

[0043]

The light emitting diodes 8 are arranged to face the side edges 5a of the light guide plate 5, and are arranged in a direction perpendicular to the light guide plate 5 (up and down direction in FIG. 2), and at the same time, A plurality are also arranged in the direction. The light emitting diode 8 is surface-mounted on a portion of the printed wiring board 7 facing the side edge 5a of the light guide plate 5. As the light emitting diode 8, a vertical light emitting diode that emits light in a direction perpendicular to the mounting surface on the printed wiring board 7 is employed.

[0044]

Next, the operation of the display and the illuminator according to the above configuration will be described. When the light emitting diode 8 is driven by a drive circuit (not shown), the light emitted from the light emitting diode 8 enters the side edge 5a of the light guide plate 5. , Into the light guide plate 5. Thereafter, the light is emitted from the surface 5b of the light guide plate 5 toward the diffusion sheet 4 as illumination light. Light that is about to leak out from the back surface 5c of the light guide plate 5 is reflected by the reflection plate 6 toward the front surface 5b. Thereafter, the light passes through the diffusion sheet 4, the optical sheet 3, and the liquid crystal panel 2 and is emitted from the liquid crystal panel 2 as predetermined display image light.

[0045]

Here, the light emitting diode 8 has a property of being deteriorated by heat. If the heat generated by light emission is not efficiently radiated, the heat deterioration is promoted, and the life of the light emitting diode 8 is shortened. I will. Moreover, since the lighting device of the present embodiment is disposed in the vehicle interior, the ambient temperature of the light emitting diode 8 may be about 70 ° C., and particularly, improvement in heat radiation is required. Further, in the present embodiment, since the light emitting diodes 8 are provided in a plurality of rows in order to increase the brightness of the display image light, improvement in heat dissipation is required.

[0046]

On the other hand, in the present embodiment, since the metal-based wiring board is used for the printed wiring board 7, the heat of the light emitting diode 8 is easily radiated by the printed wiring board 7. Therefore, it is possible to suppress the thermal deterioration of the light emitting diode 8 and extend the life of the light emitting diode 8.

[0047]

More specifically, the heat of the light emitting diode 8 is transmitted to the metal plate 71 via the flexible printed board 72 of the printed wiring board 7, but the flexible printed board 72 is very thin, and the flexible printed board 72 is Since it is in close contact with the metal plate 71, heat is efficiently transmitted to the metal plate 71. Since the metal plate 71 has high thermal conductivity, heat is efficiently conducted inside the metal plate 71. As described above, the heat dissipation by the printed wiring board 7 can be enhanced.

[0048]

In the present embodiment, since the printed wiring board 7 is bent so as to extend from the portion facing the back surface 5c of the light guide plate 5 to the portion facing the side edge 5a, the direction perpendicular to the light guide plate 5 is provided. A large heat dissipation area ($W \times (L1 + L2)$) of the printed wiring board 7 can be secured while suppressing an increase in the size of the lighting device due to the extended printed wiring board 7. Moreover, by bending the printed wiring board 7 as described above, an inexpensive vertical light emitting diode can be adopted as the light emitting diode 8.

[0049]

Here, it is desirable that the clearance between the side edge 5a of the light guide plate 5 and the light emitting diode 8 be as small as possible to improve the amount of light incident on the side edge 5a. However, if the clearance is too small, the light guide plate 5 may thermally expand and the side edge 5a may hit the light emitting diode 8. In the case where the parallel light emitting diode 8 is employed as shown in FIG. 6, when the light guide plate 5 hits as described above, a shearing stress is generated at the soldered portion of the light emitting diode 8, and the soldering is performed. It is easy to cause damage to the part.

[0050]

On the other hand, in the present embodiment, since the vertical light emitting diode 8 is employed, even if the light guide plate 5 is hit, a compressive stress is generated in the soldered portion. The risk of breakage of the soldered portion can be reduced as compared with the case of adoption.

[0051]

By the way, when the printed wiring board facing the back surface 5c of the light guide plate 5 and the printed wiring board facing the side edge 5a are separately formed and the two wiring boards are connected to each other, the heat transfer resistance at the connecting portion is reduced. Becomes large. On the other hand, in this embodiment, since one printed wiring board 7 is formed by bending, the thermal conductivity of the printed wiring board 7 can be increased.

[0052]

Further, in the present embodiment, since the heat radiation space 9 is formed between the printed wiring board 7 and the reflection plate 6, the air in the heat radiation space 9 is circulated by forced convection by a fan or the like or natural convection. Thus, the heat dissipation of the printed wiring board 7 can be further enhanced.

[0053]

Further, in the present embodiment, since a plurality of ventilation holes 7c are formed in a portion of the printed wiring board 7 facing the back surface 5c of the light guide plate 5, air may flow through the ventilation holes 7c. As a result, the heat dissipation of the printed wiring board 7 can be further enhanced.

[0054]

(2nd Embodiment)

In the first embodiment, the through hole 7b is provided in the bent portion 7a of the printed wiring board 7, whereas in the present embodiment, the bent portion 7a of the printed wiring board 7 is bent as shown in FIG. A notch 7d extending in the direction is provided. This also makes it easy to bend the printed wiring board 7. FIG. 3 is a diagram showing a state before the printed wiring board 7 is bent into a predetermined shape.

[0055]

In implementing the present invention, a similar effect can be obtained by providing a recess instead of the notch 7d.

[0056]

(Third embodiment)

In the first and second embodiments, the entire surface of the flexible printed board 72 is brought into close contact with the metal plate 71. On the other hand, in the present embodiment, as shown in FIG. 4, a region (a region indicated by reference numeral A1) from the portion of the printed wiring board 7 facing the side edge 5a of the light guide plate 5 to the bent portion 7a is a diagram. 4, the area from the part facing the back surface of the light guide plate 5 to the bent part 7 a (the area indicated by reference numeral A 2) is a flexible printed circuit board 72. Is not in close contact.

[0057]

Thereby, as compared with the case where the flexible printed circuit board 72 is adhered to all the areas, the damage due to the bending of the flexible printed circuit board 72 can be suppressed, and the heat dissipation of the printed wiring board 7 can be improved. Further, other electronic components (for example, resistors) 8a other than the light source 8 can be mounted on the portion of the printed wiring board 7 facing the back surface 5c of the light guide plate 5, and the space on the back surface side of the light guide plate 5 is effectively used. Available.

[0058]

(Other embodiments)

In each of the above embodiments, the flexible printed circuit board 72 is provided on the entire surface of the printed wiring board 7. However, in the embodiment of the present invention, the printed wiring board 7 is bent from a portion facing the back surface 5c of the light guide plate 5. The area extending to the portion 7a may be formed only of the metal plate 71 without the flexible printed circuit board 72. Thereby, damage at the bent portion 7a of the flexible printed board 72 can be avoided. In addition, since the metal plate 71 is exposed in the portion of the printed wiring board 7 facing the back surface 5c of the light guide plate 5, the heat dissipation of the printed wiring board 7 can be further improved.

[0059]

When the flexible printed circuit board 72 is provided on the entire surface of the printed wiring board 7, electronic components other than the light-emitting diodes 8 are also mounted on a portion of the printed wiring board 7 facing the back surface 5c of the light guide plate 5. it can.

[0060]

In addition, the metal-based wiring board 7 of each of the above embodiments is configured such that the flexible printed board 72 is in close contact with the metal plate 71, but the metal-based wiring board 7 of the present invention is not limited to this. As the system wiring board 7, for example, a known metal base wiring board, a metal core wiring board, an enameled wiring board, or the like is used.

[0061]

In each of the above embodiments, a plurality of light emitting diodes 8 are arranged in a row in the direction in which the side edge 5a extends, and are arranged in a row in a direction perpendicular to the light guide plate 5. In practicing the invention, the light emitting diodes 8 may be arranged in only one row.

[Brief description of the drawings]

FIG. 1 is an exploded perspective view of a vehicle display according to a first embodiment of the present invention.

FIG. 2 is a sectional view of FIG. 1 showing a light guide plate 5, a reflection plate 6, a printed wiring board 7, and a light emitting diode 8.

FIG. 3 is a perspective view showing a printed wiring board 7 and a light emitting diode 8 according to a second embodiment of the present invention, showing a state before the printed wiring board 7 is bent into a predetermined shape.

FIG. 4 is a side view showing a printed wiring board 7, a light emitting diode 8, and the like according to a third embodiment of the present invention.

FIG. 5 is an exploded perspective view of a vehicle display provided with a lighting device studied and manufactured by the present inventors.

FIG. 6 is a cross-sectional view of FIG. 5, showing a light guide plate 5, a reflection plate 6, a printed wiring board 7, and a light emitting diode 8.

7 is a cross-sectional view showing a state in which the orientation of a printed wiring board 7 is changed in the lighting device of FIG. 6;

[Explanation of symbols]

5 light guide plate, 5a side edge, 7 printed wiring board,

8: Light-emitting diode, 71: Metal plate.

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WO2012017725A1 *	2010-08-06	2012-02-09	住友電気工業株式会社	Substrate module for having heat generating source mounted thereon, and lighting device
US8269911B2	2007-10-31	2012-09-18	Hitachi Displays, Ltd.	Liquid crystal display device
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Family To Family Citations				

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JP2011146225A	2011-07-28	Light source device and backlight device equipped therewith

Priority And Related Applications

Priority Applications (1)

Application	Priority date	Filing date	Title
JP2003072187A	2003-03-17	2003-03-17	Lighting device for vehicular indicator

Applications Claiming Priority (1)

Application	Filing date	Title
JP2003072187A	2003-03-17	Lighting device for vehicular indicator

Legal Events

Date	Code	Title	Description
2005-04-20	A621	Written request for application examination	Free format text: JAPANESE INTERMEDIATE CODE: A621

Date	Code	Title	Description
			Effective date: 20050419
2007-02-07	A131	Notification of reasons for refusal	Free format text: JAPANESE INTERMEDIATE CODE: A131 Effective date: 20070206
2007-04-04	A521	Request for written amendment filed	Free format text: JAPANESE INTERMEDIATE CODE: A523 Effective date: 20070403
2007-05-30	A02	Decision of refusal	Free format text: JAPANESE INTERMEDIATE CODE: A02 Effective date: 20070529

Concepts

machine-extracted

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Name	Image	Sections	Count	Query match
metal		claims,abstract,description	40	0.000
metal		claims,abstract,description	40	0.000
radiation		claims,description	15	0.000
illumination		claims,description	11	0.000
ventilation		claims,description	7	0.000
aluminium		claims,description	5	0.000
aluminium		claims,description	5	0.000
heat dissipation		abstract,description	17	0.000
catabolic process		abstract	1	0.000
degradation reaction		abstract	1	0.000
Show all concepts from the description section				

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