

LED TRAFFIC INFORMATION BILLBOARD DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to traffic signs and traffic information billboards, and more particularly to a light emitting diode (LED) traffic information billboard device capable of controlling the distribution of light to enhance visibility and eliminate the glare of the LED.

2. Description of the Related Art

10 Since the first LED was developed successfully in 1962, LED has become a popular device used extensively in many areas now. When the LED starts its application in traffic lights and traffic billboards, people get to know the LED more and have a deep impression on its advantages.

 In general, the light emission property of the LED depends on the chip and package
15 of the LED, and most conventional LED traffic lights or traffic billboards come with a bullet-shape or a SMD package, so that light can be emitted with a forward wide angle or a symmetrical light pattern of circular or elliptical. However, traffic signals or traffic billboards are intended for providing an approaching car coming from the opposite lane or a pedestrian to view related signs or information. Obviously, an LED display with the
20 symmetric light pattern may project some of the lights in a direction that does not require the viewing of the information. To overcome this problem, the conventional LED display provides a cover plate to block such light which is considered as an invalid light source. This arrangement not only loses a part of the light effect of the overall device, but also wastes unnecessary electric power.

In general, a conventional advertising billboard has a light source with a wider angle to allow people to see the display content at different angles or from different directions. However, the light of the light source of the traffic signal or the billboard may scatter arbitrarily to cause an environmental light pollution, and the residents nearby may require
5 curtains to be installed on windows to block the externally incident light projected from the traffic signal light or traffic billboard.

Obviously, the conventional devices has to overcome the aforementioned problems and control the distribution of light in order to avoid creating unnecessary waste on superimposed lights and causing environmental light pollution. Therefore, it is an
10 important and urgent subject for related manufacturers and designers to develop a LED traffic information billboard device capable of collecting wide-angle lights and projecting the light out at a specific angle and in a specific direction, so as to enhance the lighting effect of the display as well as eliminating the glare of the LED and protecting the LED light source.

15 SUMMARY OF THE INVENTION

In view of the problems of the prior art, it is a primary objective of the present invention to provide an LED traffic information billboard device to overcome the foregoing problems of the prior art

To achieve the aforementioned objective, the present invention provides an LED
20 traffic information billboard device vertically installed on a road to remind a pedestrian or an approaching car to pay attention to the current traffic signal, comprising a light source module and a secondary optical element, and the light source module includes a plurality of LEDs and a substrate, and the LEDs are arranged in a matrix on the substrate, characterized in that the secondary optical element is installed on the LEDs, and all lights

emitted from the LEDs pass that the secondary optical element to produce a deflected beam, and the deflected beam is concentrated and projected at the pedestrian or the approaching car. Wherein, the secondary optical element is a lens, a reflecting cover or a refractive plate, and the lens includes a lens body, and the lens body includes a light exit surface, a reflecting curved surface and a light incident surface, and the light exit surface is an asymmetrical surface with a protruding end to form a bevel surface, and the reflecting curved surface is formed by a plurality of surface points, and a side edge of the reflecting curved surface is coupled to the light exit surface, and the other side of the reflecting curved surface is coupled to the light incident surface, and the light incident surface has a containing space concavely formed thereon and provided for containing the LEDs. The center of the light incident surface is defined as an origin of three-dimensional coordinates, and two lines intersecting with each other at the center are defined as the X-axis and Y-axis respectively, and the lens body is situated on a plane of the X- Z axis coordinates, and the reflecting curved surface and the light incident surface are mirror symmetric along the Y-axis. The lens body has the containing space concavely formed at the light incident surface and having a depth of 1.04 centimeter. The refractive plate refractive plate is installed on the LEDs, such that the lights emitted from the LEDs are passed through the refractive plate and reflected to produce the deflected beam, and the deflected beam is a polarized light beam. The reflecting cover is covered onto the LED, so that the lights emitted from the LEDs are reflected from the reflecting cover to form the deflected beam with the deflection angle.

In the description above, the lens body has the containing space concavely formed at the light incident surface and having an opening diameter equal to 2.02 centimeters.

The lens further comprises a snap portion disposed on a side of the light exit surface

for limiting the position of the lens and fixing the lens.

Therefore, the LED traffic information billboard device of the present invention can collect wide-angle lights and project the light out with a specific angle from the secondary optical element. With a light source emitted from a specific angle, cars and pedestrians
5 can watch the contents of the billboard from a visible range. With the angle deflection of the emitted light, the light scattering issue can be reduced, so as to avoid the light pollution caused by the light source projecting to the nearby houses or building. In addition, the present invention has a better power saving effect than the prior art.

BRIEF DESCRIPTION OF THE DRAWINGS

10 FIG. 1A is a schematic view of an LED traffic information billboard device of a preferred embodiment of the present invention;

FIG. 1B is a top view of an LED traffic information billboard device of a preferred embodiment of the present invention;

15 FIG. 1C is a first cross-sectional view of an LED traffic information billboard device of a preferred embodiment of the present invention;

FIG. 1D is a second cross-sectional view of an LED traffic information billboard device of a preferred embodiment of the present invention;

FIG. 2A is a first schematic view of a secondary optical element of a preferred embodiment of the present invention;

20 FIG. 2B is a second schematic view of a secondary optical element of a preferred embodiment of the present invention; and

FIG. 3 is a schematic view of an LED traffic information billboard device of another preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The technical contents of the present invention will become apparent with the detailed description of preferred embodiments and the illustration of related drawings as follows. It is noteworthy that same numerals are used for respecting the same elements
5 respectively.

In the present invention, the LED is preferably manufactured with a SMD packaging structure. With reference to FIG. 1A for a schematic view of an LED traffic information billboard device of a preferred embodiment of the present invention, the LED traffic information billboard device can be a traffic signal or a traffic billboard, and the traffic
10 billboard serves as the LED traffic information billboard device in this preferred embodiment, but the invention is not limited to this arrangement only.

When the LED traffic information billboard device 1 is vertically installed on a road 90, a light source with a stronger intensity for displaying specific information or signal from an appropriate distance to remind an approaching car 91 or a pedestrian is required,
15 and it is necessary to prevent the light source from being scattered or affecting cars on the other lane or pedestrians. The LED traffic information billboard device 1 of the present invention can prevent the light source of the traffic signal or traffic billboard from being projected to non-specified areas or nearby houses and buildings, so that the lights of the LED traffic information billboard device 1 can be deflected and collected to provide a
20 better lighting effect.

With reference to FIGS. 1B, 1C and 1D for the top view and the first and second cross-sectional views of an LED traffic information billboard device of a preferred embodiment of the present invention respectively, the LED traffic information billboard device 1 is erected and installed on a road to remind a pedestrian or an approaching car

to pay attention to the current traffic signal or the content of a traffic billboard, and the LED traffic information billboard device 1 comprises a light source module 11 and a secondary optical element 12.

In FIG. 1C and 1D, FIG. 1C shows the cross-section B-B as depicted in FIG. 1B, and FIG. 1D shows the cross-section C-C as depicted in FIG. 1B. The light source module 11 includes a plurality of LEDs 111 and a substrate 112, and the LEDs 111 are arranged in a matrix and installed on the substrate 112. The secondary optical element 12 is installed on the LEDs 111 and the lights emitted from the LEDs 111 are passed through the secondary optical element 12 and deflected to produce a deflected beam L, so that the deflected beam L can be projected directly onto the pedestrian or the approaching car.

In this preferred embodiment, the secondary optical element 12 is preferably a lens. The lens includes a lens body 121 coupled to the lens and sheathed on the plurality of LEDs 111. The lens body 121 further includes a snap portion 1214 disposed on a side of the light exit surface for limiting the position of the lens body 122 and fixing the lens body 121.

Therefore, if the LED traffic information billboard device 1 of the present invention is installed at a high position of the road, a traveling car in a specific lane or area or pedestrian can see the signals clearly from an appropriate distance, and the glare of the LED can be eliminated, and the scattering light beams are prevented from being projected to nearby houses or buildings.

Compared with the conventional LED traffic information billboard device, the LED traffic information billboard device 1 of the present invention can concentrate the light beam, so that when the light beam is deflected to a specific angle, the light intensity of the beam can be enhanced. In other words, the LED traffic information billboard device

1 of the present invention can achieve the power saving effect while maintaining the light intensity of the conventional LED traffic information billboard device.

With reference to FIGS. 2A and 2B for the first and second schematic views of a secondary optical element of a preferred embodiment of the present invention, FIG. 2A shows the section D of FIG. 1C, and FIG. 2B shows the section E of FIG. 1D. In FIGS. 2A and 2B, the lens body 121 includes a light exit surface 1211, a reflecting curved surface 1212 and a light incident surface 1213, wherein the light exit surface 1211 is an asymmetrical surface with a protruding end to form a bevel surface, and the reflecting curved surface 1212 is formed by a plurality of surface points, and a side edge of the reflecting curved surface 1212 is coupled to the light exit surface 1211 and the other side edge of the reflecting curved surface 1212 is coupled to the light incident surface 1213, and the light incident surface 1213 has a containing space concavely formed thereon for containing the LEDs 111.

To further elaborate the structure of the lens body 121 of the present invention as shown in FIG. 2B, refer to the relative structural position as shown in FIG. 2A, wherein the containing space of the lens body 121 is concavely formed at the light incident surface 1213 and having a depth of 1.04 cm, and an opening with a diameter of 2.02 cm. The diameter at the bottom of the light incident surface 1213 is equal to 2.35 cm. The snap portion 1214 has a height of 1.2 cm, and the light exit surface 1211 has a width of 6 cm, and the distance between two lens bodies 121 is equal to 3.2 cm.

In addition, the center of the light incident surface 1213 is defined as the origin of three-dimensional coordinates, and two straight lines intersected at the center are defined as the X-axis and the Y-axis respectively, and the lens body 121 is situated on a plane of the X- Z axis coordinates, and the reflecting curved surface 1212 and the light incident

surface 1213 are mirror symmetric along the Y-axis.

With reference to FIG. 3 for a schematic view of an LED traffic information billboard device of another preferred embodiment of the present invention, if the secondary optical element is a refractive plate 122, the refractive plate 122 is installed on LED 111, so that the lights emitted from the LEDs 111 can be deflected by the refractive plate 122 to produce the deflected beam L, wherein the deflected beam L is a polarized light.

In addition, the reflecting cover (not shown in the figure) can be sheathed on the LED in other embodiments, so that the lights emitted from the LEDs are reflected from the reflecting cover to form the deflected beam with the deflection angle.

In summation of the description above, the LED traffic information billboard device of the present invention has the following advantages:

(1) The LED traffic information billboard device of the present invention can improve the visible distance by emitting the light source according to the requirement of traffics and roads, so that a car or a pedestrian within the visible range can see the content of the billboard clearly.

(2) The LED traffic information billboard device of the present invention can reduce the light scattering issue by the angle defection of the emitted light beam, so as to prevent the light source from being projected to nearby houses and building that may cause a light pollution.

(3) The LED traffic information billboard device of the present invention can concentrate the light source and deflect the light beam emitted from the secondary optical element to achieve the effect of enhancing the light intensity of the beam and provide a better power saving effect than the prior art.

WHAT IS CLAIMED IS:

1. A light emitting diode (LED) traffic information billboard device, erected on a road for reminding a pedestrian or an approaching car to pay attention to the current traffic signal, comprising a light source module and a secondary optical element, and
5 the light source module including a plurality of LEDs and a substrate, and the LEDs being arranged in a matrix on the substrate, characterized in that: the secondary optical element is installed on the LEDs, and all lights emitted from the LEDs pass that the secondary optical element to produce a deflected beam, and the deflected beam is concentrated and projected at the pedestrian or the approaching
10 car; wherein the secondary optical element is a lens, a reflecting cover or a refractive plate, therein the lens includes a lens body, and the lens body includes a light exit surface, a reflecting curved surface and a light incident surface, and the light exit surface is an asymmetrical surface with a protruding end to form a bevel surface, and the reflecting curved surface is formed by a plurality of surface points, and a
15 side edge of the reflecting curved surface is coupled to the light exit surface, and the other side edge of the reflecting curved surface is coupled to the light incident surface, and the light incident surface has a containing space concavely formed thereon and provided for containing the LEDs; the refractive plate is installed on the LEDs, such that the lights emitted from the LEDs are passed through the refractive
20 plate and reflected to produce the deflected beam, and the deflected beam is a polarized light beam; the reflecting cover is covered onto the LED, so that the lights emitted from the LEDs are reflected from the reflecting cover to form the deflected beam with the deflection angle;
wherein the center of the light incident surface is defined as an origin of three-

dimensional coordinates, and two lines intersecting with each other at the center are defined as the X-axis and Y-axis respectively, and the lens body is situated on a plane of the X- Z axis coordinates, and the reflecting curved surface and the light incident surface are mirror symmetric along the Y-axis; wherein the LED traffic information billboard device of claim 1, wherein the lens further comprises a snap portion disposed on a side of the light exit surface for limiting the position of the lens and fixing the lens.

2. The LED traffic information billboard device of claim 1, wherein the lens body has the containing space concavely formed at the light incident surface and having a depth of 1.04 centimeter.

3. The LED traffic information billboard device of claim 1, wherein the lens body has the containing space concavely formed at the light incident surface and having an opening diameter equal to 2.02 centimeters.