Abstract: Disclosed is a road stud, which converts solar energy into electric energy and emits light using the electric energy. The road stud includes a receptacle space disposed in an upper portion of a support plate, a base disposed at a lower portion of the support plate and having a fixing shaft projected downwardly, a luminescent unit having a plurality of luminescent elements emitting light using solar energy, the luminescent unit being put in the receptacle space, light emitting members serving to emit the light generated from the luminescent unit at wide visible angles and to reflect the light emitted from a headlamp of a vehicle, a cover supporting the luminescent unit and the light emitting members to prevent a movement of internal elements and to protect the internal elements from an external shock, and fixing members for coupling and fixing the cover and the light emitting members.
ROAD STUD USING SOLAR CELL

BACKGROUND OF THE INVENTION

1. **Field of the Invention**

   The present invention relates to a road stud using a solar cell.

2. **Description of the Related Art**

   In general, a road stud is installed at the center or the border of a road as shown in Fig. 1 and reflects light from a headlamp of a vehicle or performs a self-emission of light to allow a driver to discriminate a traffic lane or confirm the extent of a curve of the road at night or in foul weather.

   The road stud is exposed on the ground when a road is constructed and includes a display part having a reflection member or a luminous member laid under the ground, and a support part for protecting the display part from a physical strength, such as a rotary power, a pull-out strength, or the likes, with which the road stud may be confronted, to make the road stud fulfill its function well.

   As shown in Fig. 2, a typical road stud includes a display part 1 having a reflection part 4 disposed on an inclined surface 3 and a support part 2 formed downwardly in the form of a ‘+’ symbol to prevent a rotation of the road stud and resist to a pull-out strength by increasing a surface area. The reflection part 4 has a plurality of reflection members 5 at front and rear portions for radiating light.

   However, because the typical road stud uses only a reflection action by a headlamp of a vehicle, a visible range is narrow and an angle of visibility is small, and thereby the road stud cannot guide the vehicle well in a curved road or at night.
Furthermore, since the road stud is manufactured integrally to use a prescribed period of time until it is damaged, if a portion of the road stud is damaged or the function of the reflection members 5 is lowered, the whole device must be replaced, and thereby the maintenance duration becomes short and an economical efficiency is lowered.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a road stud, of which a visible range is widened, maintenance fees are reduced, and an emitted angle of light is widened to increase a visible angle, and which provides a convenience in maintenance and management by making a top portion of the road stud easily be opened and shut when the road stud is applied actually.

To achieve the above object, the present invention provides a road stud comprising a receipt space disposed in an upper portion of a support, a base disposed at a lower portion of the support plate and having a fixing shaft projected downwardly, a luminescent unit having a plurality of luminescent elements emitting light using solar energy, the luminescent unit being put in the receipt space, light emitting members serving to emit the light generated from the luminescent unit at wide visible angles and to reflect the light emitted from a headlamp of a vehicle, a cover supporting the luminescent unit and the light emitting members to prevent a movement of internal elements and to protect the internal elements from an external shock, and fixing members for coupling and fixing the cover and the light emitting members.
BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages of the invention can be more fully understood from the following detailed description taken in conjunction with the accompanying drawings in which:

5 Fig. 1 is a view showing a state that a road stud is installed in the road;

Fig. 2 is a perspective view of a conventional road stud;

Fig. 3 is a perspective view of the present invention;

Fig. 4 is an exploded perspective view of the present invention; and

Fig. 5 is a sectional view of the present invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention will now be described in detail in connection with preferred embodiments with reference to the accompanying drawings. For reference, like reference characters designate corresponding parts throughout several views.

15 The present invention relates to a road stud converting solar energy into electric energy using a solar cell and emitting light using electric energy, and for indicating a traffic lane while being charged or discharged according to weather conditions.

The present invention includes a base 10, a luminescent unit 20, a light emitting member 30 and a cover 40.

20 The base 10 receives the luminescent unit 20, the light emitting member 30 and cover 40 in a detachable manner and is adhered on a road surface. The base 10 includes a support plate 11 of a prescribed thickness, which has upper and lower planes, a fixing shaft 12 projected downwardly at a lower center of the support plate 11, a receipt space
13 formed in an upper center of the support plate 11, gates 14 formed and opened at the centers of front and rear side walls 15 of the receipt space 13, light emitting projections 16 formed on external surfaces of the front and rear side walls 15, fastening holes 17 formed on external surfaces of the left and right side walls 15' of the receipt space 13, and fixing holes 18 formed in the external surfaces of the left and right side walls 15' of the receipt space 13.

The fixing shaft 12 is a cylindrical shaft for providing bearing capacity when the road stud is installed in the road, and has a plurality of fixing plates 121 of a disc shape, which are parallel with the support plate 11 and have a prescribed thickness, a fixing projection 122 of an arrowhead shape formed at a front end, a plurality of fixing ribs 123 formed at an upper portion and being at right angles to the support plate 11 in a longitudinal direction of the fixing shaft.

The fixing plates 121 serve to increase a contact area of an adhesive member for adhering and putting under the ground the road stud, and the fixing projection 122 serves to protect the present invention from a pull-out force that the road stud is pulled out by an external shock. Additionally, the fixing ribs 123 serve to protect the road stud from the external shock, which tends to rotate the present invention.

The receipt space 13 for receiving the luminescent unit 20 includes the gates 14 formed and opened at the centers of the front and rear side walls 15 for receiving a light emitted diode (LED) case 213 of the luminescent unit 20, and the light emitting projections 16 of a wedge shape formed on the external surfaces of the front and rear side walls 15 and having two inclined surfaces 161 and 162 inclined from the external surface to the outside. Each of the light emitting projection has an internal inclined surface
being a light guiding surface 161 for guiding light emitted from the luminescent unit 20 and an external inclined surface being a light reflection surface 162 for supporting a reflection part 312 of the light emitting member 30 and reflecting light entered through a reflection part 312.

The light guiding surface 161 forms a light path with an upper surface of the support plate 11 and a bottom of the cover 40 for guiding light emitted from the LED 26.

The luminescent unit 20, which contains luminescent elements using a solar cell and generates light, includes a case having an upper housing 21 and a lower housing 22, a light collection board 23, a cell 24, a printed circuit board 25 and a LED 26, which are contained in the case.

The lower housing 21 has two receipt openings 211 divided into right and left sides for containing the luminescent elements, and each of the receipt openings 211 has jaws 212 for receiving the light collection board 23 inside and LED cases 213 projected oppositely to each other at the centers of both diagonal sides.

The upper housing 22 is in the form of a cover fit with the lower housing 21 to cover the lower housing 21, and includes a diffusion lens 221 disposed on the surface corresponding to an front surface of the LED case 213 of the for diffusing the light emitted from the LED case 213.

The light emitting members 30 are mounted at the front and rear portions of the base 10 to emit the light generated in the luminescent unit 20 or reflect the light irradiated from the outside, such as a headlamp of a vehicle. Each light emitting member 30 includes a body 31 of a round shape inclined to the outside and coupling sections 32 extending at both ends of the body 31 directly downwardly to fasten the body 31 to the
right and left side walls 15'.

The body 31, which serves as a lens for reflecting or emitting the light, includes an emission part 311 for emitting the light generated from the luminescent unit 20 in a wide visible angle and a reflection part 312 formed integrally with the body 31 for reflecting the light emitted from the headlamp of the vehicle.

The emission part 311 includes a plurality of lenses disposed at the center of the body 31 and having different sizes and refraction angles, and the reflection part 312 includes a plurality of lenses disposed at both sides of the body 31 and having different sizes and refraction angles.

Each of the coupling sections 32 include a coupling hole 321 allowing a fixing member 50 passing through a fixing hole 45 of a side of the cover 40 to pass through the coupling hole 321 to fit in the fixing holes 18 of the right and left side walls 15' of the receipt space 13, thereby holding the light emitting member 30.

The cover 40 is detachably mounted on the upper portion of the base 10 containing the luminescent unit 20 and supports the luminescent unit 20 and the light emitting member 30 to prevent the movement of internal elements of the road stud and to protect the road stud from the external shock. The cover 40 includes a bulkhead 41 disposed at an upper center for preventing a movement of the luminescent unit 20, light collecting holes 42 formed in both sides of the bulkhead 41 for allowing the luminescent unit 20 to receive solar light, receiving holes 43 formed at front and rear portions for receiving the luminescent unit 20 and the light emitting member 30, fastening projections 44 formed at internal surfaces of right and left sides for fixing the cover in such a manner that the cover is inserted into the fastening holes 17 formed at the external surfaces of the
side walls 15', and fixing holes 45 formed at the external surfaces of the right and left sides to fix the cover 40 and the light emitting member 30 in such a manner that the cover 40 and the light emitting member 30 are inserted into the fixing holes 18 formed in the external surfaces of the side walls 15'.

The present invention is assembled in such a manner that the luminescent unit 20 is put in the receipt space 13 of the base 10, the coupling sections 32 of the light emitting members 30 are fit and fixed at both sides of the projections 16, the cover 40 is covered, and the fixing members 50 pass through the fixing hole 45 of the cover 40 and the coupling hole 321 of the coupling section 32 and inserted into the fixing holes 18 of the side walls 15'. The assembly of the present invention will be described in more detail as follows.

First, to assemble the luminescent unit 20, the light collecting plate 23 absorbing solar energy, the cell 24 for converting solar energy absorbed by the light collecting plate 23 into electric energy and charging, the printed circuit board 25 for controlling functions of the above components and the LED 26 generating light by the functions of the above components are connected electrically. After that, the LED 26 is seated on the LED case 213 of the lower housing 21 and the cell 24 and the printed circuit board 25 are seated on the receipt hole 211 respectively. Using silicon, the light collecting plate 23 is seated on the jaw 212 formed on the internal surface of the receipt hole 211, and then, the upper housing 22 is fit and covered on the lower housing 21.

Next, the luminescent unit 20 is put in the receipt space 13 in such a manner that the LED case 213 of the luminescent unit 20 is seated on the gate 14, and then the coupling sections 32 of the light emitting members 30 are fit and fastened to the
projections 16.

Next, the cover 40 is covered and fit on the base 10 in such a manner that the projections 44 are seated in the fastening holes 17 of the external surfaces of the side walls 15' of the receipt space 13.

Finally, the fixing members 50 pass through the fixing holes 45 of the cover 40 and through the coupling holes 321 of the coupling sections 32 of the light emitting members 30 and are fastened in the fixing holes 18 of the base 10, and thereby the assembly of the road stud is finished.

To disassemble the road stud of the present invention, first, after the fixing members 50 are pulled out and the cover 40 is removed, the luminescent unit 20 is took out if necessary, the upper housing 22 is opened and the internal elements are took out or the light emitting member 30 is separated.

Thus, when the repair or the component exchange is required in use, the road stud of the present invention can largely improve a convenience in the maintenance and management since being easy in opening and shutting of an aboveground part.

The operation of the present invention will be described hereinafter.

The light collection board 23 absorbs the solar energy and the cell 24 is charged with the absorbed solar energy, and thereby the solar energy is converted into the electric energy.

At this time, it is preferable that the period of time when the cell 24 is charged with the solar energy absorbed by the light collection board 23 is set as short as possible and the cell 24 is low in service voltage. For this, in the present invention, the cell of 1.2V in service voltage is used and the light collection board 23 of DC 1.5V in output
voltage is used.

The cell 24 differs in output voltage according to day and night, that is, the cell 24 is charged in the daytime when sunlight shines but discharges the charged energy at night to emit light through the LED 26.

That is, if the charging voltage is not generated, the road stud discharges energy to supply voltage, and thereby the LED 26 is turned on. If the charging voltage is generated, the voltage supplied to the LED 26 is blocked to stop the lighting. A series of process to turn on and off the LED 26 repeatedly is continuously performed according to the passage of time and the weather conditions.

The light of the LED 26 passes the light path formed by the light guide surface 161 of the light emitting projection 16, the upper surface of the support plate 11 and the bottom of the cover 40 through the diffusion lens 221 disposed at the front end of the LED case 213, and reaches the light emitting member 30. After that, the light of the LED 26 is emitted to the outside by the emission part 311 of the light emitting member 30, which consists of the plural lenses having different refraction angles. At this time, because the light is emitted at wide angles in all directions, the light of the LED 26 is come within the driver's field of vision in any directions, so that the LED 26 can lead the driver's careful driving.

Furthermore, even though the lighting function of the LED 26 is damaged, the reflection part 312 reflects the light of headlamp of the vehicle, so that the reflection part 312 can lead the driver's careful driving in lieu of the LED 26.

A method for installing the road stud of the present invention will be described hereinafter. First, a hole is formed in a prescribed position of the road, where the road
stud will be installed, with a drill of a fixed size, dust and impurities are removed from the hole and the road surface, epoxy resin for the road are poured in the hole as high as the surrounding asphalt. After that, an adhesive is coated on the lower portion of the road stud, the road stud is inserted into the hole while the road stud is turned to spread the adhesive, the upper portion of the road stud is pressed to adjust the adhered state, and the epoxy resin flowing out from the road stud is removed. By the above method, the road stud of the present invention may be installed in the road surface.

If the road stud of the present invention is installed as described above, the fixing plate 121 of the fixing shaft 12 of the base 10 has a more contact area with the epoxy resin to increase the bearing capacity, the fixing rib 123 protects the road stud from the rotary force, and the fixing projection 122 of the arrowhead formed on the front end protects the road stud from the drawing strength, and thereby the road stud is prevented from being drawn out by any external shock to perform the road indication function safely.

As previously described, the road stud according to the present invention increases a visibility range and reduces the maintenance fee by using a self-luminescent function by the solar cell, increase the visible angle by widening the emitting angle of the light, and increase the convenience in maintenance and management by making the aboveground part of the road stud be opened and shut easily.

Thus, the road stud, which secures the driver’s safety by increasing the guiding function of the vehicles during driving at night, makes the maintenance and management of the road easily and reduces the expenses by increasing the usable duration, can increase the reliability of the product.

While the present invention has been described with reference to the particular
illustrative embodiments, it is not to be restricted by the embodiments but only by the appended claims. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention.
WHAT IS CLAIMED IS:

1. A road stud fixed in a road surface and allowing a driver to discriminate a traffic lane by reflecting light of a headlamp of a vehicle or by performing a self-emission of light, the road stud comprising:

   a base removably receiving a luminescent unit and a light emitting member, the base being adhered on the road surface;

   a luminescent unit containing luminescent elements using a solar cell, the luminescent unit being put in the base and generating light;

   light emitting members mounted at rear and front portions of the base, the light emitting members emitting the light generated from the luminescent unit 20 and reflecting the light entered from the outside; and

   a cover for preventing a movement internal elements of the road stud.

2. The road stud as claimed in claim 1, wherein the base includes a support plate of a prescribed thickness, which has upper and lower planes, a fixing shaft projected downwardly at a lower center of the support plate, a receipt space formed in an upper center of the support plate, gates formed and opened at the centers of front and rear side walls of the receipt space, light emitting projections of a wedge shape formed on external surfaces of the front and rear side walls, fastening holes formed on an external surfaces of the left and right side walls of the receipt space, and fixing holes formed in the external surfaces of the front and rear side walls of the receipt space.
3. The road stud as claimed in claim 2, wherein the fixing shaft includes a plurality of fixing plates of a disc shape, which are parallel with the support plate and have a prescribed thickness, a fixing projection of an arrowhead shape formed at a front end, a plurality of fixing ribs formed at an upper portion and being at right angles to the support plate in a longitudinal direction of the fixing shaft.

4. The road stud as claimed in claim 2, wherein the light emitting projection includes a light guiding surface formed on an internal surface and inclined outwardly and a light reflection surface formed on an external surface and inclined outwardly.

5. The road stud as claimed in claim 1, wherein the luminescent unit includes:
   a lower housing, the lower housing having two receipt openings divided into right and left sides, jaws formed on an internal surface of the receipt openings, and LED cases projected oppositely to each other at the centers of both diagonal sides of the receipt openings;
   an upper housing being in the form of a cover fit with the lower housing, the upper housing having a diffusion lens disposed on the surface corresponding to an front surface of the LED case of the housing;
   a light collection board;
   a cell;
   a printed circuit board; and
   an LED.
6. The road stud as claimed in claim 1, wherein the light emitting member includes:

a body of a round shape inclined to the outside; and

coupling sections extending at both ends of the body directly downward.

7. The road stud as claimed in claim 6, wherein the body includes an emission part disposed at the center of the body, the emission part having a plurality of lenses having different sizes and refraction angles, and a reflection part disposed at both sides of the body, the reflection part having a plurality of lenses having different sizes and refraction angles.

8. The road stud as claimed in claim 1, wherein the cover includes a bulkhead disposed at an upper center, light collecting holes formed in both sides of the bulkhead, receiving holes formed at front and rear sides of a lower portion, projections formed at internal surfaces of right and left sides, and fixing holes formed at the external surface of the right and left sides.

9. The road stud as claimed in claim 1, wherein the luminescent unit is assembled in such a manner that the light collection board, the cell, the printed circuit board and the LED are connected electrically, the LED is seated on the LED case of the lower housing, the cell and the printed circuit board are seated in the receipt holes respectively, the light collection board is seated on the jaw of the receipt hole by using a silicon, and the upper housing is covered on the lower housing,
the luminescent unit is put in the receipt space in such a manner that the LED case part is seated in the gate,

the coupling section of the light emitting member is fit and fixed to the light emitting projection,

5 the cover is covered on the base in such a manner that the projection is seated in the fastening holes of the external surface of the side walls of the receipt space, and

a fixing member is coupled in such a manner that the fixing member passes the fixing hole of the cover and the coupling hole of the coupling section of the light emitting member and is fixed in the fixing hole of the base.

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INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 E01F 9/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 E01F 9/00, E01F 9/04, E01F 9/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KR, JP: classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tbody>
<tr>
<td>X</td>
<td>US 4668120 A (John C. Roberts) 26 MAY 1987</td>
<td>1</td>
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<td>X</td>
<td>US 5074706 A (Harry D. Paulos) 24 DEC 1991</td>
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<td>X</td>
<td>JP 9-3839 A() 7 JAN 1997</td>
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<td>JP 8-311829 A(Y-Tech) 26 NOV 1996</td>
<td>1, 3</td>
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:
  "A" document defining the general state of the art which is not considered to be of particular relevance
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search
16 MARCH 2001 (16.03.2001)

Name and mailing address of the ISA/KR
Korean Industrial Property Office
Government Complex-Taejon, Dunsan-dong, So-ku, Taejon Metropolitan City 302-701, Republic of Korea
Farsimile No. 82-42-472-7140

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