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(54) LIGHT EMITTING ELEMENT LAMP AND LIGHTING EQUIPMENT

LAMPE MIT LICHTEMITTIERENDEM ELEMENT UND BELEUCHTUNGSEINHEIT

LAMPE À ÉLÉMENT ÉMETTEUR DE LUMIÈRE ET ÉQUIPEMENT D'ÉCLAIRAGE

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Description

Technical Field

[0001] The present invention relates to a light emitting element lamp in which a light emitting element such as an LED (light emitting diode) is applied as a light source, and also relates to a lighting equipment which uses the light emitting element lamp.

Background Art

[0002] Light emitting elements such as LEDs are reduced in light output performance as the temperature thereof rise. The temperature rise also affects operating lifetime thereof. Thus, in a lamp in which a solid-state light emitting element such as an LED or an EL element is used as a light source, it is necessary to suppress the temperature of the light emitting element from rising to thereby improve various characteristics such as operating lifetime and efficiency. An LED lamp in which a cylindrical heat radiator is provided between a substrate on which LEDs are provided and a base, and the substrate is attached to a rim of the cylindrical heat radiator to thereby effectively radiate heat has been known as this type of LED lamp (see Patent Document 1 : JP 2005-286267A).

[0003] DE 10 2004 042 0186 A1 discloses an optoelectronic component including a reflector and a base having an electrical circuit integrated into the base.

Disclosure of the Invention

[0004] In the LED lamp disclosed in Patent Document 1, however, the heat radiator is provided specially for the purpose of radiating heat, and a substrate is disposed so as to be in contact only with a rim of the heat radiator. In other words, the heat radiator and the substrate are only in line contact with each other. Thus, it is difficult to obtain a sufficient heat radiation effect.

[0005] The present invention has been made in view of the circumstances mentioned above, and it is an object of the present invention to provide a light emitting element lamp and a lighting equipment or apparatus capable of effectively suppressing a temperature rising of a substrate, on which a light emitting element is mounted, by use of a reflector.

[0006] This object is achieved by a light emitting element lamp according to claim 1 and a lighting equipment according to claim 2.

[0007] A light emitting element lamp of the present invention includes: a heat-conductive reflector provided with an emission opening portion and formed to be widened toward the emission opening portion, and having a reflecting surface being provided on an inner surface side and an outer peripheral surface being exposed to an outside; a base connected to the reflector through a cover; a heat-conductive heat radiating member provided on the inner peripheral surface of the reflector and thermally connected to the reflector; a substrate having a light emitting element mounted thereon and attached to the heat radiating member with a substrate surface being thermally connected to the heat radiating member in a surface contact state; a lighting circuit housed in the cover to light the light emitting element; and a translucent cover covering the emission opening portion of the reflector.

[0008] The light emitting element includes an LED, an organic EL element or the like. The cover portion may be provided integrally with or separately from the reflector. The light emitting element is preferably mounted by chip-on-board technology or surface-mount technology. Because of the nature of the present invention, however, a mounting method is not particularly limited. For example, a bullet-shaped LED may also be mounted on the substrate. The number of light emitting elements to be mounted is also not particularly limited. The lighting circuit may be entirely housed in the cover portion, or may be partially housed in the cover portion with a remaining portion being housed in the base, for example. The reflecting surface may not be provided on the inner surface side of the reflector, but may be provided on the light emitting element side thereof. Moreover, the reflector may be widened continuously, or may be widened gradually, that is, in a discontinuous shape, in a light emitting direction. An E-type base having a threaded shell is most preferable as the base. However, a pin-type base may also be used. The disclosure of "A substrate surface being thermally connected to the heat radiating member in a surface contact state" means not only that the substrate surface is in direct contact with the heat radiating member, but also that the substrate surface is indirectly connected to the heat radiating member via a heat-conductive member.

[0009] According to the present invention, since heat generated from the substrate by lighting the light emitting element can be effectively radiated by using the relatively large outer peripheral surface of the reflector having a shape widened toward the emission opening portion, the temperature rising of the light emitting element lamp can be effectively suppressed.

[0010] In the present invention of the structure mentioned above, it may be preferred that the heat radiating member has a surface continuous to the inner peripheral surface of the reflector. Accordingly, since the heat radiating member forms the continuous surface with the inner peripheral surface of the reflector, a contacting surface area is increased, and a reflecting function is not deteriorated.

[0011] Furthermore, in the present invention, it may be desired that the heat radiating member is formed integrally with the reflector. Accordingly, since the heat radiating member is formed integrally with the reflector, good heat conductivity can be achieved.

[0012] A lighting equipment according to the present invention is composed of an equipment body having a socket and a light emitting element lamp according to

claim 1 mounted to the socket of the equipment body.

[0013] According to the present invention, there is provided a lighting equipment achieving effects by the features of the respective claims.

Brief Description of the Drawings

[0014]

Fig. 1 is a perspective view illustrating a light emitting element lamp according to a first embodiment of the present invention.

Fig. 2 is a sectional elevation view illustrating the portion of the light emitting element lamp shown in Fig. 1.

Fig. 3 is a schematic top plan view illustrating the light emitting element lamp of Fig. 1.

Fig. 4 is a schematic top plan view illustrating a light emitting element lamp according to a second embodiment of the present invention.

Fig. 5 is a sectional elevation view illustrating a light emitting element lamp according to a third embodiment, corresponding to the portion of Fig. 2.

Fig. 6 is a sectional elevation view illustrating a light emitting element lamp according to a fourth embodiment, corresponding to the portion of Fig. 2.

Fig. 7 is a sectional elevation view illustrating a light emitting element lamp according to a fifth embodiment, corresponding to the portion of Fig. 2.

Fig. 8 is a sectional view illustrating a light emitting element lamp according to a sixth embodiment (Example 1).

Fig. 9 is a plan view illustrating the light emitting element lamp of Fig. 8 with a first reflector being removed therefrom.

Fig. 10 is a perspective view illustrating a second reflector of the light emitting element lamp of Fig. 8

Fig. 11 is a sectional view illustrating a light emitting element lamp according to the sixth embodiment (Example 2). The embodiments disclosed in Fig. 7 to 11 are not part of the invention.

Fig. 12 is a perspective view illustrating an embodiment of a lighting equipment according to the present invention in which each of the light emitting element lamps of the above embodiments is applicable.

Best Mode for Carrying Out the Invention

[0015] In the following, a light emitting element lamp according to a first embodiment of the present invention will be described with reference to Figs. 1 to 3. Fig. 1 is a perspective view illustrating the light emitting element lamp. Fig. 2 is a sectional elevation view illustrating a portion of the light emitting element lamp. Fig. 3 is a schematic top view illustrating the light emitting element lamp with a translucent cover being removed therefrom.

It is first to be noted that a following description is based on the assumption that the light emitting element lamp according to the present embodiment may be mounted instead of an existing reflective incandescent light bulb referred to as a so-called beam lamp, and has an outer appearance and dimensions substantially equivalent to those of the beam lamp.

The beam lamp is suitable for spotlights used in various stores, floodlights for lighting buildings or signs, and lights at construction sites or the like.

[0016] As shown in Figs. 1 and 2, a light emitting element lamp 1 has an outer appearance similar to that of the existing beam lamp. The light emitting element lamp 1 includes a reflector 2, a cover portion 3, a base 4, and a front lens 5 as a translucent cover. The reflector 2 is formed as an integrally molded article of aluminum, for example. The reflector 2 is formed in a bowl shape so as to be widened from a base portion 2b toward an emission opening portion 2c with a reflecting surface 2a being provided on an inner surface side and an outer peripheral surface being exposed to an outside. The reflector 2 may be made of not only aluminum, but also a metal material or a resin material having good heat conductivity.

[0017] Similarly, the cover portion 3 is an integrally molded article of aluminum, for example, which is formed in a substantially cylindrical shape. The base portion 2b of the reflector 2 is fixed to one end of the cover portion 3, and the base 4 is fixed to the other end thereof. The base 4 is a standard E26 base. The base 4 is screwed into a lamp socket of a lighting equipment or apparatus when the light emitting element lamp 1 is mounted in the lighting equipment. The front lens 5 is attached to the reflector 2 via a seal so as to hermetically cover the opening portion 2c of the reflector 2. A collecting lens or a diffusing lens may be selected according to the intended use as the front lens 5. Basically, components of the existing beam lamp are directly used as the components (the reflector 2, the cover portion 3, the base 4, and the front lens 5) mentioned above.

[0018] Subsequently, a light emitting element as a light source is provided in the base portion 2b of the reflector 2. The light emitting element is an LED chip 6. The LED chips 6 are mounted on a printed substrate 7 using chip-on-board technology. That is, 100 LED chips 6 are disposed in a matrix of 10 columns and 10 rows on a front surface of the printed substrate 7. A coating material is applied to surfaces of the LED chips 6. The printed substrate 7 is a substantially square flat plate of metal or an insulating material (see Fig. 3).

When the printed substrate 7 is made of metal, a material having good heat conductivity and excellent in heat radiation property such as aluminum is preferably used. When the printed substrate 7 is made of an insulating material, a ceramic material or a synthetic resin material having relatively good heat radiation property and excellent in durability may be used. In the case where the synthetic resin material is used, glass epoxy resin or the like may be employed, for example.

[0019] The substrate 7 is bonded to a heat radiating member 8 with an adhesive. A material having good heat

conductivity obtained by mixing a metal oxide or the like into a silicone resin adhesive is preferably used as the adhesive. The heat radiating member 8 is an integrally molded article of aluminum, and is formed in a substantially circular disc shape. The heat radiating member 8 has a flat mounting surface 8a on which the substrate 7 is to be mounted.

A flange portion 8b is formed from the mounting surface 8a in an outer circumferential direction. To mount the substrate 7 on the heat radiating member 8, the adhesive is first applied to the mounting surface 8a of the heat radiating member 8, and a rear surface of the substrate 7 is then attached thereto such that the substrate 7 is brought into surface contact with the heat radiating member 8.

[0020] The flange portion 8b of the heat radiating member 8 is formed on the inner surface side of the reflector 2, that is, in a shape along the reflecting surface 2a, and is thereby mounted on the reflector 2 in close surface contact therewith. The adhesive having good heat conductivity as described above is also preferably used to mount the flange portion 8b on the reflector 2. That is, the heat radiating member 8 forms a continuous surface with the reflecting surface 2a of the reflector 2.

[0021] A lighting circuit 9 is housed in the cover portion 3. The lighting circuit 9 is used for lighting the LED chips 6. Components such as a capacitor and a transistor as a switching element are mounted on a circuit board of the lighting circuit 9. A lead wire extends from the lighting circuit 9 so as to be electrically connected to the printed substrate 7 and the base 4, not shown.

An insulating protection tube 10 for electrically insulating the lighting circuit 9 is arranged around the lighting circuit 9. The lighting circuit 9 may be entirely housed within the cover portion 3, or may be partially housed within the cover portion 3 with a remaining portion being housed within the base 4.

[0022] An operation of the light emitting element lamp 1 having the components or structure mentioned above will be described hereunder.

[0023] When the light emitting element lamp 1 is electrified by mounting the base 4 in a socket of a lighting equipment, the lighting circuit 9 is activated to supply power to the substrate 7. The LED chips 6 thereby emit light. The light emitted from the LED chips 6 mostly passes directly through the front lens 5 to be projected frontward. The light is partially reflected by the reflecting surface 2a of the reflector 2, and passes through the front lens 5 to be projected frontward. Meanwhile, heat generated from the LED chips 6 in association therewith is mainly conducted to the heat radiating member 8 through the adhesive from substantially the entire rear surface of the substrate 7.

[0024] The heat is further conducted through the flange portion 8b of the heat radiating member 8 to the reflector 2 having a large heat radiation area in surface contact with the flange portion 8b, and is radiated therefrom. The respective members are thermally connected to each other as described above, so that a temperature rising of the substrate 7 can be suppressed by radiating the heat through the heat conducting path.

[0025] According to the present embodiment, the temperature rising of the substrate 7 on which the LED chips 6 are mounted can be effectively suppressed by use of the reflector 2. Since the substrate 7 is in surface contact with the heat radiating member 8, good heat conductivity will be achieved. Since the heat radiating member 8 is also in surface contact with the reflector 2, good heat conductivity will be also achieved. As a result, the heat radiation property can be improved. Furthermore, since the reflector 2 flares in a light emitting direction, the outer peripheral surface that produces a heat radiation effect has a large area, and is provided away from the lighting circuit 9 that is another heat generating source and requires thermal protection. Thus, it is effective to utilize the reflector 2 as a heat radiating element to suppress the temperature rising of the substrate 7.

Moreover, since the heat radiating member 8, particularly, the flange portion 8b has the shape along the reflecting surface 2a to form the continuous surface with the reflecting surface 2a of the reflector 2, the heat radiating member 8 is less likely to deteriorate a reflection effect of the reflecting surface 2a. Additionally, since the components of the existing so-called beam lamp can be used, the components can be shared between the light emitting element lamp and the existing beam lamp, so that the light emitting element lamp can be provided at a low cost.

[0026] Hereunder, a light emitting element lamp according to a second embodiment of the present invention will be described with reference to Fig. 4, which is a schematic top plan view illustrating the light emitting element lamp with a translucent cover being removed therefrom, and corresponds to Fig. 3 in the first embodiment. The same or corresponding portions as those of the first embodiment are assigned with the same reference numerals, and duplicated description is omitted herein.

A printed substrate 7-2 is a circular flat plate. The LED chips 6 are regularly mounted on the circular plate. The circular printed substrate 7-2 is disposed substantially concentrically with the heat radiating member 8 and the reflector 2 as shown in the drawing.

[0027] According to the present embodiment, since a heat conducting distance between a circular outer periphery of the printed substrate 7-2 and the reflector 2 is constant, the temperature rise of the printed substrate 7-2 can be substantially uniformly suppressed in addition to the effect described in the first embodiment.

[0028] Light emitting element lamps according to third to fifth embodiments of the present invention will be described hereunder with reference to Figs. 5 to 7, respectively.

The same or corresponding portions as those of the first embodiment are assigned with the same reference numerals, and duplicated description is omitted herein.

The third to fifth embodiments are different from the first embodiment in a configuration or structure of the heat

radiating member 8.

[0029] First, Fig. 5 is a sectional elevation view illustrating an essential portion of the light emitting element lamp according to the third embodiment. A heat radiating member 8-2 has a cap shape. The heat radiating member 8-2 is bonded to the base portion 2b of the reflector 2 with the adhesive with an outer peripheral surface 8-2b being in close surface contact with the base portion 2b.

[0030] According to the present embodiment, in a similar manner to the first embodiment, heat generated from the LED chips 6 is conducted to the heat radiating member 8-2 through the adhesive from substantially the entire rear surface of the substrate 7. The heat is further conducted through the outer peripheral surface 8-2b of the heat radiating member 8-2 to the reflector 2 having a large heat radiation area in surface contact with the outer peripheral surface 8-2b, and is radiated therefrom. The temperature rising of the substrate 7 can be thereby suppressed. Furthermore, since the heat radiating member 8-2 forms a continuous surface with the reflecting surface 2a of the reflector 2 without projecting therefrom, the heat radiating member 8-2 does not deteriorate the reflection effect of the reflecting surface 2a.

[0031] Fig. 6 is a sectional elevation view illustrating the light emitting element lamp according to the fourth embodiment. A heat radiating member 8-3 is formed in substantially the same shape as that of the reflector 2, and is mounted thereon so as to enclose a rim of the emission opening portion 2c of the reflector 2 from the inner side toward the outer side in a surface contact state. In this embodiment, heat generated from the LED chips 6 is also conducted to the heat radiating member 8-3 through the adhesive from substantially the entire rear surface of the substrate 7. The heat is further conducted through an opening rim 8-3b of the heat radiating member 8-3 to the rim of the emission opening portion 2c of the reflector 2 in surface contact with the opening rim 8-3b, is conducted to the outer peripheral surface of the reflector 2 having a large heat radiation area, and is effectively radiated therefrom. The temperature rising of the substrate 7 can be thereby suppressed.

[0032] Fig. 7 is a sectional elevation view illustrating the light emitting element lamp according to the fifth embodiment, which does not have a recessed portion on a back surface side of a heat radiating member and does not fall within the scope of the claims. A heat radiating member 8-4 is formed integrally with the base portion 2b of the reflector 2. According to the present embodiment, heat generated from the LED chips 6 is conducted to the heat radiating member 8-4 through the adhesive from substantially the entire rear surface of the substrate 7. The heat is further directly conducted to the reflector 2 having a large heat radiation area and is radiated therefrom. The temperature rising of the substrate 7 can be thereby suppressed. Since the heat radiating member 8-4 is integrated with the reflecting surface 2a of the reflector 2 and forms a continuous surface with the reflecting surface 2a without projecting therefrom, the heat radiating member 8-4 does not deteriorate the reflection effect of the reflecting surface 2a.

[0033] Next, a light emitting element lamp according to a sixth embodiment, which does not have a recessed portion on a back surface side of a heat radiating member and does not fall within the scope of the claims, will be described with reference to Figs. 8 to 11. Fig. 8 is a sectional view illustrating a light emitting element lamp (Example 1), which does not have a recessed portion on a back surface side of a heat radiating member and does not fall within the scope of the claims. Fig. 9 is a plan view illustrating the light emitting element lamp with a first reflector being removed therefrom. Fig. 10 is a perspective view illustrating a second reflector. Fig. 11 is a sectional view illustrating a light emitting element lamp (Example 2) , which does not have a recessed portion on a back surface side of a heat radiating member and does not fall within the scope of the claims.

The light emitting element lamp according to the present embodiment is a lamp referred to as a so-called beam lamp in a similar manner to the first embodiment. The heat radiating member is formed integrally with the reflector in a similar manner to the fifth embodiment.

Example 1:

[0034] As show in Fig. 8, a light emitting element lamp 101 has an outer appearance similar to that of the existing beam lamp, and has a waterproof function to be appropriately used outdoors. The light emitting element lamp 101 includes a heat-conductive first reflector 102, a light source portion 103, a second reflector 103a, a light emitting element 104, a heat-conductive cover 105, an insulating cover 106, a base 107 and a front lens 108 as a translucent cover.

[0035] The first reflector 102 is an integrally molded article of aluminum, for example, and white acrylic baking paint is applied thereon. The first reflector 102 is formed in a bottomed bowl shape so as to flare (be widened) from a base portion 102a toward an emission opening portion 102b with an outer peripheral surface being exposed to an outside. A bottom wall of an inner peripheral surface has a flat surface, and a heat radiating member 102c is formed integrally therewith. Meanwhile, a bottom wall rim of the outer peripheral surface forms a ring-shaped connection portion 102d to be connected to the heat-conductive cover 105 described below. Three threaded through holes are formed in the bottom wall with an interval of about 120 degrees therebetween.

[0036] The first reflector 102 may be made of not only aluminum, but also a metal material or a resin material having good heat conductivity. Furthermore, alumite treatment is preferably applied to the inner peripheral surface of the first reflector 102. By applying the alumite treatment, a heat radiation effect of the first reflector 102 can be improved. When the alumite treatment is applied thereto, although a reflection effect of the inner peripheral surface of the first reflector 102 is reduced, the reduction

in reflection effect does not degrade the performance of the light emitting element lamp as the second reflector 103a described below is separately provided. Further, in order to improve the reflection effect of the first reflector 102, the inner peripheral surface may be mirror-finished or the like.

[0037] The light source portion 103 is provided on the bottom wall of the first reflector 102. The light source portion (unit or section) 103 includes a substrate 109 and the light emitting elements 104 mounted on the substrate 109. The light emitting elements 104 are LED chips, which are mounted on the substrate 109 using chip-on-board technology. That is, a plurality of LED chips are disposed in a matrix on a front surface of the substrate 109. A coating material is applied to surfaces of the LED chips. The substrate 109 is a substantially circular flat plate made of metal, for example, a material having good heat conductivity and excellent in heat radiation property such as aluminum. When the substrate 109 is made of an insulating material, a ceramic material or a synthetic resin material having relatively good heat radiation property and excellent in durability can be applied. In the case where the synthetic resin material is used, glass epoxy resin or the like may be employed, for example.

[0038] The substrate 109 is mounted on the heat radiating member 102c formed on the bottom wall of the first reflector 102 in close surface contact therewith. To mount the substrate 109, an adhesive may be used. When the adhesive is used, a material having good heat conductivity obtained by mixing a metal oxide or the like into a silicone resin adhesive is preferably used. The substrate 109 and the heat radiating member 102c may not be in full surface contact, but may be in partial surface contact with each other.

[0039] The second reflector 103a made of white polycarbonate, ASA resin or the like is mounted on the front surface of the substrate 109. The second reflector 103a enables effective light emission by controlling distribution of light emitted from each of the LED chips. The second reflector 103a has a circular disc shape. A plurality of incident openings 103b are defined by a ridge line to be formed in the second reflector 103a. Each of the incident openings 103b of the second reflector 103a is disposed so as to face each of the LED chips of the substrate, 109. That is, a substantially bowl-shaped reflecting surface 103c flaring from each of the incident openings 103b in an emission direction, that is, toward the ridge line is formed in the second reflector 103a with respect to each of the incident openings 103b. Three cutouts 103d to which screws are inserted and engaged are formed in an outer peripheral portion of the second reflector 103a with an interval of about 120 degrees therebetween.

[0040] The heat-conductive cover 105 is made of aluminum die casting. White acrylic baking paint is applied thereon. The heat-conductive cover 105 is formed in a substantially cylindrical shape tapered to a distal end continuously from the outer peripheral surface of the first reflector 102. The length and thickness of the cover 105 may be appropriately determined in consideration of the heat radiation effect or the like. A connection portion 105a of the cover 105 with the first reflector 102 has a ring shape with a predetermined width (see Fig. 2). Thus, the connection portion 102d of the first reflector 102 is formed so as to face the connection portion 105a. The connection portions 102d and 105a are thermally connected to each other in a surface contact state. A ring-shaped groove is formed in the connection portion 105a. An O-ring 110 made of synthetic rubber or the like is fitted into the groove. Three threaded holes 111 are formed on an inner side of the O-ring 110 with an interval of about 120 degrees therebetween.

[0041] The insulating cover 106 molded from PBT resin is provided along the shape of the heat-conductive cover 105 on an inner side of the heat-conductive cover 105. The insulating cover 106 is connected to the heat-conductive cover 105 on one end side so as to project from the heat-conductive cover 105 on the other end side. The base 107 is fixed to a projecting portion 106a. The base 107 is a standard E26 base. The base 107 is screwed into a lamp socket of a lighting equipment when the light emitting element lamp 101 is mounted in the lighting equipment. An air outlet 106b is formed in the projecting portion 106a. The air outlet 106b is a small hole for reducing a pressure when an internal pressure in the insulating cover 106 is increased.

[0042] A lighting circuit 112 is housed in the insulating cover 106. The lighting circuit 112 is used for controlling the lighting of the LED chips, and includes components such as a capacitor and a transistor as a switching element. The lighting circuit 112 is mounted on a circuit board. The circuit board has a substantially T-shape and is housed longitudinally in the insulating cover 106. A narrow space can be thereby effectively utilized for mounting the circuit board therein. A lead wire 112a extends from the lighting circuit 112 to be electrically connected to the substrate 109 of the light source portion 103 through a lead wire insertion hole 112b formed in the heat radiating member 102c. The lighting circuit 112 is also electrically connected to the base 107. The lighting circuit 112 may be entirely housed within the insulating cover 106 or may be partially housed within the insulating cover 106 with a remaining portion being housed within the base 107.

[0043] A filling material 113 fills the insulating cover 106 so as to cover the lighting circuit 112. The filling material 113 is made of silicone resin and has elasticity, insulating property and heat conductivity. To fill the insulating cover 106, a liquid filling material 113 is first injected from above the insulating cover 106. The filling material 113 is injected to reach the level at a top end portion of the insulating cover 106. The filling material 113 is then hardened and stabilized in a high temperature atmosphere.

[0044] The front lens 108 is attached to the first reflector 102 via a silicone resin packing or seal so as to hermetically cover the emission opening portion 102b of the

first reflector 102. A collecting lens or a diffusing lens may be appropriately selected according to the intended use as the front lens 108.

[0045] The heat-conductive first reflector 102 and the heat-conductive cover 105 will be connected in the following manner.

The connection portion 102d of the first reflector 102 is disposed so as to face the connection portion 105a of the heat-conductive cover 105. The substrate 109 is arranged on the heat radiating member 102c of the first reflector 102, and the second reflector 103a is overlapped thereon. Subsequently, screws 114 are screwed into the threaded holes 111 of the heat-conductive cover 105 through the cutouts 103d of the second reflector 103a and the threaded through holes of the first reflector 102. The heat-conductive first reflector 102 is thereby fixed to the heat-conductive cover 105. Then, a bottom end of the second reflector 103a presses the front surface of the substrate 109, so that the second reflector 103a and the substrate 109 are fixed to the bottom wall of the first reflector 102. In such a state, the O-ring 110 is elastically deformed between the connection portion 105a and the connection portion 102d to thereby connect the connection portions 105a and 102d in an airtight state. That is, the inner side of the O-ring 110 is maintained in an airtight state.

The wiring for electrical connection between the lighting circuit 112 and the substrate 109 on which the LED chips are mounted by the lead wire 112a is done on the inner side of the O-ring 110.

[0046] An operation of the light emitting element lamp 101 having the structure and configuration mentioned hereinabove will be described hereunder.

When the light emitting element lamp 101 is electrified by mounting the base 107 sin a socket of a lighting apparatus, the lighting circuit 112 is activated to supply power to the substrate 109. The LED chips thereby emit light. Distribution of the light emitted from each of the LED chips is controlled by each of the reflecting surfaces 103c of the second reflector 103a. The light is also reflected by the first reflector 102, and passes through the front lens 108 to be projected frontward. Heat generated from the LED chips in association therewith is conducted to the heat radiating member 102c from a substantially entire rear surface of the substrate 109. The heat is further conducted to the first reflector 102 having a large heat radiation area. Furthermore, the heat is conducted to the connection portion 105a of the heat conductive cover 5 from the connection portion 102d of the first reflector 102, and is conducted to the entire heat conductive cover 105. The respective members are thermally connected to each other as described above, so that a temperature rising of the substrate 109 can be suppressed by radiating the heat through the heat conducting path. Meanwhile, the heat generated from the lighting circuit 112 is conducted to the first reflector 102 via the filling material 113 and is radiated therefrom. The heat is then transferred to the base 107, which is then conducted to the lamp socket of the lighting equipment or the like, and is radiated therefrom.

[0047] Furthermore, in the light emitting element lamp 101 according to the present example, the front lens 108 is attached to the emission opening portion 102b of the first reflector 102 via the packing. The O-ring 110 is provided between the connection portion 102d of the first reflector 102 and the connection portion 105a of the heat-conductive cover 105a. Additionally, the lighting circuit 112 is covered by the filling material 113. Accordingly, the electric insulating property is maintained, and a weather-resistance and rain-proof function is provided. The light emitting element lamp 101 is thereby appropriately used in outdoors. If the lighting circuit components function abnormally and the capacitor is damaged or blown to increase the internal pressure in the insulating cover 106, a secondary damage may be caused because of employment of the sealed structure for the above purpose.

However, the increasing pressure inside the insulating cover 106 can be discharged through the air outlet 106b.

[0048] As described above, according to the present example, the temperature rising of the substrate 109 **on** which the light emitting elements 104 are mounted can be effectively suppressed by use of the heat conductive first reflector 102 and the heat-conductive cover 105 Since the first reflector 102 flares toward the emission opening portion 102b, the outer peripheral surface that produces a heat radiation effect has a large area, and the heat radiation effect is effectively improved. Since the heatconductive first reflector 102 is in surface contact with the heat-conductive cover 105, good heat conductivity is achieved.

Furthermore, the light distribution can be controlled with respect to each of the LED chips by each of the reflecting surfaces 103c of the second reflector 103a, so that the desired optical processing could be performed. Moreover, since the O-ring 110 is provided between the connection portion 102d of the first reflector 102 and the connection portion 105a of the heat-conductive cover 105 to maintain the sealability, the waterproof function can be maintained and the power supply path to the light source portion 103 can also be ensured with the simple configuration. Additionally, since the components of the existing so-called beam lamp can be used, the components will be shared between the light emitting element lamp and the existing beam lamp. Accordingly, the light emitting element lamp can be provided at a low cost.

Example 2:

[0049] Fig. 11 shows a configuration in which the second reflector in the first example is not provided according to the present example. The same portions as those of the first example are assigned with the same reference numerals and duplicated description is omitted herein.

In this second example, the heat generated from the LED chips is also conducted to the heat radiating member

102c from substantially the entire rear surface of the substrate 109 and is further conducted to the first reflector 102 having a large heat radiation area in a manner similar to the first example, thus performing the effective heat radiation.

[0050] In the following, an embodiment of a lighting equipment or apparatus using the light emitting element lamp as a light source of the structures and characters mentioned above will be described with reference to Fig. 12.

A garden light is shown as a lighting equipment 20. The lighting equipment 20 includes an apparatus body 21 and a base 22 on which the apparatus body 21 is mounted. A socket 23 is provided in the apparatus body 21. The base 4 of the light emitting element lamp 1 is screwed into the socket 23. The lighting equipment or apparatus 20 is installed by fixing the base 22 to the ground or the like. The apparatus body 21 can be changed in direction relative to the base 22, so that a light emitting direction can be changed to any direction. By employing the lighting equipment 20 of the structure as described above, the lighting equipment capable of effectively suppressing the temperature rising of the substrate by use of the reflector can be provided.

[0051] Although the above-mentioned respective embodiments are described on the assumption that the components of the existing beam lamp are applied, the components of the existing beam lamp may not be necessarily used in the present invention.

Industrial Applicability

[0052] According to the present invention, the heat generated from the substrate by lighting the light emitting element can be effectively radiated by using the relatively large outer peripheral surface of the reflector having the flaring shape toward the emission opening portion. Accordingly, the temperature rising of the light emitting element lamp can be effectively suppressed.

Claims

1. A light emitting element lamp (1) comprising:

   a heat-conductive reflector (2) provided, at one end side, with an emission opening portion, and at another end side, with an inside flat heat radiating member (8) and a recessed portion on a back surface side of the heat radiating member (8) and formed to be widened toward the emission opening portion from the another end side, and having a reflecting surface (2a) being provided on an inside and an outer peripheral surface being exposed to an outside;
   a cover portion (3) having a one end side attached to the another end side of the reflector (2) so as to be connected to the recessed portion of the reflector (2);
   a base (4) attached on another end side of the cover portion (3) ;
   a print substrate (7) provided with a light emitting element (6) and attached to the heat radiating member (8) with a substrate surface being thermally connected to the inside flat surface (8a) of the heat radiating member (8) in a surface contact state; and
   a lighting circuit (9) housed in a space formed in the cover portion (3) and the reflector (2) in a manner apart from the outer surface of the heat radiating member (8) of the reflector (2) so as to light the light emitting element.

2. A lighting equipment (20) comprising:

   an equipment body (21) provided with a socket (23); and
   a light emitting element lamp (1) according to claim 1 to be mounted to the socket (23) of the equipment body (21).

Patentansprüche

1. Lichtemissionselementlampe (1) mit
   einem wärmeleitenden Reflektor (2), der an einer Endseite mit einem Emissionsöffnungsabschnitt und an einer anderen Endseite mit einem inneren flachen wärmeabstrahlenden Teil (8) und einem ausgesparten Abschnitt auf einer Rückflächenseite des wärmeabstrahlenden Elements (8) versehen ist und der derart ausgebildet ist, dass er sich in Richtung des Emissionsöffnungsabschnitts von der anderen Endseite aus aufweitet, und der eine Reflektionsoberfläche (2a) hat, die auf einer Innenseite und einer Außenumfangsfläche, die gegenüber dem Äußeren freiliegt, vorgesehen ist,
   einem Abdeckungsabschnitt (3) mit einem an der anderen Endseite des Reflektors (2) derart befestigten einen Ende, dass er mit dem ausgesparten Abschnitt des Reflektors (2) verbunden ist,
   einer an dem anderen Ende des Abdeckungsabschnitts (3) befestigten Basis (4), einem Drucksubstrat (7), das mit einem Lichtemissionselement (6) versehen ist und das an dem wärmeabstrahlenden Teil (8) mit einer Substratoberfläche, die thermisch mit der inneren flachen Oberfläche (8a) des wärmeabstrahlenden Teils (8) in einem Oberflächenkontaktzustand thermisch verbunden ist, befestigt ist, und
   einem Beleuchtungskreis (9), der in einem derart in dem Abdeckungsabschnitt (3) und dem Reflektor (2) ausgebildeten Bereich getrennt von der Außenfläche des wärmeabstrahlenden Teils (8) des Reflektors (2) untergebracht ist, um das Lichtemissionselement zu erleuchten.

2. Beleuchtungsgerät (2) mit einem Gerätekörper (21) mit einer Fassung (23), und einer Lichtemissionselementlampe (1) gemäß Anspruch 1 zum Anbringen in der Fassung (23) des Gerätekörpers (21).

Revendications

1. Lampe à élément photoémetteur (1), comprenant :

   un réflecteur conducteur de la chaleur (2) pourvu, sur un côté d'extrémité, d'une partie d'ouverture d'émission et, sur un autre côté d'extrémité, d'un élément thermo-rayonnant plat intérieur (8) et d'une partie évidée sur le verso de l'élément thermo-rayonnant (8) et formée pour s'élargir vers la partie d'ouverture d'émission de l'autre côté d'extrémité, et ayant une surface réfléchissante (2a) qui est ménagée à l'intérieur et une surface périphérique externe qui est exposée à l'extérieur ;
   une partie de recouvrement (3) ayant un côté d'extrémité fixé à l'autre côté d'extrémité du réflecteur (2) de manière à être connectée à la partie évidée du réflecteur (2) ;
   une base (4) fixée sur l'autre côté d'extrémité de la partie de recouvrement (3) ;
   un substrat imprimé (7) pourvu d'un élément photoémetteur (6) et fixé à l'élément thermo-rayonnant (8) avec une surface du substrat qui est connectée thermiquement à la surface intérieure plate (8a) de l'élément thermo-rayonnant (8) dans un état de contact entre surfaces ; et
   un circuit d'éclairage (9) logé dans un espace formé dans la partie de recouvrement (3) et le réflecteur (2) séparément de la surface externe de l'élément thermo-rayonnant (8) du réflecteur (2) de manière à éclairer l'élément photoémetteur.

2. Equipement d'éclairage (20) comprenant :

   un corps d'équipement (21) pourvu d'une douille (23) ; et
   une lampe à élément photoémetteur (1) selon la revendication 1 à monter dans la douille (23) du corps d'équipement (21).

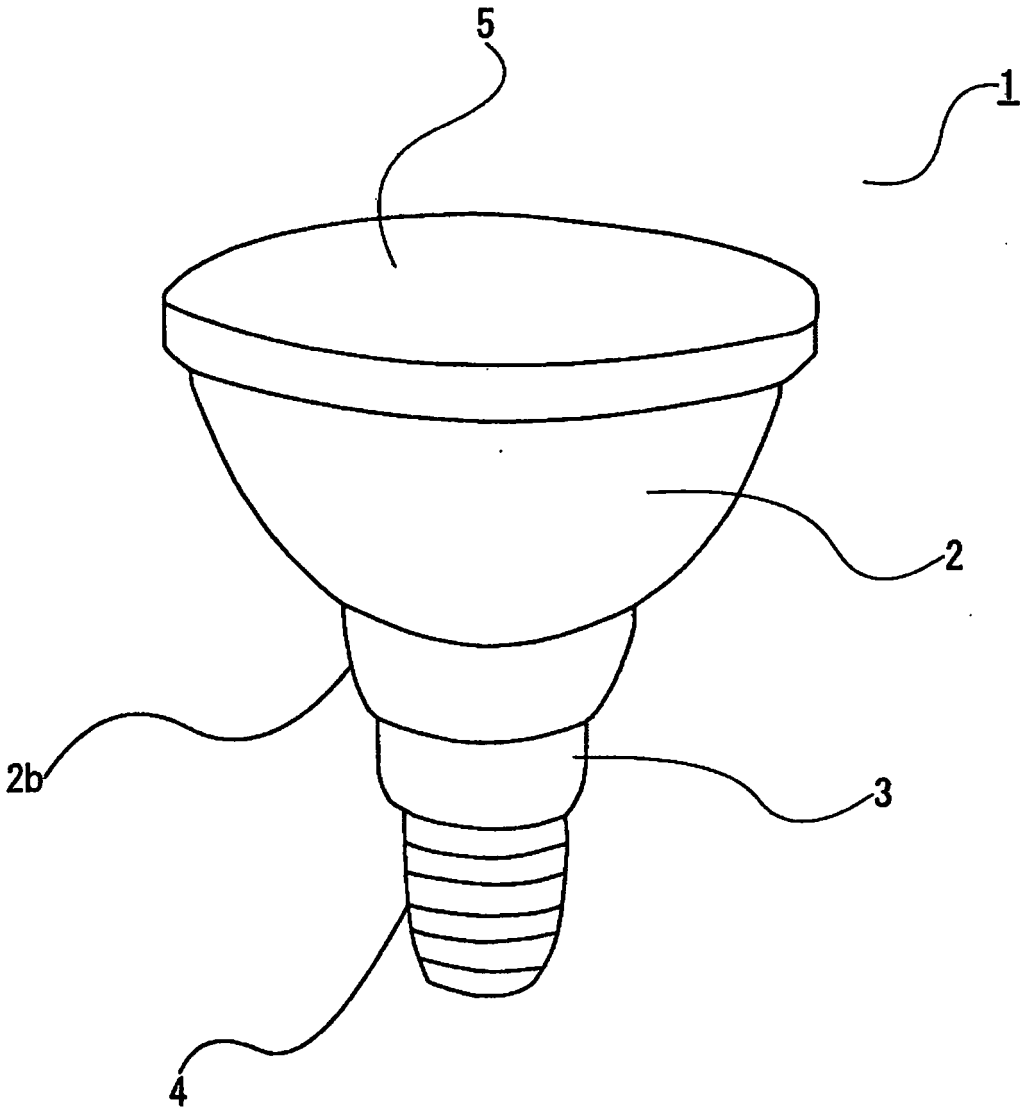


FIG. 1

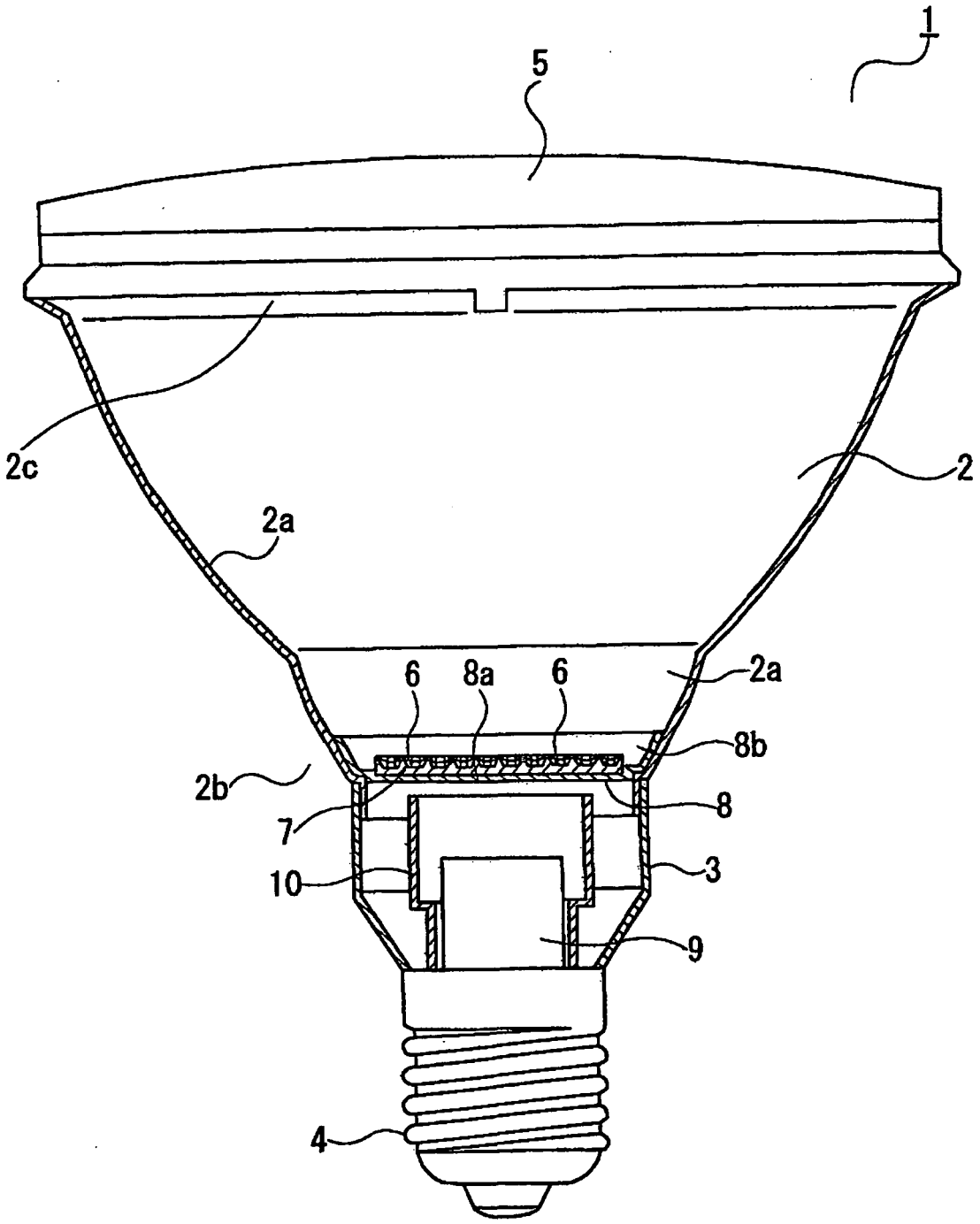


FIG. 2

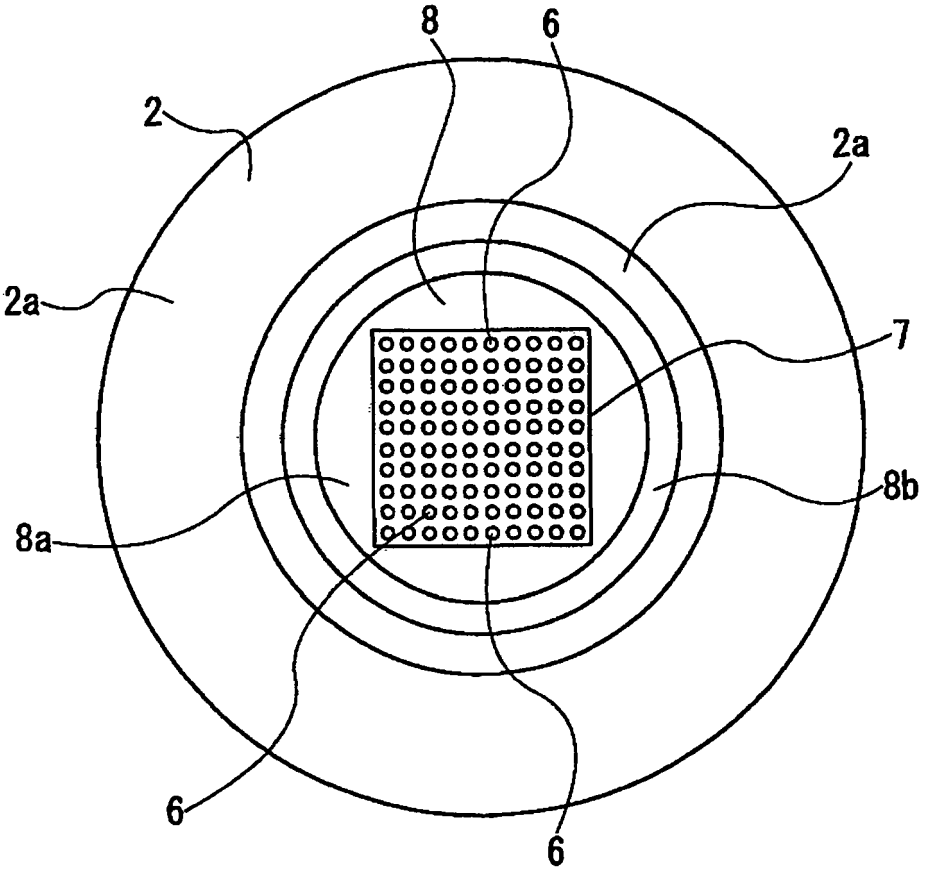


FIG. 3

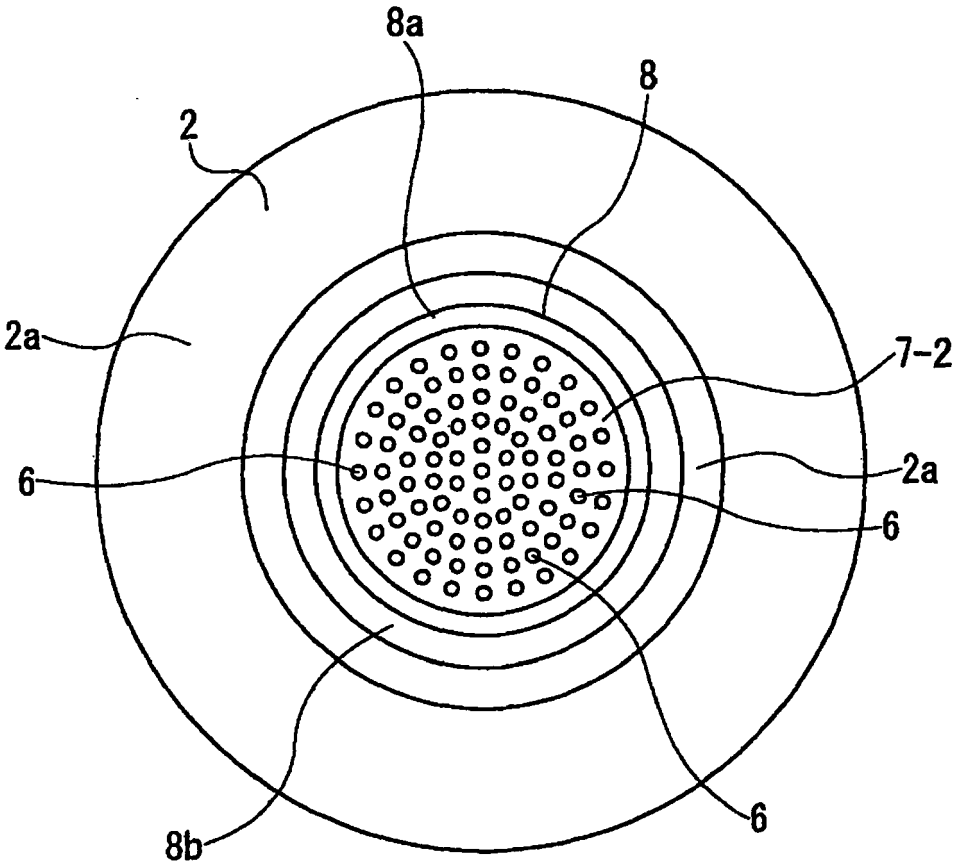


FIG. 4

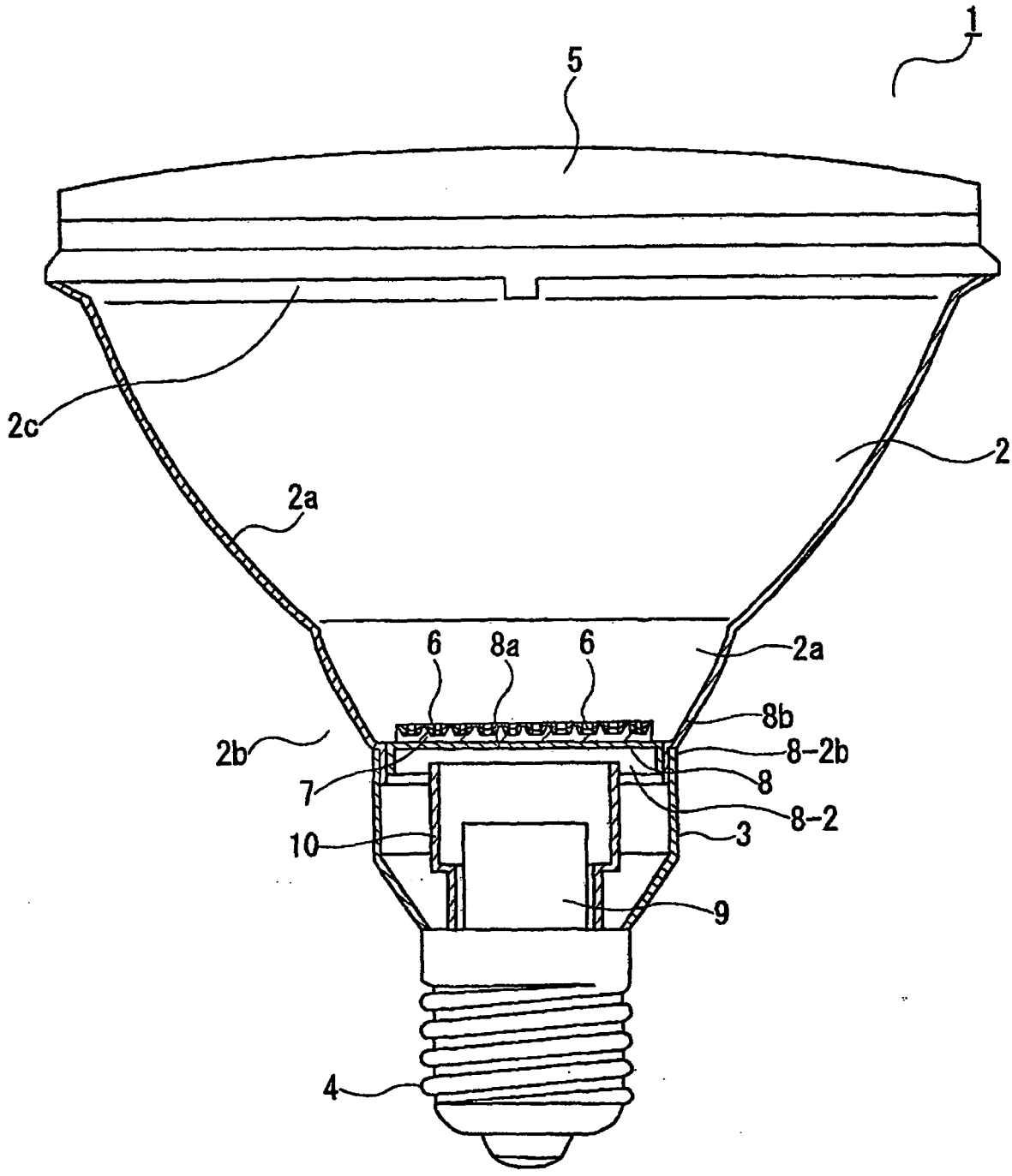


FIG. 5

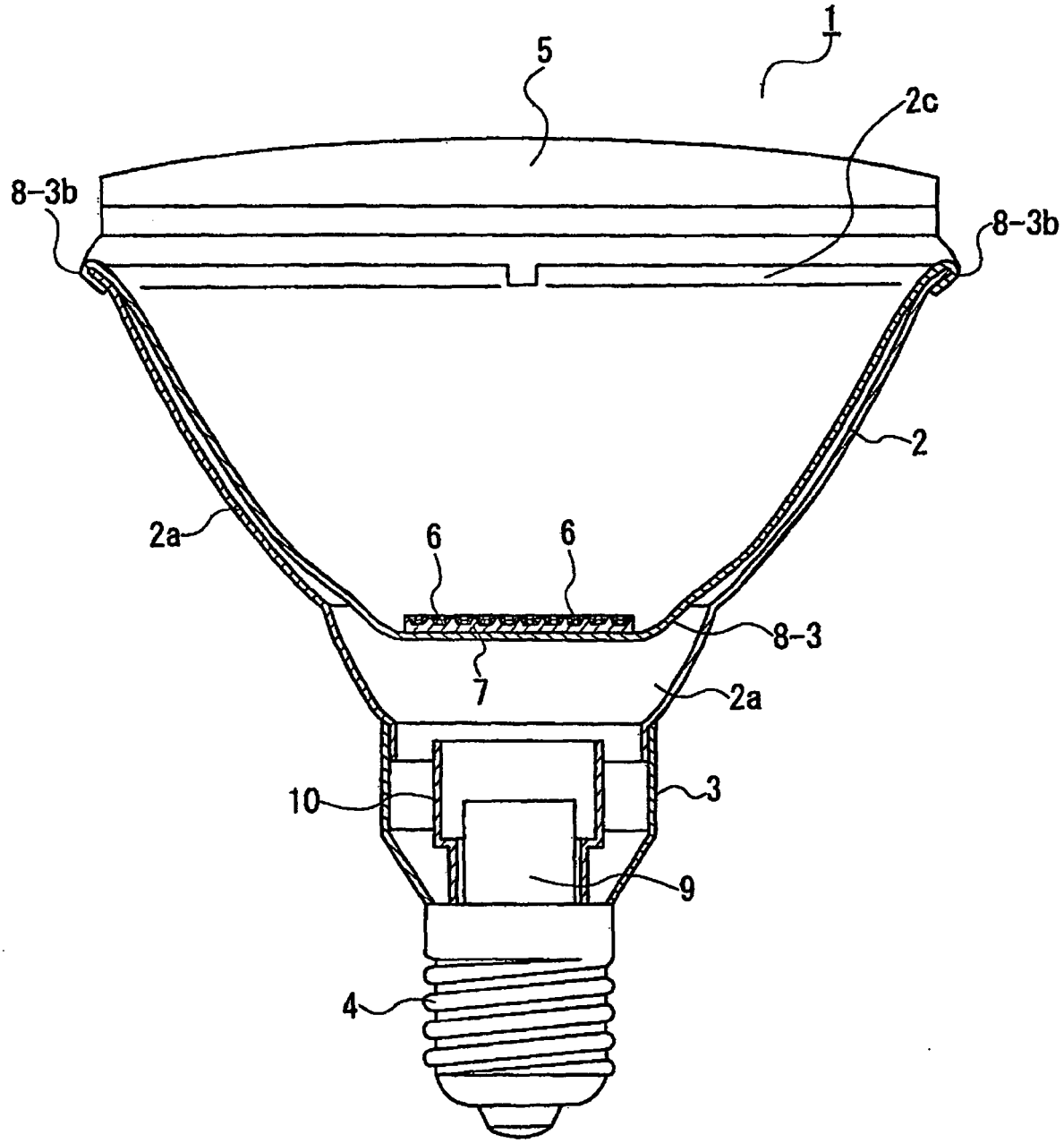


FIG. 6

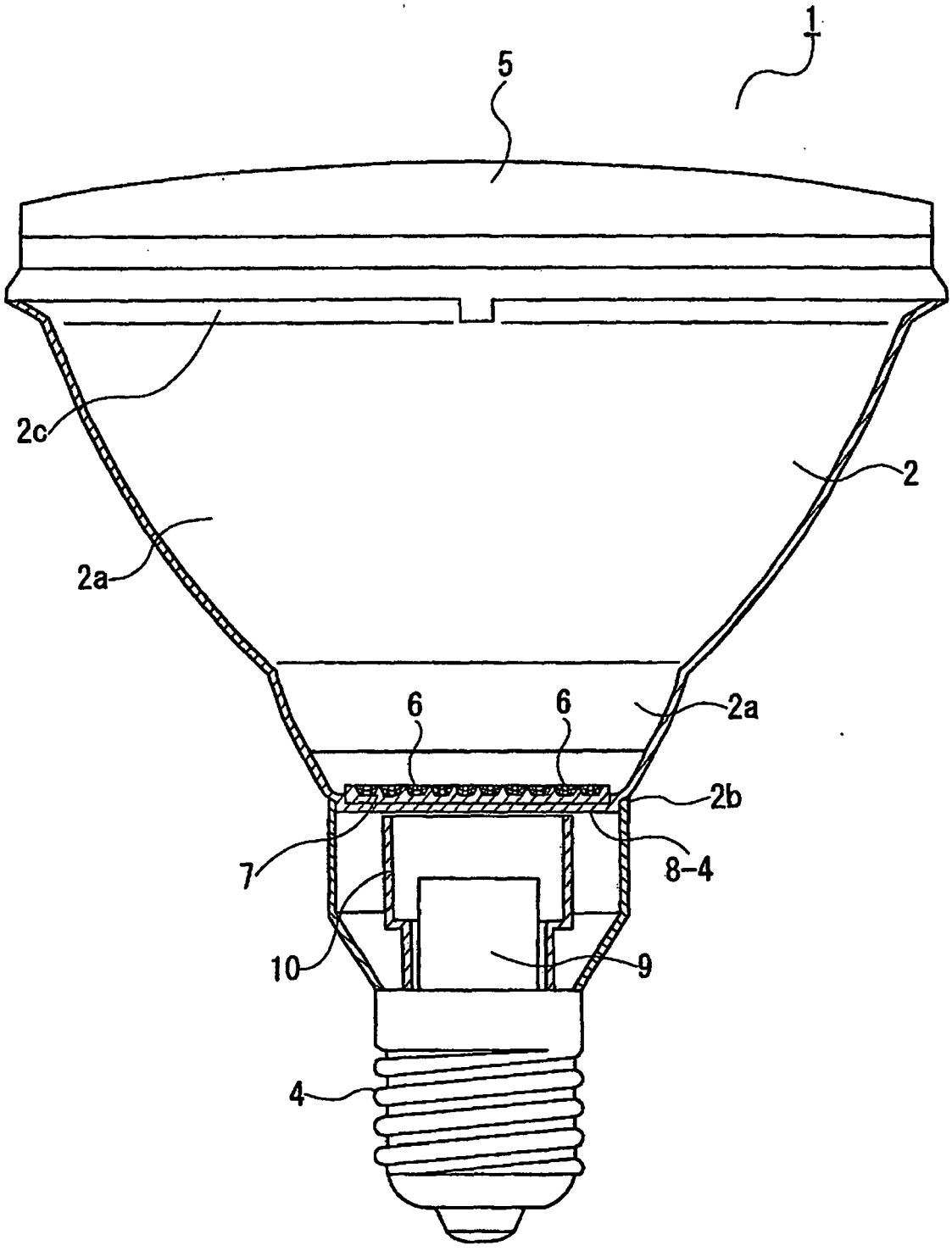
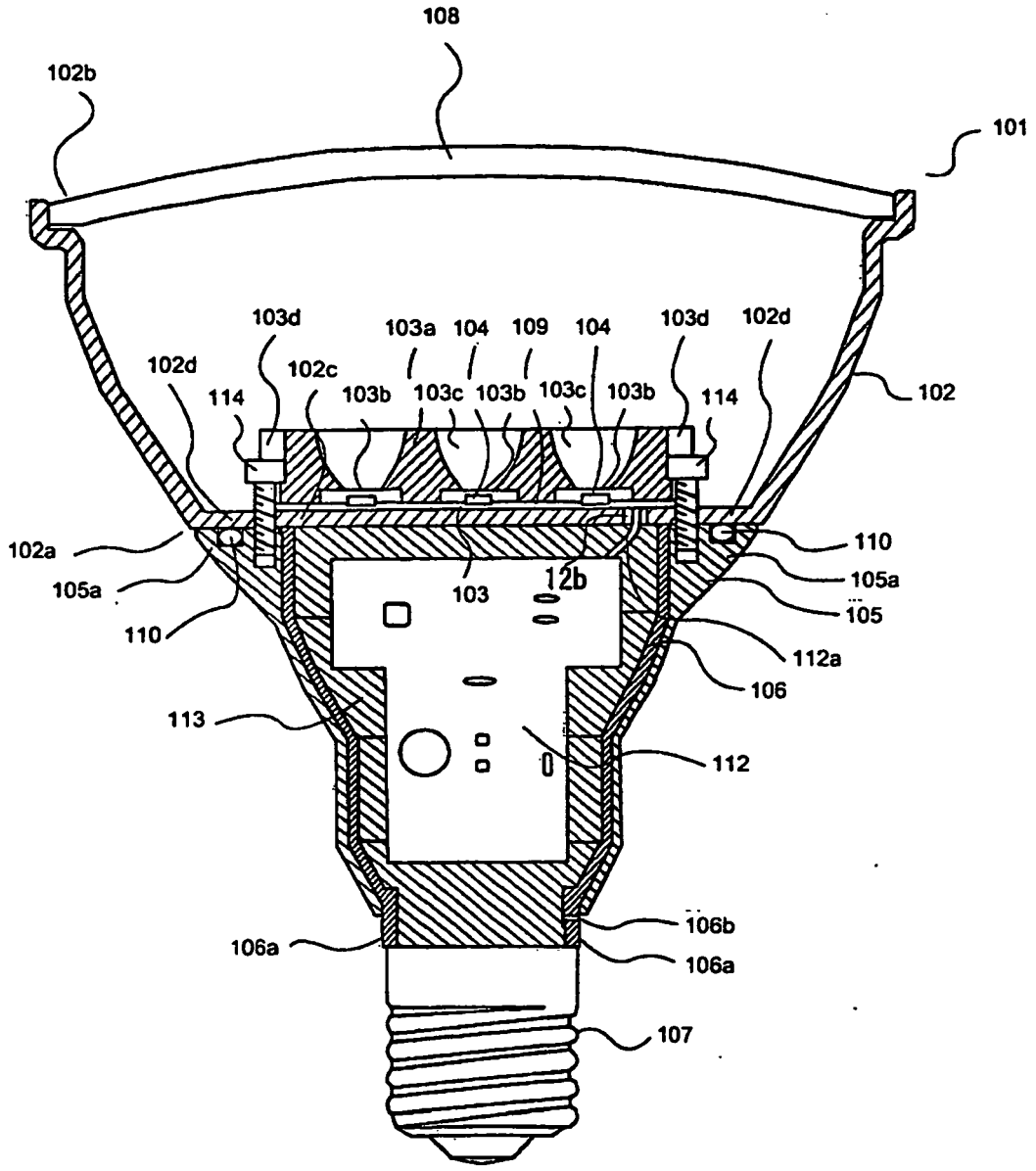


FIG. 7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103d
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103c
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114
102
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106a
107

FIG. 8

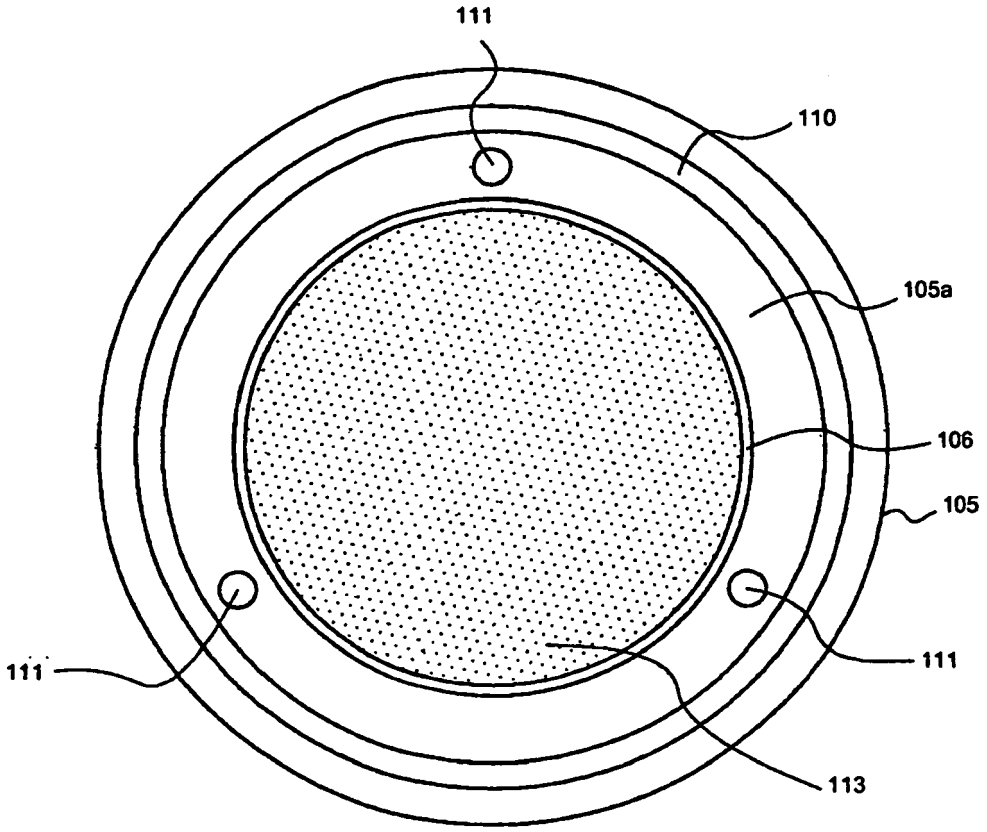


FIG. 9

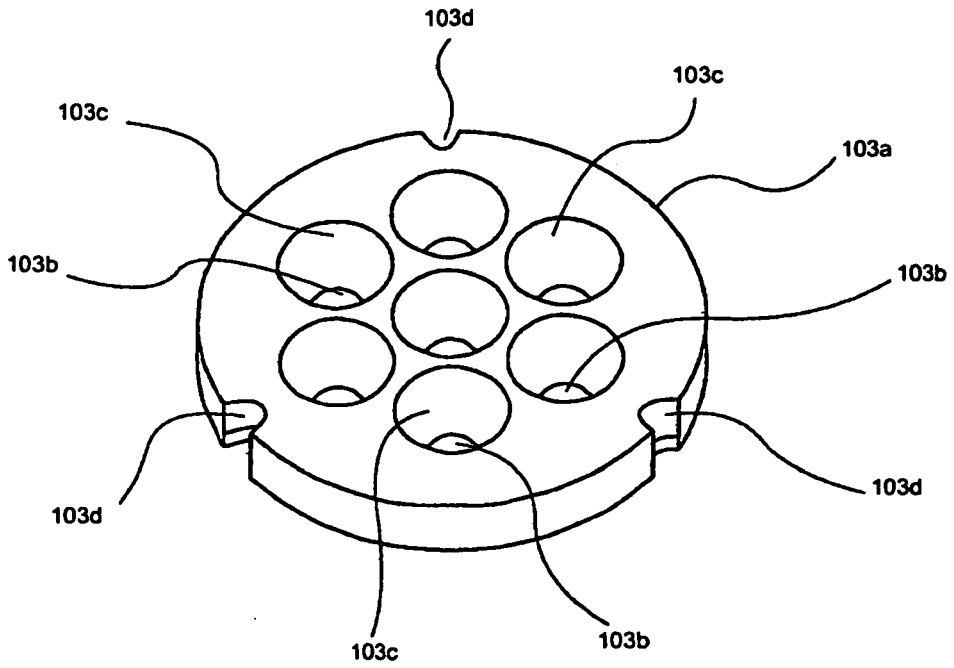
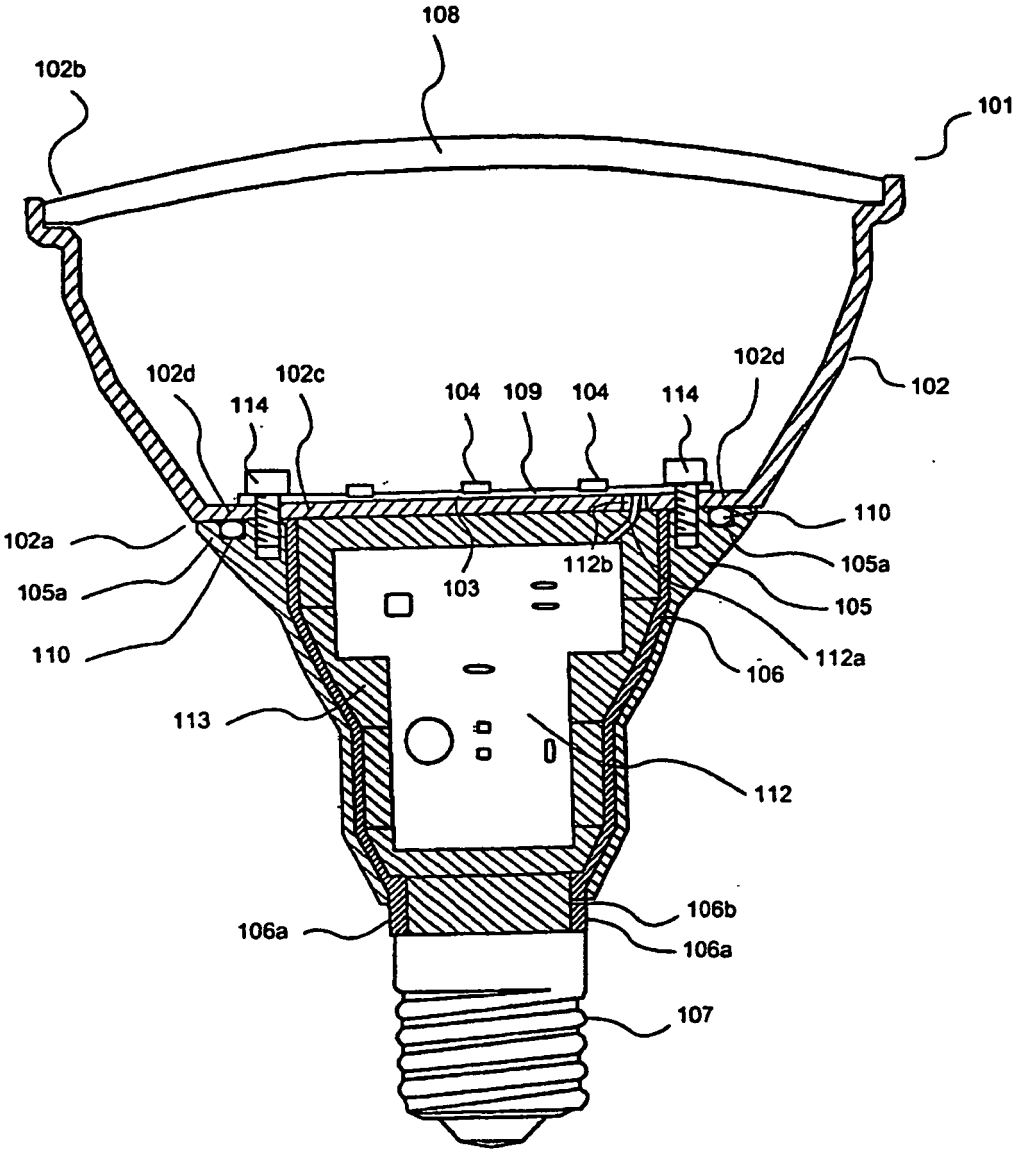


FIG. 10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106a
107

FIG. 11

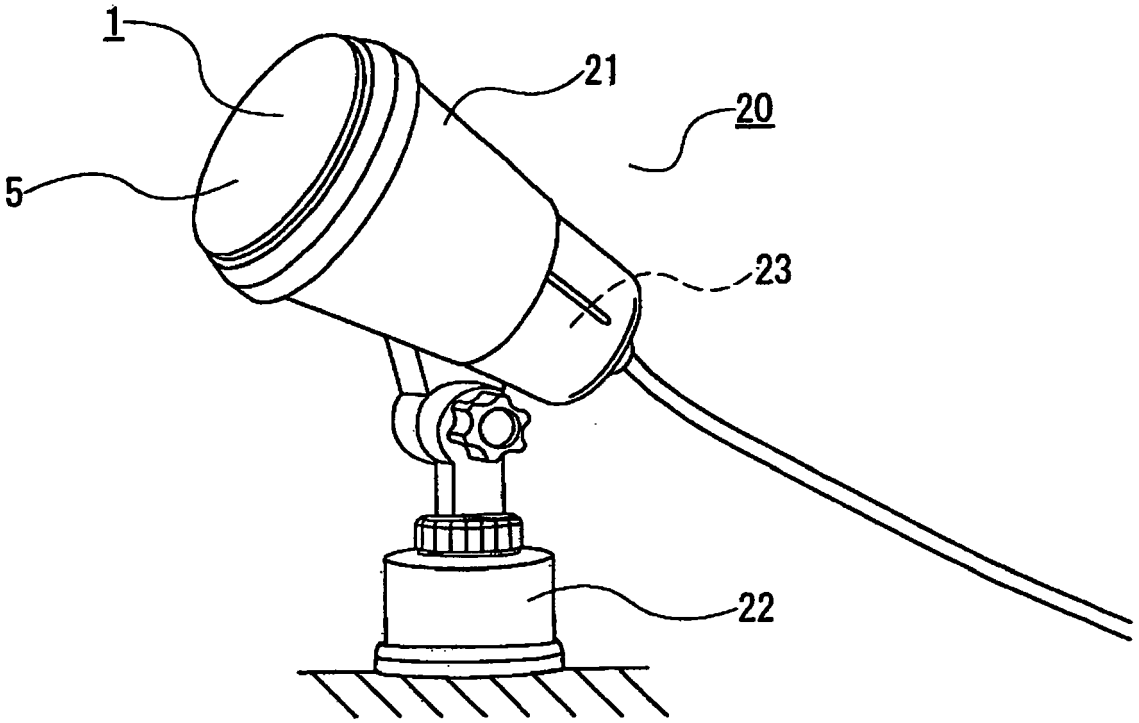

FIG. 12

REFERENCES CITED IN THE DESCRIPTION

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- DE 1020040420186 A1 **[0003]**