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(54) **Lamp unit and lighting device**

(57) According to one embodiment, a housing includes a resin housing and a metal housing. The resin housing is provided in a hollow shape of which one end side is open, and includes a pair of power circuit holding units which is provided from one end side to other end side in the inside of the resin housing. The metal housing includes a pair of metal housing members which is divided into two by having the power circuit holding unit as a boundary. Metal housing members are respectively arranged on both sides of the power circuit holding unit along the inside of the resin housing.

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Description

FIELD

[0001] Embodiments described herein relate generally to a lamp unit using a light emitting module, and a lighting device using the lamp unit.

BACKGROUND

[0002] In the related art, in order to ensure a heat radiation property, the exterior of a lamp unit using a light emitting module is configured of a metal housing, and the light emitting module is arranged at one end side of the metal housing. In addition, in order to secure an insulation property, a resin case is arranged inside the metal housing, and a power circuit is accommodated inside the resin case.

[0003] The exterior of the lamp unit is configured of the metal housing; however, it is preferable that the exterior of the lamp unit be a resin housing in order to secure an insulation property, and it is desirable to also secure a heat radiation property in addition to that.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004]

FIG. 1 is a cross-sectional view which illustrates a lamp unit according to a first embodiment.
FIG. 2 is a perspective view which illustrates the inside of a housing of the lamp unit.
FIG. 3 is a perspective view which illustrates an exploded state of the lamp unit.
FIG. 4 is a perspective view which illustrates an assembled state of the lamp unit.
FIG. 5 is a perspective view which illustrates a lighting device using the lamp unit.
FIG. 6 is a cross-sectional view which illustrates a lamp unit according to a second embodiment.
FIG. 7 is a cross-sectional view which illustrates a lamp unit according to a third embodiment.
FIG. 8 is a cross-sectional view which illustrates a lamp unit according to a fourth embodiment.

DETAI LED DESCRIPTION

[0005] A lamp unit according to an embodiment includes a housing, a heat radiating plate, a light emitting module, a power circuit, and a power supply unit. The housing includes a resin housing and a metal housing. The resin housing is provided in a hollow shape of which one end side is open, and includes a pair of power circuit holding units which is provided from one end side to the other end side on the inside of the resin housing. The metal housing includes a pair of metal housing members which is divided into two by having the power circuit holding unit as a boundary. The metal housing members are respectively arranged at both sides of the power circuit holding unit, and are arranged along the inside of the resin housing. The heat radiating plate is arranged at one end side of the housing, and comes into contact with the metal housing. The light emitting module is arranged on one end side of the heat radiating plate. The power circuit is arranged inside the housing by being held by the power circuit holding unit. The power supply unit is arranged on the other end side of the resin housing.

[0006] In the lamp unit according to the embodiment, it is possible to secure an insulation property, and to improve a heat radiation property.

[0007] Hereinafter, a first embodiment will be described with reference to FIGS. 1 to 5.

[0008] In FIGS. 1 to 4, a lamp unit 10 includes a housing 11, a heat radiating plate 12 which is arranged on one end side of the housing 11, a light emitting module 13 which is attached to a face on one end side of the heat radiating plate 12, a cover 14 which is arranged at a center of the light emitting module 13, a globe 15 which is attached to one end side of the housing 11, a power circuit (lighting circuit) 16 which is arranged inside the housing 11, and a base 17 as a power supply unit which is attached to the other end side of the housing 11. In addition, according to the embodiment, a virtual lamp center axis which passes through a center of the lamp unit 10 from the globe 15 to the base 17 is included, and descriptions will be made by setting a side on which the globe 15 is located when viewed from the base 17 to one end side, and a side which is opposite to the one end side, and on which the base 17 is located when viewed from the globe 15 to the other end side, in the lamp center axis.

[0009] In addition, the housing 11 includes a resin housing 20 in a hollow shape, and a metal housing 21 which is arranged inside the resin housing 20.

[0010] The resin housing 20 is formed of a resin material with an insulation property. The resin housing 20 is respectively open on one end side, and on the other end side, and is formed in a cylindrical shape of which a diameter contracts from one end side to the other end side. According to the embodiment, the resin housing 20 includes one end cylindrical portion 23a which is located on one end side, an inclined cylindrical portion 23b of which a diameter contracts toward the other end side from the one end cylindrical portion 23a, an intermediate cylindrical portion 23c which is located on the other end side of the inclined cylindrical portion 23b, an inclined cylindrical portion 23d of which a diameter contracts from the intermediate cylindrical portion 23c to the other end side, and the other end cylindrical portion 23e which is located on the other end side of the inclined cylindrical portion 23d. A cavity portion 24 which is open on one end side and the other end side, respectively, is formed inside the resin housing 20. The thickness of the resin housing 20 is approximately 2 mm to 4 mm, preferably. When the thickness is less than 2 mm, it is difficult to secure rigidity or an insulation property, and on the other hand, when the thickness is larger than 4 mm, it is difficult to dissipate

heat, and a heat radiation property deteriorates.

[0011] A flat-shaped board mounting unit 25 is formed, and a peripheral wall portion 26 which protrudes on one end side from the periphery of the board mounting unit 25 is formed on one end side of the resin housing 20.

[0012] A plurality of mounting holes 28 in which first screws 27 as a plurality of screws which jointly fasten and fix the heat radiating plate 12 and the metal housing 21 to the resin housing 20 are screwed are formed in the board mounting unit 25. In addition, in the board mounting unit 25, a plurality of escape holes 30 into which a plurality of second screws 29 which fasten and fix the light emitting module 13 to the heat radiating plate 12 intrude are formed. In addition, a positioning protrusion 31 which positions the metal housing 21 which is incorporated in the resin housing 20, the heat radiating plate 12, and the light emitting module 13, respectively, is provided in a protruding manner, in the board mounting unit 25.

[0013] A plurality of globe mounting holes 32 in which the globe 15 is rotatably mounted are formed in the inner periphery of the peripheral wall portion 26. An annular packing 33 which causes a waterproof structure between the peripheral wall portion and the globe 15 is arranged on a face on one end side of the peripheral wall portion 26. The peripheral wall portion 26 protrudes in the outer diameter direction of the resin housing 20, and a plurality of fin units 34 are formed between the peripheral wall portion 26 and the outer peripheral face of the resin housing 20.

[0014] A pair of power circuit holding units 35 is formed along the other end side from one end side of the resin housing 20 at a position which is symmetric to the lamp center axis inside the resin housing 20. The pair of power circuit holding units 35 includes a pair of holding walls 36 which protrudes from the inner face of the resin housing 20, and a holding groove 37 which is formed between the pair of holding walls 36. That is, the pair of holding walls 36 and the holding groove 37 are formed along the other end side from one end side, in the inside of the resin housing 20. According to the embodiment, the power circuit holding unit 35 is formed by being divided into a first forming region from the one end cylindrical portion 23a of the resin housing 20 to the inclined cylindrical portion 23b and a middle position of the intermediate cylindrical portion 23c, and a second forming region of the other end cylindrical portion 23e. The first forming region is a region corresponding to an arranging region of the metal housing 21 which is arranged inside the resin housing 20. In addition, the power circuit holding unit 35 may be continuously formed over the first forming region and the second forming region. In addition, the width dimension of the holding wall 36 in the aligning direction of the pair of holding walls 36 is preferably 1 mm or greater, when considering insulation between the power circuit 16 and the metal housing 21, and rigidity of the holding wall 36.

[0015] The metal housing 21 has a pair of metal housing members 39 which is divided into two by having the pair of power circuit holding units 35 as a boundary, and is arranged on both sides of the pair of power circuit holding units 35, respectively, along the inside of the resin housing 20. The pair of metal housing members 39 is formed of a metallic material such as aluminum by using press molding. The pair of metal housing members 39 is formed in the same shape.

[0016] The metal housing member 39 cannot obtain sufficient thermal conductivity when the plate thickness does not have a certain thickness, and on the other hand, when the thickness exceeds a certain thickness, only mass increases, and thermal conductivity is not improved much, and therefore it is preferable to set the thickness to approximately 1 mm to 3.5 mm. In addition, it is more preferable to set the plate thickness of the metal housing member 39 to 2 mm.

[0017] The metal housing member 39 is formed in a half cylindrical shape of which a diameter contracts from one end side to the other end side. According to the embodiment, the metal housing member includes one end half cylindrical portion 40a which is arranged along the inside of the one end cylindrical portion 23a of the resin housing 20, an inclined half cylindrical portion 40b which is arranged along the inside of the inclined cylindrical portion 23b, and the other end half cylindrical portion 40c which is arranged along the inside of the intermediate cylindrical portion 23c. The length on the other end of the the other end half cylindrical portion 40c is formed to the intermediate position of the intermediate cylindrical portion 23c.

[0018] A flange unit 41 which is arranged in the board mounting unit 25 is formed on one end side of the metal housing member 39. A positioning groove 42 which is put into the positioning protrusion 31 of the board mounting unit 25 is formed in the flange unit 41. I n addition, a plurality of insertion holes 43 into which the first screws 27 are inserted are formed, and a plurality of screw holes 44 to which the second screws 29 are screwed are formed in the flange unit 41.

[0019] In addition, the heat radiating plate 12 is formed in a flat plate shape using a metallic material such as aluminum, for example. A through hole 47 is formed at a center of the heat radiating plate 12. The outer peripheral portion of the heat radiating plate 12 is arranged at the board mounting unit 25 so as to be overlapped with the flange unit 41 of the metal housing member 39. A positioning groove 48 which is put into the positioning protrusion 31 of the board mounting unit 25 is formed on the outer peripheral portion of the heat radiating plate 12. In addition, on the outer peripheral portion of the heat radiating plate 12, a plurality of insertion holes 49 into which the plurality of first screws 27 are inserted, and a plurality of screw holes 50a to which the plurality of second screws 29 are screwed, and a plurality of insertion holes 50b into which the plurality of second screws 29 are inserted are formed. In addition, a plurality of screw holes 52 to which a plurality of third screws 51 are screwed are formed on the inner peripheral portion of the

heat radiating plate 12. The third screw 51 is configured so as to jointly fasten and fix the cover 14, the light emitting module 13, and the heat radiating plate 12.

[0020] In addition, the light emitting module 13 includes a board 55, and a plurality of light emitting elements 56 which are mounted on a face on one side of the board 55.

[0021] The board 55 is formed in a flat plate shape using a material with high thermal conductivity, for example, aluminum, ceramic, or the like. A through hole 57 is formed at a center of the board 55. A wiring pattern on which the light emitting element 56 is mounted is formed on a face of one end side of the board 55.

[0022] A positioning groove 58 which is put into the positioning protrusion 31 of the board mounting unit 25 is formed on the outer peripheral portion of the board 55. In addition, a plurality of insertion holes 59 into which the plurality of first screws 27 are inserted, and a plurality of insertion holes 60 into which the plurality of second screws 29 are inserted are formed at the outer peripheral portion of the board 55. A plurality of insertion holes 61 into which the third screws 51 are inserted are formed at the inner peripheral portion of the board 55.

[0023] The light emitting element 56 is formed of a plurality of LEDs, for example, and is mounted on a face of one end side of the board 55 at a predetermined interval along the circumferential direction. When the LED is used, an SMD package which is formed by covering a blue luminescence LED chip using a yellow phosphor layer is used. In addition, in the light emitting module 13, a COB module which is formed by mounting a plurality of LEDs on the board 55 and covering the LEDs using a yellow phosphor layer may be used, or another light emitting element, other than the LED, such as an organic EL, for example, may be used.

[0024] In addition, a connector (not illustrated) which is electrically connected to the wiring pattern of the board 55 is mounted on the board 55.

[0025] In addition, the cover 14 has lower thermal conductivity than the heat radiating plate 12 and the board 55, and is formed of a resin material of which thermal conductivity is 0.5 W/mK or less, for example. A protrusion portion 64 which is inserted into the through hole 57 of the board 55 and the through hole 47 of the heat radiating plate 12, and protrudes more than a face on the other end side of the heat radiating plate 12 is formed at a center of the cover 14. A wiring hole 65 through which wiring with the connector which is derived from the power circuit 16 passes in order to be electrically connected to the connector of the light emitting module 13 is formed in the protrusion unit 64. A pressing unit 64a which presses the power circuit 16 which is arranged in the resin housing 20 is formed on a face of the other end side of the protrusion unit 64. In addition, a flange unit 66 which is arranged on a face on the one end side of the board 55 is formed at the outer peripheral portion of the cover 14. I n the flange unit 66, a plurality of insertion holes 67 into which the plurality of third screws 51 are inserted are formed. In addition, at least a face on one end side of the cover 14 is formed in a white face, or the like, for example, and has high reflectivity.

[0026] In addition, the globe 15 has a light transmission property and a light diffusing property. The globe 15 is formed in a milky-white color by mixing a diffusing material in a synthetic resin such as polycarbonate, for example. The globe 15 is formed in a dome shape of which the center side expands to the one end side compared to the outer peripheral side. A plurality of mounting units 69 which are mounted so as to rotate with respect to a plurality of globe mounting grooves 32 of the resin housing 20 are formed at the outer peripheral portion of the globe 15. The outer peripheral portion of the globe 15 is attached to the peripheral wall portion 26 of the resin housing 20 through the packing 33, and has a waterproof structure.

[0027] I n addition, the power circuit 16 rectifies AC power which is input from the base 17, converts the AC power into predetermined DC power, supplies the DC power to the light emitting element 56 of the light emitting module 13, and causes the light emitting element 56 to emit light.

[0028] The power circuit 16 includes a circuit board 72 and a plurality of electronic components 73 which are mounted on the circuit board 72. A wiring pattern is formed on one face of the circuit board 72, and the electronic components 73 which are mounted on the circuit board 72 are electrically connected to the wiring pattern.

[0029] The circuit board 72 is inserted into the cavity portion 24 from one end side of the resin housing 20, and both side edges of the circuit board 72 are inserted into the pair of power circuit holding units 35, and are held. The side edges of the circuit board 72 which are inserted into the power circuit holding unit 35 are inserted into a holding wall 37 between a pair of holding walls 36.

[0030] Both of the side edges of the circuit board 72 are formed in shapes corresponding to a shape of the inner side of the resin housing 20. That is, the circuit board 72 includes one end edge portion 74a which is arranged along the inside of the one end cylindrical portion 23a of the resin housing 20, an inclined edge portion 74b which is arranged along the inside of the inclined cylindrical portion 23b, an intermediate edge portion 74c which is arranged along the inside of the intermediate cylindrical portion 23c, an inclined edge portion 74d which is arranged along the inside of the inclined cylindrical portion 23d, and the other end edge portion 74e which is arranged along the inside of the the other end cylindrical portion 23e. In addition, when the circuit board 72 is inserted into the cavity portion 24 from the one end side of the resin housing 20, the inclined edge portions 74b and 74d come into contact with the inclined cylindrical portions 23b and 23d, and are positioned with respect to the resin housing 20 in the other end direction of the circuit board 72.

[0031] An abutting unit 75 with which the cover 14 comes into contact is provided in a protruding manner at one end of the circuit board 72.

[0032] In the power circuit 16, the other end side of the circuit board 72 is set to an input side which is electrically connected to the base 17, and the one end side of the circuit board 72 is set to an output side which is connected to the light emitting module 13. Corresponding to this, various electronic components 73 which configure the power circuit 16 are mounted on the circuit board 72. Connector wiring for being electrically connected to the light emitting module 13 is derived on the output side of the power circuit 16.

[0033] In addition, as the base 17, for example, an E26 base is used. The base 17 includes a metallic shell 78 which is attached to the outer periphery of the other end cylindrical portion 23e of the resin housing 20, an insulating unit 79 which is provided on the other end side of the shell 78, and a metallic eyelet 80 which is provided at an apex portion of the insulating unit 79. In addition, though it is not illustrated in drawings, a helical screw is formed at the periphery of the shell 78. In addition, the shell 78 and the eyelet 80 are electrically connected to the input side of the power circuit 16.

[0034] In addition, FIG. 5 illustrates a lighting device 83 in which the lamp unit 10 is used. The lighting device 83 includes a device main body 84 and a socket 85 which is arranged inside the device main body 84. The lamp unit 10 is inserted into the device main body 84, and the base 17 is installed in the socket 85. In addition, AC power is supplied to the lamp unit 10 through the socket 85.

[0035] Subsequently, operations of the embodiment will be described.

[0036] When assembling the lamp unit 10, the pair of metal housing members 39 and the power circuit 16 are inserted in order in the resin housing 20.

[0037] The pair of metal housing members 39 is arranged on both sides of the pair of power circuit holding units 35 along the inside of the resin housing 20, respectively, in an inserting manner. At this time, positioning of the metal housing member 39 and the resin housing 20 in the circumferential direction is performed when the positioning groove 42 of the metal housing member 39 is put into the positioning protrusion 31 of the resin housing 20. In addition, it is preferable to interpose a heat conduction member A such as heat conduction grease or a heat conduction sheet, for example, between the inside of the resin housing 20 and the outside of the metal housing member 39 in order to cause a gap therebetween to come into close contact with each other by being buried.

[0038] In the power circuit 16, the both side edges of the circuit board 72 are inserted into the pair of power circuit holding units 35. At this time, the side edge of the circuit board 72 is inserted into the holding groove 37 between the pair of holding walls 36. In addition, the inclined edge portions 74b and 74d of the circuit board 72 come into contact with the inclined cylindrical portions 23b and 23d of the resin housing 20, and insertion of the circuit board 72 is regulated.

[0039] In addition, the heat radiating plate 12 is arranged in the board mounting unit 25 of the resin housing 20, and the outer peripheral portion of the heat radiating plate 12 and the flange unit 41 of the metal housing member 39 are jointly fastened and fixed to the resin housing 20 using the first screw 27. Also at this time, positioning of the heat radiating plate 12, the metal housing member 39, and the resin housing 20 in the circumferential direction is performed when the positioning groove 48 of the heat radiating plate 12 is put into the positioning protrusion 31 of the resin housing 20.

[0040] The light emitting module 13 is arranged on the heat radiating plate 12, and the outer peripheral portion of the board 55 is fastened and fixed to the heat radiating plate 12 or the metal housing member 39 using the second screw 29. Also at this time, positioning of the board 55, the heat radiating plate 12, the metal housing member 39, and the resin housing 20 in the circumferential direction is performed when the positioning groove 58 of the board 55 is put into the positioning protrusion 31 of the resin housing 20.

[0041] In addition, the connector wiring of the power circuit 16 is pulled out from a wiring hole 65 of the cover 14, and the protrusion unit 64 of the cover 14 is inserted into the through hole 57 of the board 55, and the through hole 47 of the heat radiating plate 12. The flange unit 66 of the cover 14 and the inner peripheral portion of the board 55 are jointly fastened and fixed in the inner peripheral portion of the heat radiating plate 12 using the third screw 51. When the cover 14 is attached to the board 55 and the heat radiating plate 12, the pressing unit 64a of the cover 14 comes into contact with the abutting unit 75 of the circuit board 72, and is positioned and held by being interposed between the cover 14 and the resin housing 20 from one end side and the other end side of the circuit board 72.

[0042] The connector wiring which is pulled out from the wiring hole 65 of the cover 14 is connected to the connector on the board 55. The globe 15 is attached to one end of the resin housing 20 through the packing 33.

[0043] The base 17 is attached to the the other end cylindrical portion 23e of the resin housing 20 while being subjected to an electrical connection with the power circuit 16.

[0044] In addition, the order of assembling the lamp unit 10 is not limited to such an order.

[0045] In addition, when AC power is supplied to the base 17 of the lamp unit 10 which is installed in the lighting device 83, the AC power is rectified and is converted into the predetermined DC power, and the DC power is supplied to the light emitting element 56 of the light emitting module 13. In this manner, the plurality of light emitting elements 56 emit light, light penetrates the globe 15, and is radiated to the outside.

[0046] When the lamp unit 10 is turned on, the light emitting element 56 and the electronic components 73 of the power circuit 16 generate heat.

[0047] The heat which is generated in the light emitting element 56 is mainly transmitted to the metal housing 21 through the board 55 and the heat radiating plate 12, is

transmitted to the resin housing 20 from the metal housing 21, and is radiated to the outside air from the surface of the resin housing 20.

[0048] The heat which is generated in the electronic components 73 of the power circuit 16 is mainly transmitted to the resin housing 20 from the circuit board 72, and is radiated to the outside air from the surface of the resin housing 20.

[0049] Meanwhile, since a temperature of the metal housing 21 to which heat of the light emitting element 56 is transmitted rises, when a distance between the metal housing 21 and the power circuit 16 is small, a temperature of the power circuit 16 rises due to the heat from the metal housing 21. According to the embodiment, since the metal housing 21 is divided into two metal housing members 39 which are a pair, by having the pair of power circuit holding units 35 which hold the power circuit 16 as a boundary, and by there being a distance between the metal housing member 39 and the power circuit 16, it is possible to prevent the temperature of the power circuit 16 from rising due to the heat from the metal housing 21.

[0050] In addition, in the lamp unit 10 according to the embodiment, since the exterior of the housing 11 which can be touched by a finger, or the like, in a state in which the base 17 is installed in the socket 85 is configured of the resin housing 20, it is possible to secure an insulation property.

[0051] Since the metal housing 21 is arranged inside the resin housing 20, heat of the light emitting module 13 is transmitted to the metal housing 21 through the heat radiating plate 12, and the heat can be radiated through the resin housing 20 from the metal housing 21, it is possible to secure a heat radiation property.

[0052] Since the pair of power circuit holding units 35 is provided inside the resin housing 20, the metal housing 21 is configured of the pair of metal housing members 39 which is divided into two by having the pair of power circuit holding units 35 as the boundary, and the pair of metal housing members 39 is arranged at both sides of the pair of power circuit holding units 35, respectively, along the inside of the resin housing 20, it is possible to secure an insulation property between the metal housing 21 and the power circuit 16 even when the metal housing 21 and the power circuit 16 are arranged inside the resin housing 20 together.

[0053] Since the pair of metal housing members 39 is formed in the same shape, it is possible to obtain a good manufacturability of the metal housing member 39, and to perform assembly well when embedding the metal housing member 39 in the resin housing 20.

[0054] Since the heat radiating plate 12 and the metal housing member 39 are jointly fastened and fixed to the resin housing 20 using the first screw 27, it is possible to reduce assembly man-hours, and to improve thermal conductivity from the heat radiating plate 12 to the metal housing member 39.

[0055] Since the outer peripheral portion of the board 55 is fastened and fixed to the outer peripheral portion of the heat radiating plate 12 using the second screw 29, and the cover 14 and the inner peripheral portion of the board 55 are jointly fastened and fixed to the inner peripheral portion of the heat radiating plate 12 using the third screw 51, it is possible to cause the board 55 of the light emitting module 13, and the outer peripheral portion and the inner peripheral portion of the heat radiating plate 12 to come into close contact, adhesion of the board 55 and the heat radiating plate 12 in the entire region is maintained, and it is possible to improve thermal conductivity from the board 55 to the heat radiating plate 12.

[0056] By attaching the cover 14 to the board 55 and the heat radiating plate 12, the circuit board 72 can be positioned and held by one end side and the other end side of the circuit board 72, by being interposed between the cover 14 and the resin housing 20.

[0057] Subsequently, a second embodiment is described in FIG. 6. In addition, the same reference numerals are used in the same configurations as those in the first embodiment, and descriptions of the configuration and operations will be om itted.

[0058] A power circuit 16 includes a heat generation component 73a which most easily generates heat among the electronic components 73. As the heat generation component 73a, for example, there is a rectifier, or the like, which is arranged on the input side of the power circuit 16. I n this case, the heat generation component 73a is installed on the other end side of the circuit board 72, and is arranged inside the resin housing 20 which is farther than the other end side of the metal housing 21, that is, at a position which is not surrounded with the metal housing 21.

[0059] An arranging unit 88 in which the heat generation component 73a is arranged is formed on the other end side compared to the metal housing 21 in the resin housing 20. According to the embodiment, a wall portion 89 stands so as to face the circuit board 72, and the arranging unit 88 in which the heat generation component 73a is arranged between the arranging unit and the circuit board 72 is formed. In the arranging unit 88, a filling material 90 such as a silicone resin, or the like, for example, is filled, and the heat generation component 73a is thermally connected to the resin housing 20.

[0060] In addition, when the arranging unit 88 in which the heat generation component 73a is arranged is formed in the resin housing 20, it is possible to efficiently radiate heat which is generated from the heat generation component 73a from the surface of the resin housing 20, without being thermally influenced by the metal housing 21, and to reduce a temperature of the heat generation component 73a.

[0061] By filling the filling material 90 in the arranging unit 88, it is possible to improve a heat radiation property from the heat generation component 73a to the resin housing 20. The filling material 90 may be fully filled inside the resin housing 20; however, it leads to an increase in mass of the lamp unit 10, but it is possible to make the

lamp unit 10 light while securing a heat radiation property, by filling the filling material 90 only in a portion of the heat generation component 73a at which heat radiation is necessary.

[0062] Subsequently, a third embodiment is illustrated in FIG. 7. In addition, the same reference numerals are used in the same configurations as those in each embodiment, and description of configurations and operation effects thereof will be omitted.

[0063] As a heat generation component 73a, for example, there is a switching element, or the like, which is arranged on the output side of a power circuit 16. I n this case, the heat generation component 73a is installed on one end side of a circuit board 72, and is arranged inside a metal housing 21.

[0064] A protrusion unit 93 is provided in a protruding manner from the inner peripheral portion of a heat radiating plate 12 to the power circuit 16, and a tip end of the protrusion unit 93 is caused to come into contact with the own heat generation component 73a or a position which is close to the circuit board 72 in which the heat generation component 73a is installed, or to be close thereto.

[0065] In addition, a heat conduction member A such as a heat conduction sheet with an insulation property may be interposed between the protrusion unit 93 and the heat generation component 73a or the circuit board 72, in order to improve thermal conductivity and an insulation property. As the heat conduction member A, it is preferable to use a member of which thermal conductivity is 0.2 W/mK to 10 W/mK, and a thickness is approximately 0.5 mm to 3 mm.

[0066] In addition, it is possible to radiate heat which is generated from the heat generation component 73a by transmitting the heat from the protrusion unit 93 to the heat radiating plate 12 and the metal housing 21, and to reduce a temperature of the heat generation component 73a.

[0067] In addition, even when the protrusion unit 93 is not provided corresponding to a specific heat generation component 73a, it is possible to reduce a temperature of the power circuit 16 by forming a heat radiating path from the power circuit 16 using the protrusion unit 93.

[0068] Subsequently, FIG. 8 illustrates a fourth embodiment. In addition, the same reference numerals are used in the same configurations as those in each embodiment, and descriptions of the configuration and operation effects thereof will be om itted.

[0069] It is a case that a heat generation component 73a is installed at an intermediate position of one end side and the other end side of a circuit board 72, and that the heat generation component is arranged inside a metal housing 21.

[0070] A protrusion unit 96 is provided in a protruding manner from the metal housing 21 to a power circuit 16, and a tip end of the protrusion unit 96 is caused to come into contact with the own heat generation component 73a or a position which is close to the circuit board 72 in which the heat generation component 73a is installed, or to be close thereto.

[0071] In addition, a heat conduction member A such as a heat conduction sheet with an insulation property may be interposed between the protrusion unit 96 and the heat generation component 73a or the circuit board 72, in order to improve thermal conductivity and an insulation property. As the heat conduction member A, it is preferable to use a member of which thermal conductivity is 0.2 W/mK to 10 W/mK, and a thickness is approximately 0.5 mm to 3 mm.

[0072] In addition, it is possible to radiate heat which is generated from the heat generation component 73a by transmitting the heat from the protrusion unit 96 to the metal housing 21, and to reduce a temperature of the heat generation component 73a.

[0073] In addition, even when the protrusion unit 96 is not provided corresponding to a specific heat generation component 73a, it is possible to reduce a temperature of the power circuit 16 by forming a heat radiating path from the power circuit 16 using the protrusion unit 96.

[0074] I n addition, in the housing 11, the metal housing member 39 of the metal housing 21 may be formed using insertion molding in the resin housing 20.

[0075] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

Claims

1. A lamp unit (10) comprising:

a housing (11) which includes a resin housing (20) which is provided in a hollow shape of which one end side is open, and includes a pair of power circuit holding units (35) which is provided from one end side to other end side in the inside thereof, and a metal housing (21) which includes a pair of metal housing members (39) which is divided into two by having the power circuit holding unit (35) as a boundary, and is arranged on both sides of the power circuit holding unit (35), respectively, along the inside of the resin housing (20);

a heat radiating plate (12) which is arranged on one end side of the housing (11), and comes into contact with the metal housing (21);

a light emitting module (13) which is arranged on one end side of the heat radiating plate (12);

a power circuit (16) which is held by the power

circuit holding unit (35), and is arranged inside the housing (11); and
a power supply unit (17) which is provided on the other end side of the resin housing (20).

2. The unit (10) according to claim 1,
wherein a through hole (47) (57) is provided at a center of the heat radiating plate (12) and the light emitting module (13), and a cover (14) which protrudes in a direction of the power supply unit (17), and comes into contact with one end side of the power circuit (16) is provided in the through hole (47) (57).

3. The unit (10) according to claim 1 or 2,
wherein the resin housing (20) includes an arranging unit (88) which is provided on the other end side compared to the metal housing (21), and in which a heat generation component (73a) included in the power circuit (16) is arranged, and is thermally connected.

4. The unit (10) according to any one of claims 1 to 3,
wherein the metal housing (21) and the heat radiating plate (12) are jointly fastened to one end side of the resin housing (20) using a first screw (27).

5. The unit (10) according to claim 4,
wherein the light emitting module (13) is fastened and fixed to the heat radiating plate (12) using a second screw (29).

6. The unit (10) according to any one of claims 1 to 5,
wherein the metal housing (21) includes a flange unit (41) which protrudes on one end side of the metal housing (21) in an outer diameter direction, and in which a face on one end side of the flange unit (41) comes into contact with the heat radiating plate (12), and a face on the other end side comes into contact with the resin housing (20).

7. The unit (10) according to any one of claims 1 to 6,
wherein
the power circuit holding unit (35) includes a pair of holding walls (36) which protrudes from an inner face of the resin housing (20), and holds the power circuit (16) between the pair of holding walls (36), and
the metal housing members (39) are respectively arranged on both sides of the holding wall (36), and are separated using the holding wall (36).

8. The unit (10) according to any one of claims 1 to 7,
wherein the resin housing (20) includes a common positioning protrusion (31) which positions the metal housing (21), the heat radiating plate (12), and the light emitting module (13) on one end side of the resin housing (21) respectively.

9. The unit (10) according to any one of claims 1 to 8,
wherein a heat conduction member (A) is interposed between the resin housing (20) and the metal housing (21).

10. A lighting device (83) comprising:

a socket (85),
the lamp unit (10) according to any one of claims 1 to 9 in which the power supply unit (17) is connected to the socket (85).

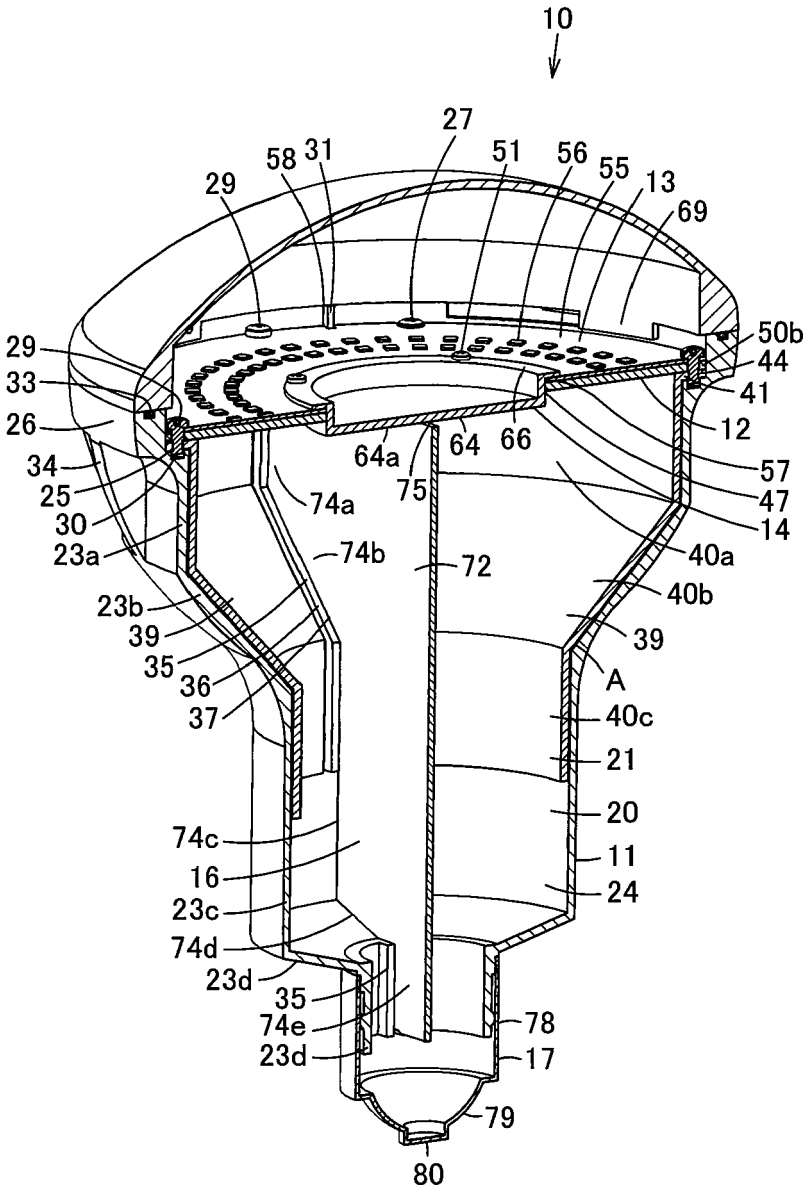
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FIG. 1

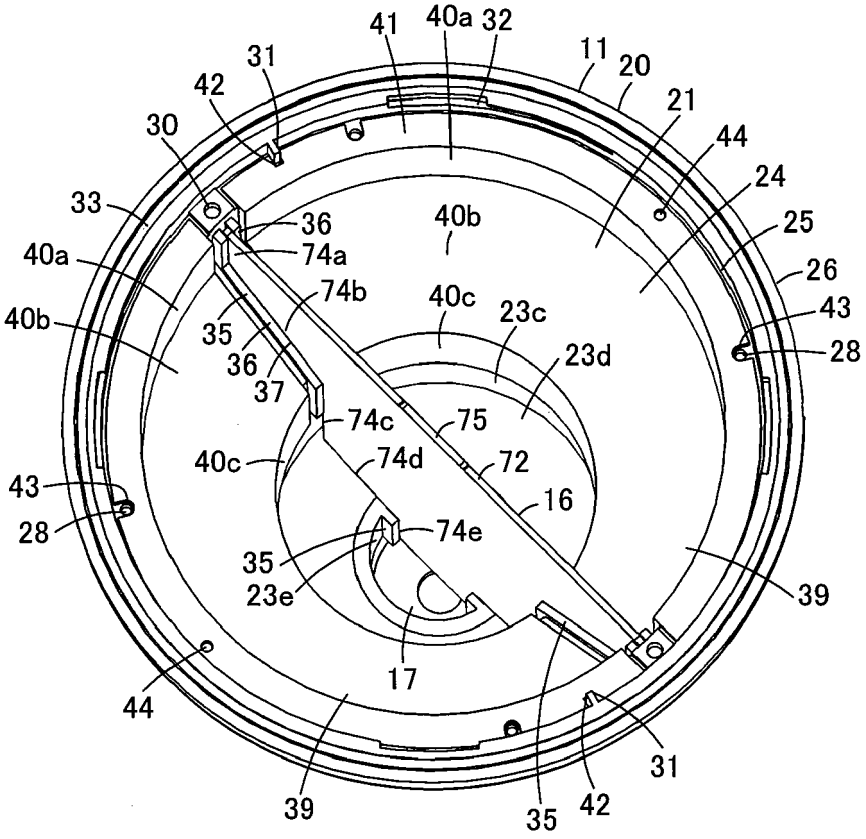
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FIG. 2

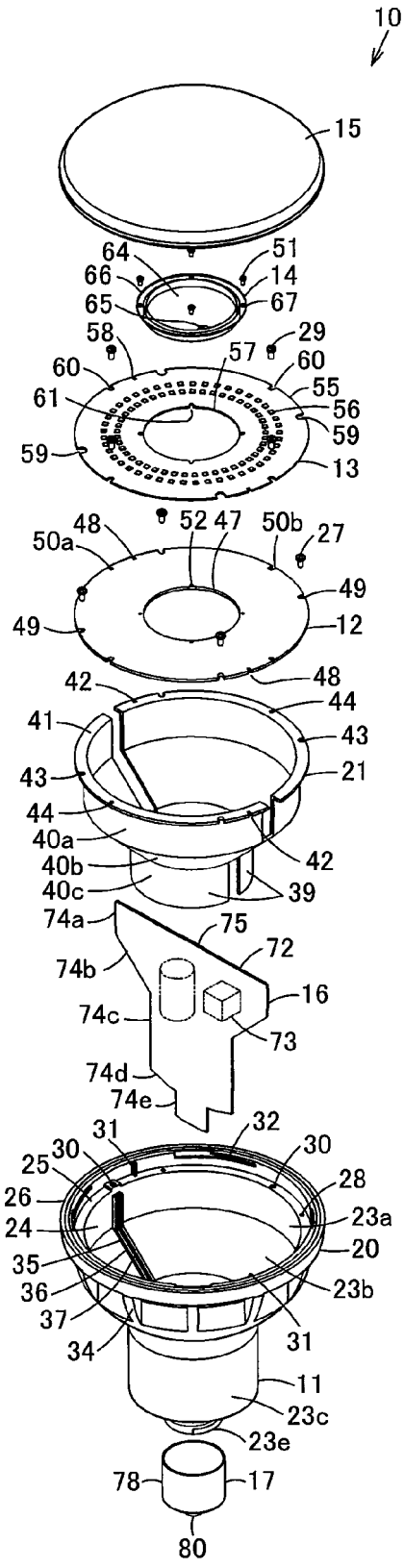
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FIG. 3

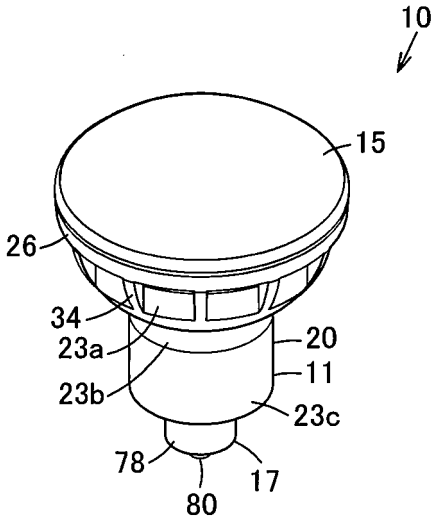

FIG. 4

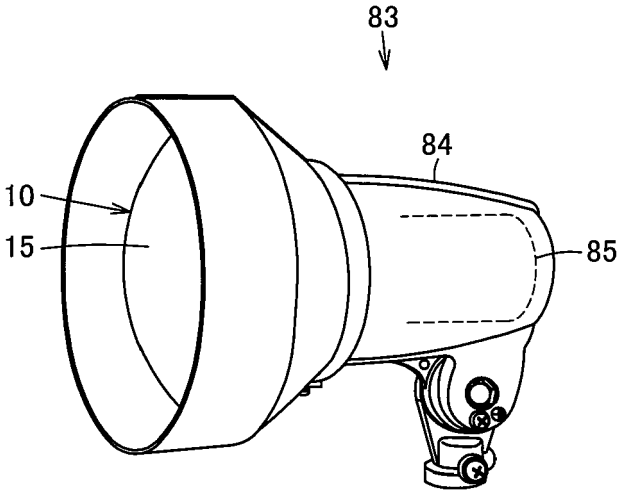

FIG. 5

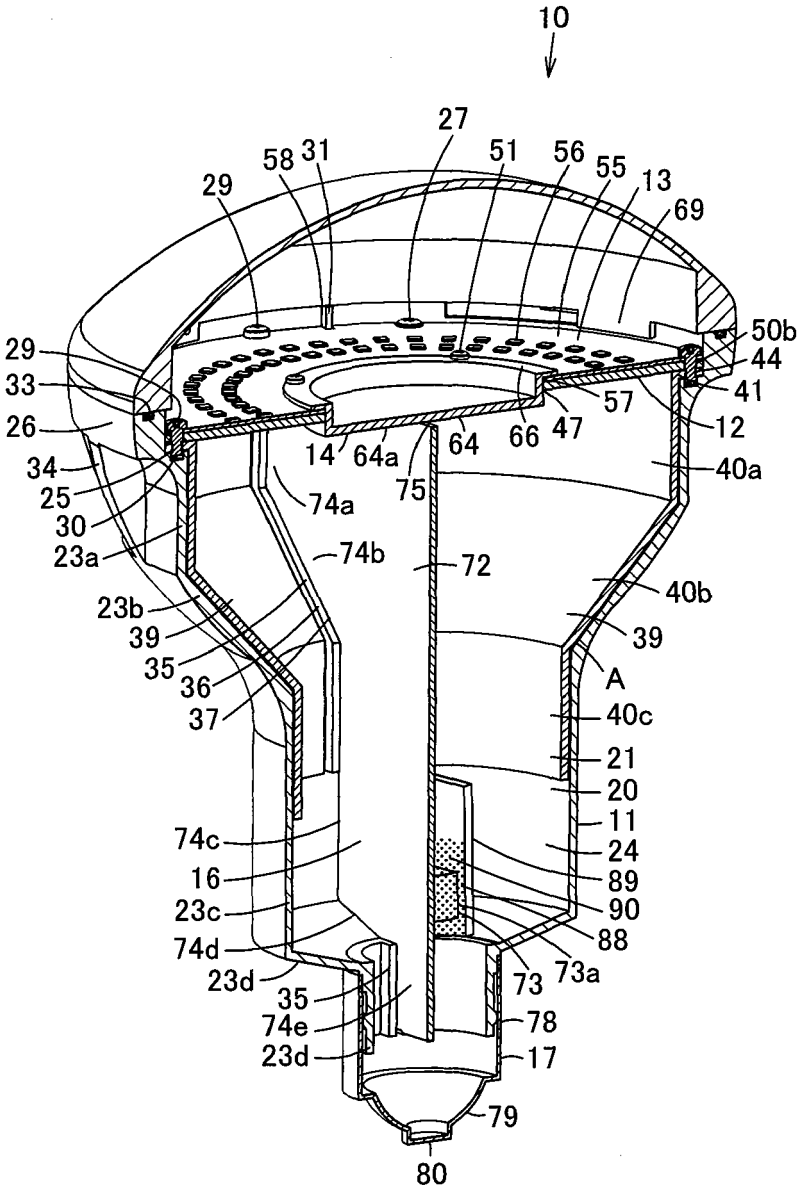
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FIG. 6

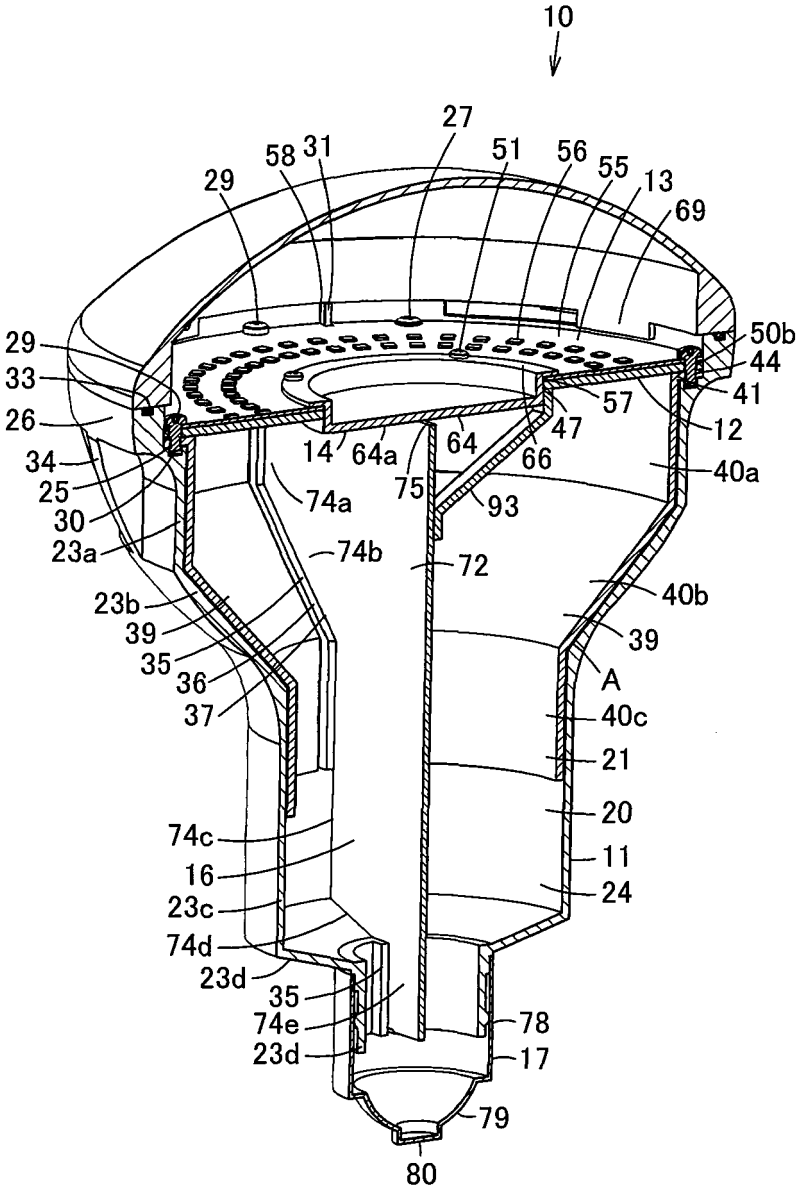
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FIG. 7

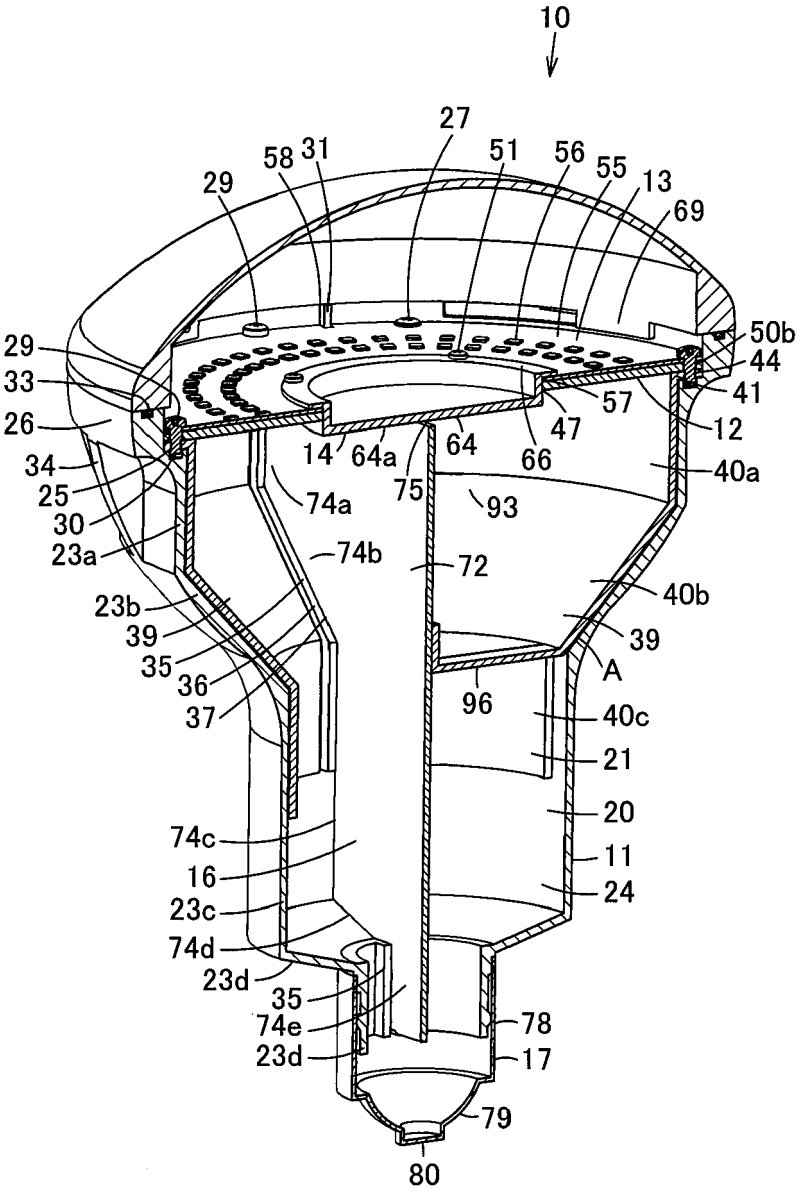
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FIG. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 15 15 0929

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F21K
F21V
F21Y

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 March 2015	Demirel, Mehmet

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