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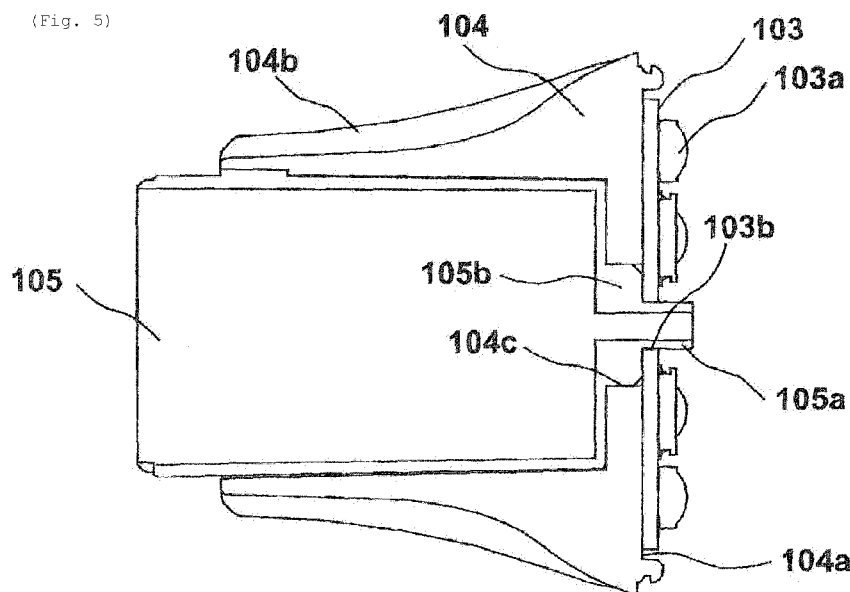
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(54) **Title:** LIGHTING DEVICE



(57) **Abstract:** The lighting device (100) of this invention is provided with a base (103) on which a light source (103a) is mounted, a heat dissipater (104) which cools the light source, a lighting circuit- board (106) which controls the light source, a housing (107) which accommodates the lighting circuit base, in which the heat dissipater is provided with a disk (104a) having an aperture provided near the center and which is mounted on the base, and has a plurality of cooling fins (104b), the housing being provided with a projection (105a) at the end of the base side, the projection of the housing being pressed into an aperture provided in the disk of the heat dissipater, securing the heat dissipater and housing.



Lighting device

(Technical Field)

(0001)

The invention relates to a lighting device which employs a light-emitting diode.

(Technical Background)

(0002)

To provide a LED (light-emitting diode) bulb with improved mechanical strength as well as improved cooling without the need for cooling fins with a complex die cast structure being used in the heat dissipating section, an LED bulb has been proposed which has a structure with an LED module to which an LED element is attached, a heat dissipation plate to which the LED module is secured and which transmits the heat generated by the LED module externally, and a metal cover member on which the heat dissipating plate is mounted and which houses the power circuit, the heat dissipating plate being formed with a surround, the external surface of the surround being in close contact with the inner surface of a stepped section on the cover member (see Patent Literature 1, for example).

(0003)

However, although the shell member and fitting are electrically insulated because the connecting member employed in the LED bulb is of synthetic resin, there is the difficulty that when the lighting circuit-board within the external member ignites, the connecting member can deform due to melting from the heat or the like, and in some cases the connecting member may catch fire. To resolve this difficulty, a lighting device has been

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proposed which is characterized in that a connector is provided which connects a conductive member in the heat dissipating part or the like which dissipates heat generated by the heat source and functions by receiving power from the power source with a power source connector which connects the source of heat to an external power source which supplies the power, the connector being electrically insulated in order to electrically insulate the conductive member and the power connector, and also provided with heat insulation to prevent deformation due to heat from the heat source (see Patent Literature 2, for example).

(0004)

As cited in Patent Literature 1 and Patent Literature 2, with a lighting device which employs a light-emitting diode element such as an LED bulb, is compact, and has a shape similar to a conventional incandescent bulb, there is the difficulty that the life of the light-emitting diode is short due to the heat generated by the light-emitting diode element. For this reason almost all LED bulbs are provided with a heat dissipater. The layout of the heat dissipater, light-emitting diode element and lighting circuit-board is the subject of research to enable the heat dissipater to more effectively dissipate the heat.

(0005)

Thus although production processes requiring skill such as thermal processing of the glass and cathode sealing as with conventional incandescent bulbs no longer exist, the number of parts in an LED bulb is greater than for an incandescent bulb, and the manufacturing process is complex.

(0006)

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Fig. 14 shows an oblique exploded view of conventional lighting device 400. Conventional lighting device 400 shown in Fig. 14 comprises the following parts:

- (1) translucent cover 401;
- (2) plurality of fixing screws 402;
- (3) light-emitting diode base 403 mounted with light-emitting diode elements;
- (4) heat dissipater 404 which cools the light-emitting diode elements;
- (5) dissipater-side housing 405 which houses lighting circuit-board 406;
- (6) lighting circuit-board 406 which controls light-emitting diode element light-emission;
- (7) fitting-end housing 407;
- (8) fitting 408.

(0007)

With lighting device 400 comprising these types of part, light-emitting diode base 403, heat dissipater 404, lighting circuit-board 406, and housing 405 which houses lighting circuit-board 406 are usually secured by a plurality of fixing screws 402. Moreover, the positioning of these parts (light-emitting diode base 403, heat dissipater 404, lighting circuit-board 406, and housing 405 which houses lighting circuit-board 406) at this time is done by matching up the plurality of fixing screws 402 and screw apertures (not shown in the diagram) and inserting fixing screws 402.

(0008)

The procedure is essentially the same with the LED bulbs and lighting devices cited in Patent Literature 1 and Patent Literature 2 as for lighting device 400.

(Literature in Prior Art)

(Patent Literature)

(0009)

(Patent Literature 1) Japanese Utility Model 3159084

(Patent Literature 2) Japanese Patent 2010-3580 Gazette

(Outline of Invention)

(Difficulty to Be Resolved by the Invention)

(0010)

The positioning of these parts (light-emitting diode base 403, heat dissipater 404, lighting circuit-board 406, and housing 405 which houses lighting circuit-board 406) and the tightening of fixing screws 402 takes a considerable amount of time. This type of process is not suitable for an automated assembly line. Moreover, in a production factory where the work is mainly manual, there is always the danger of a rise in processing costs, and there is thus an urgent need to simplify the above processes.

(0011)

The invention provides a lighting device which employs light-emitting diode elements for which the assembly process is simplified and which enables easy automation, having been devised as a means of resolving the above difficulty.

(Means of Resolving the Difficulties)

(0012)

In a lighting device provided with a base mounted with a light source, a heat dissipater which cools the light source, a

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lighting circuit-board which controls the light source, and a housing which houses the lighting circuit-board, the invention is characterized in that

the heat dissipater is fitted with a base, having a disk with an aperture provided near the center, and a plurality of cooling fins,

the housing is provided with a projection at the base end,

the projection on the housing being pressed into the aperture in the disk of the heat dissipater, securing the heat dissipater and housing.

(0013)

The lighting device of the invention is characterized in that a plurality of base fins are provided at the base of the projection on the housing, these base fins being pressed into the aperture in the disk of the heat dissipater.

(0014)

The lighting device of the invention is characterized in that a positioning aperture is provided in a position corresponding to the aperture in the disk of the heat dissipater near the center of the base, the projection of the housing being inserted into the base positioning aperture.

(0015)

The lighting device of the invention is characterized in that the base is secured to the disk of the heat dissipater by adhesive or the like.

(0016)

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The lighting device of the invention is characterized in that a positioning aperture is provided in a position corresponding to the aperture in the disk of the heat dissipater near the center of the base, the projection being pressed into the base positioning aperture.

(0017)

The lighting device of the invention is characterized in that a positioning aperture is provided in a position corresponding to the aperture in the disk of the heat dissipater near the center of the base, the base fins being pressed into the base positioning aperture.

(0018)

The lighting device of the invention is characterized in that in addition to being formed so as to extend away from the disk to the side opposite the base on the outer periphery, the heat dissipater is provided with three or more cooling fins which project in a radial direction.

(0019)

The lighting device of the invention is characterized in being provided with a fitting which is connected to the light fixture and supplies electric power from the lighting fixture,

the housing which houses the lighting circuit-board being split between a dissipater-end housing secured to the heat dissipater and a fitting-end housing secured to the fitting.

(0020)

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The lighting device of the invention is characterized in being provided with a fitting which is connected to the light fixture and supplies electric power from the lighting fixture,

the housing which houses the lighting circuit-board being split between a dissipater-end housing secured to the heat dissipater and a fitting-end housing secured to the fitting,

with the dissipater-end housing and fitting-end housing being indirectly secured through the secure fit between the dissipater and the fitting-end housing.

(0021)

The lighting device of the invention is characterized in that the dissipater-end housing and fitting-end housing are secured through engagement between the clasps formed on both sides.

(0022)

The lighting device of the invention is characterized in that a concavity is formed at the bottom of specific cooling fins among the plurality of cooling fins on the heat dissipater,

a projection corresponding to this concavity being formed on the tubular section of the fitting-end housing such that it projects toward the dissipater,

with rotation of the fitting-end housing being prevented by insertion of the projection into the concavity.

(0023)

The lighting device of the invention is characterized in that the dissipater-end housing has a conical shape with its apex at the dissipater end.

(0024)

The lighting device of the invention is characterized in that the light source is a semiconductor light-emitting element.

(0025)

The lighting device of the invention is characterized in that the semiconductor light-emitting element is a light-emitting diode element.

(Effect of the Invention)

(0026)

The invention enables a simplified assembly process and allows for easy automation because the projection of the housing is pressed into an aperture provided in the disk section of the heat dissipater, securing the heat dissipater and the housing.

(Brief Description of the Drawings)

(0027)

(Fig. 1) Diagram illustrating Embodiment 1, an oblique view of lighting device 100.

(Fig. 2) Diagram illustrating Embodiment 1, an exploded oblique view of lighting device 100.

(Fig. 3) Diagram illustrating Embodiment 1, heat dissipater 104.

(Fig. 4) Diagram illustrating Embodiment 1, an oblique view of dissipater-end housing 105.

(Fig. 5) Diagram illustrating Embodiment 1, showing the assembled structure of dissipater-end housing 105, heat dissipater 104 and light-emitting diode base 103.

(Fig. 6) Diagram illustrating Embodiment 2, an oblique view of lighting device 200.

Fig. 7) Diagram illustrating Embodiment 2, an exploded oblique view of lighting device 200.

(Fig. 8) Diagram illustrating Embodiment 2, heat dissipater 204.

(Fig. 9) Diagram illustrating Embodiment 2, an oblique view of dissipater-end housing 205.

(Fig. 10) Diagram illustrating Embodiment 2, an oblique view of light-emitting diode base 203.

(Fig. 11) Diagram illustrating Embodiment 2, an oblique view of dissipater 204 and fitting-end housing 207.

(Fig. 12) Diagram illustrating Embodiment 2, an exploded oblique view of fitting-end housing 207.

(Fig. 13) Diagram illustrating Embodiment 3, showing the assembled structure of dissipater-end housing 305, heat dissipater 304 and light-emitting diode base 303.

(Fig. 14) Exploded oblique view of conventional lighting device 400.

(Embodiments of the Invention)

(0028) Figs. 1 and 2 are diagrams illustrating Embodiment 1, Fig. 1 being an oblique view of lighting device 100, and Fig. 2 an exploded oblique view of lighting device 100. Lighting device 100 shown in Fig. 1 is a bulb-shaped LED lamp having a light-emitting diode (LED) as the light source. Explanation of the numbers keyed in Fig. 1 will be omitted here.

(0029)

A description of the structure of lighting device 100 will now be given with reference to the exploded oblique diagram in Fig. 2. Lighting device 100 is provided with the following parts:

- (1) translucent cover 101 made of translucent resin;
- (2) light-emitting diode base 103 (base) on which light-emitting diode elements 103a (semiconductor element, light source, six in this instance) are mounted;

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- (3) heat dissipater 104 having disk 104a (planar section) in the shape of a disk on which light-emitting diode base 103 is mounted on the side of translucent cover 101;
- (4) dissipater-end housing 105 which houses lighting circuit-board 106;
- (5) lighting circuit-board 106 which controls the lighting of light-emitting diode elements 103a;
- (6) fitting-end housing 107 secured to fitting 108, and housing part of lighting circuit-board 106;
- (7) fitting 108 connected to the lighting fixture, and to which power is supplied from the lighting fixture.

It should be noted that the "housing" comprises both dissipater-end housing 105 and fitting-end housing 107. Dissipater-end housing 105 and fitting-end housing 107 are secured by being fitted together.

(0030)

Fig. 3 is a diagram illustrating Embodiment 1, and shows an oblique view of heat dissipater 104. As shown in Fig. 3, heat dissipater 104 has the form of an almost tubular-shaped cap projecting in a taper shape from disk 104a on the side opposite to light-emitting diode base 103 on which light-emitting diode elements 103a are mounted (the diameter on the side of disk 104a being larger, gradually decreasing to the opposite side to disk 104a). Around the almost tubular-shaped outer periphery are a plurality of cooling fins 104b which extend away from disk 104a. Aperture 104c is provided near the center of disk 104a of heat dissipater 104.

(0031)

Fig. 4 is a diagram illustrating Embodiment 1, and is an oblique view of dissipater-end housing 105. As shown in Fig. 4, projection 105a is provided on the side of light-emitting diode base 103 mounted with light-emitting diode elements 103a (the

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light source) of dissipater-end housing 105 which houses lighting circuit-board 106. In addition, projecting base fins 105b are provided at the base of projection 105a in four directions (radially) from projection 105a.

(0032)

Dissipater 104 and dissipater-end housing 105 which houses lighting circuit-board 106 are secured by pressing base fins 105b which project from projection 105a of dissipater-end housing 105 which houses lighting circuit-board 106 into aperture 104c provided near the center of disk 104a of heat dissipater 104.

(0033)

Fig. 5 is a diagram illustrating Embodiment 1, and illustrates the assembled state of dissipater-end housing 105, heat dissipater 104 and light-emitting diode base 103.

(0034)

As shown in Fig. 5, projection 105a of dissipater-end housing 105 projects in the direction of light-emitting diode base 103 on which light-emitting diode elements 103a are mounted through aperture 104c provided near the center of disk 104a of heat dissipater 104.

(0035)

Light-emitting diode base 103 is positioned by inserting projection 105a of dissipater-end housing 105 in positioning aperture 103b provided near the center of heat light-emitting diode base 103 on which light-emitting diode elements 103a are mounted.

(0036)

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Light-emitting diode base 103 on which light-emitting diode elements 103a are mounted and disk 104a of heat dissipater 104 are secured by means of adhesive, adhesive tape, small screws or the like (not shown in the diagram).

(0037)

Dissipater-end housing 105 which houses lighting circuit-board 106 and fitting-end housing 107 on the side of fitting 108 are secured by being fitted together (not shown in the diagram). Fitting-end housing 107 is secured by being fitted or screwed into fitting 108 (not shown in the diagram).

(0038)

According to the embodiment, as projection 105a of dissipater-end housing 105 is pressed into aperture 104c provided in disk 104a of heat dissipater 104, securing heat dissipater 104 to dissipater-end housing 105, the manufacturing process is simplified and automation is easily enabled.

(0039)

Moreover, as plurality of base fins 105b are provided at the base of projection 105a of dissipater-end housing 105, and base fins 105b are pressed into aperture 104c of disk 104a of heat dissipater 104, they can be pressed in with less force.

(0040)

Furthermore, as positioning aperture 103b is provided in a position corresponding to aperture 104c of disk 104a of heat dissipater 104 near the center of light-emitting diode base 103, and projection 105a of dissipater-end housing 105 is inserted into positioning aperture 103b of light-emitting diode base 103 and aperture 104c of disk 104a of heat dissipater 104,

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the positioning of light-emitting diode base 103 is easily accomplished, and the process can be easily automated.

(0041)

Moreover, as the periphery of heat dissipater 104 has three or more cooling fins 104b which not only extend away from disk 104a on the side opposite light-emitting diode base 103 but project in a radial direction, air can flow freely and cooling efficiency can be improved.

(0042)

Embodiment 2

Figs. 6, 7 are diagrams illustrating Embodiment 2, Fig. 6 being an oblique view of lighting device 200, and Fig. 7 an exploded oblique view of lighting device 200. Lighting device 200 shown in Fig. 6 is also a bulb-shaped LED lamp having light-emitting diode (LED) elements as a light source. A description of the numbers used to key Fig. 6 will be omitted here.

(0043)

The structure of lighting device 200 will now be described with reference to the exploded oblique diagram in Fig. 7. Lighting device 200 is provided with the following parts:

- (1) translucent cover 201 made of translucent resin;
- (2) light-emitting diode base 203 (base) on which light-emitting diode elements 203a (semiconductor elements, light source) are mounted;
- (3) heat dissipater 204 having disk 204a (planar section) in the shape of a disk on which light-emitting diode base 203 is mounted on the side of translucent cover 201;
- (4) dissipater-end housing 205 which houses lighting circuit-board 206;

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- (5) lighting circuit-board 206 which controls the lighting of light-emitting diode element 203a;
- (6) fitting-end housing 207 secured to fitting 208 and housing part of lighting circuit-board 206;
- (7) fitting 208 connected to the lighting fixture, and to which power is supplied from the lighting fixture.

It should be noted that the "housing" comprises both dissipater-end housing 205 and fitting-end housing 207.

(0044)

Fig. 8 is a diagram illustrating Embodiment 2, and shows an oblique view of heat dissipater 204. As shown in Fig. 8, heat dissipater 204 is provided with a plurality of cooling fins 204b which extend from disk 204a to the side opposite light-emitting diode base 203 (here there are 8 fins). Slits (spaces) are provided between adjacent cooling fins 204b. The eight cooling fins 204b are positioned in the shape of a cap with a radius that narrows away from disk 204a. Each cooling fin 204b is positioned equidistant around the circumference.

(0045)

The housing which houses lighting circuit-board 206 comprises dissipater-end housing 205 which is secured to disk 204a of heat dissipater 204 and fitting-end housing 207 which is secured to fitting 208.

(0046)

Fig. 9 is a diagram illustrating Embodiment 2, and shows an oblique view of dissipater-end housing 205. As shown in Fig. 9, projection 205a is provided at the end of light-emitting diode base 203 of dissipater-end housing 205. In addition, the base of projection 205a is provided with base fins 205b which project in four directions (radially) from projection 205a.

(0047)

Aperture 204c is provided at the center of disk 204a of heat dissipater 204. The base fins 205b which project in a radial direction from projection 205a of heat dissipater housing 205 which houses lighting circuit-board 206 are pressed into aperture 204c and secure heat dissipater 204 and dissipater-end housing 205.

(0048)

Fig. 10 is a diagram illustrating Embodiment 2, and shows an oblique view of light-emitting diode base 203. Projection 205a of dissipater-end housing 205 is inserted into the direction of light-emitting diode base 203 through aperture 204c provided near the center of disk 204a of heat dissipater 204, and is also inserted into positioning aperture 203b provided near the center of light-emitting diode base 203. This is how the positioning of heat emitting diode base 203 is accomplished (not shown in the diagram).

(0049)

Light-emitting diode base 203 on which light-emitting diode elements 203a are mounted and disk 204a of heat dissipater 204 are secured using adhesive, adhesive tape, small screws or the like (not shown in the diagram).

(0050)

Fig. 11, Fig. 12 are diagrams illustrating Embodiment 2, Fig. 11 being an oblique view of heat dissipater 204 and fitting-end housing 207, with Fig. 12 showing an exploded oblique view of fitting-end housing 207.

(0051)

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As shown in Fig. 8, Fig. 11 and Fig. 12, catches 204e (slots) are provided at the bottom end of four cooling fins 204b of heat dissipater 204. Moreover, four catches 207a (projections) are provided around the circumference of tubular section 207c formed on the dissipater 204 side of fitting-end housing 207.

(0052)

Heat dissipater 204 and fitting-end housing 207 are fitted together and secured through the engagement of catches 204e (slots) and catches 207a (projections).

(0053)

At this time concavities 204d are provided at the bottom of another three cooling fins 204b on heat dissipater 204. Projections 207b are provided in three places on tubular section 207c of fitting-end housing 207 so as to project to the side of heat dissipater 204.

(0054)

By inserting projections 207b in concavities 204d, fitting-end housing 207 which is secured to heat dissipater 204 by catches (catches 204e (slots) and catches 207a (projections)) can be prevented from rotating.

(0055)

Dissipater-end housing 205 and fitting-end housing 207 are linked (not shown in the diagram) by inserting tubular section 205c at the fitting 208 end of dissipater-end housing 205 into tubular section 207c (inner periphery) of fitting-end housing 207. Fitting-end housing 207 is secured to fitting 208 by being fitting or screwed (not shown in the diagram).

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(0056)

With this embodiment, lighting circuit-board 206 is housed within fitting-end housing 207 and dissipater-end housing 205, with fitting-end housing 207 and dissipater-end housing 205 forming an incomplete linkage through the mutual insertion of tubular sections (tubular section 205c, tubular section 207c).

(0057)

A characteristic of the invention is that heat dissipater 204 and fitting-end housing 207 are secured together by the engagement of catches 204e (slots) on heat dissipater 204 and catches 207a (projections) on fitting-end housing 207 between lighting circuit-board 206 and dissipater-end housing 205.

(0058)

Dissipater-end housing 205, as shown in Fig. 9, is a cone with heat dissipater 204 at its apex, and lighting circuit-board 206 housed within dissipater-end housing 205 also has a tapered shape which is narrower at the end of dissipater-end housing 205 to fit this shape.

(0059)

According to the embodiment, the housing which houses lighting circuit-board 206 is split between dissipater-end housing 205 and fitting-end housing 207, enabling lighting circuit-board 206 housing to be more easily accommodated.

(0060)

As dissipater-end housing 205 and fitting-end housing 207 are secured respectively to heat dissipater 204, there is no need to secure dissipater-end housing 205 and fitting-end housing 207, thus simplifying the process and making automation easy.

(0061)

As fitting-end housing 207 is secured using a strong and simple method through the catches (catches 204e (slots), catches 207a (projections)) on cooling fins 204b of heat dissipater 204, the process is simplified and automation made easy.

(0062)

It is possible to prevent rotation of fitting-end housing 207 by the simple method of inserting projections 207b provided on fitting-end housing 207 into concavities 204d provided on cooling fins 204b of heat dissipater 204.

(0063)

Embodiment 3

Fig. 13 is a diagram illustrating Embodiment 3, the diagram showing the assembled condition of heat dissipater 304, housing 305 and light-emitting diodes 303.

(0064)

As shown in Fig. 13, projections 305a are provided on the side of light-emitting diode base 303 (base) of housing 305 which houses the lighting circuit-board. Base fins 305b which project in four directions (radially) from projection 305a are provided on the base of projection 305a.

(0065)

Aperture 304c is provided near the center of disk 304a of heat dissipater 304. Heat dissipater 304 and housing 305 are secured by pressing into aperture 304c base fins 305b which project

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from projection 305a of housing 305 which houses the lighting circuit-board.

(0066)

At this time, base fins 305b of housing 305 project in the direction of light-emitting diode base 303, and are simultaneously pressed into positioning aperture 303b provided near the center of light-emitting diode base 303.

(0067)

By this means at the same time as light-emitting diode base 303 is being positioned, housing 305, heat dissipater 304 and light-emitting diode base 303 are secured together. The additional structure is identical to that of Embodiment 1.

(Key to Diagrams)

(0068)

100 lighting device, 101 translucent cover, 103 light-emitting diode base, 103a light-emitting diode element, 104 heat dissipater, 104a disk, 104b cooling fin, 104c aperture, 105 dissipater-end housing, 105a projection, 105b base, 106 lighting circuit-board, 107 fitting-end housing, 108 fitting, 200 lighting device, 201 translucent cover, 203 light-emitting diode base, 203a light-emitting diode element, 203b positioning aperture, 204 heat dissipater, 204a disk, 204b cooling fin, 204c aperture, 204d concavity, 204e catches, 205 dissipater-end housing, 205a projection, 205b base fin, 205c tubular section, 206 lighting circuit-board, 207 fitting-end housing, 207a catch, 207b projection, 207c tubular section, 208 fitting, 303 light-emitting diode base, 303b positioning aperture, 304 heat dissipater, 304a disk, 304c aperture, 305 housing, 305a projection, 305b base fin, 400 lighting device, 401 translucent cover, 402 fixing screw, 403 light-emitting

diode base, 404 heat dissipater, 405 housing, 406 lighting circuit-board, 407 fitting-end housing, 408 fitting.

Claims

(Claim 1)

A lighting device provided with a base mounted with a light source, a heat dissipater which cools the light source, a lighting circuit-board which controls the light source, and a housing which houses the lighting circuit-board, characterized in that

the heat dissipater is fitted with a base, having a disk with an aperture provided near the center, and a plurality of cooling fins,

the housing is provided with a projection at the base end,

and the projection on the housing is pressed into the aperture in the disk of the heat dissipater, fixing the heat dissipater and housing together.

(Claim 2)

The lighting device of Claim 1, characterized in that a plurality of base fins are provided at the base of the projection on the housing, these base fins being pressed into the aperture in the disk of the heat dissipater.

(Claim 3)

The lighting device of Claim 1 and Claim 2, characterized in that

a positioning aperture is provided in a position corresponding to the aperture in the disk of the heat dissipater near the center of the base, the projection of the housing being inserted into the base positioning aperture.

(Claim 4)

The lighting device of Claim 3, characterized in that the base is secured to the disk of the heat dissipater by adhesive or the like.

(Claim 5)

The lighting device of Claim 1, characterized in that

a positioning aperture is provided in a position corresponding to the aperture in the disk of the heat dissipater near the center of the base, the projection being pressed into the base positioning aperture.

(Claim 6)

The lighting device of Claim 5, characterized in that

a positioning aperture is provided in a position corresponding to the aperture in the disk of the heat dissipater near the center of the base, the base fins being pressed into the base positioning aperture.

(Claim 7)

The lighting device of any of Claims 1-6, characterized in that in addition to being formed so as to extend to the opposite side of the base from the disk on the surrounding surface, the heat dissipater is provided with three or more cooling fins which project in a radial direction.

(Claim 8)

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The lighting device of any of Claim 1-7, characterized in having

a fitting which is connected to the light fixture and supplies electric power from the lighting fixture,

the housing which houses the lighting circuit-board being split between a dissipater-end housing secured to the heat dissipater and a fitting-end housing secured to the fitting.

(Claim 9)

The lighting device of any of Claims 1-7 characterized in having

a fitting which is connected to the light fixture and supplies electric power from the lighting fixture,

the housing which houses the lighting circuit-board being split between a dissipater-end housing secured to the heat dissipater and a fitting-end housing secured to the fitting,

with the dissipater-end housing and fitting-end housing being indirectly secured through the secure fit between the dissipater and the fitting-end housing.

(Claim 10)

The lighting device of Claim 9, characterized in that the dissipater-end housing and fitting-end housing are secured through engagement between the clasps formed on both sides.

(Claim 11)

The lighting device of Claim 9 and Claim 10, characterized in that a concavity is formed at the bottom of specific cooling

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fins among the plurality of cooling fins on the heat dissipater,

a projection corresponding to this concavity being formed on the tubular section of the fitting-end housing so that it projects toward the dissipater,

with rotation of the fitting-end housing being prevented by insertion of the projection into the concavity.

(Claim 12)

The lighting device of any of Claims 9-11, characterized in that the dissipater-end housing has a conical shape with its apex at the dissipater end.

(Claim 13)

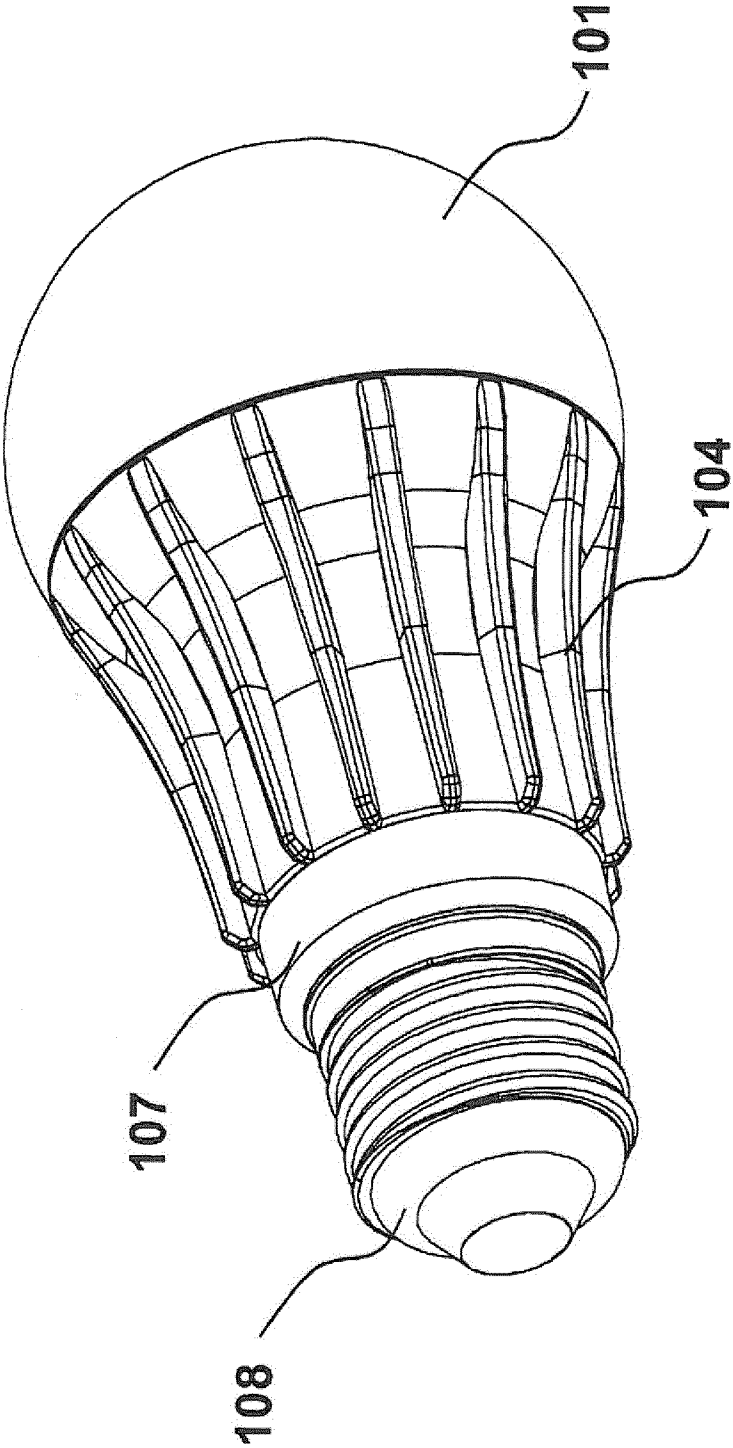
The lighting device of any of Claims 1-12, characterized in that the light source is a semiconductor light-emitting element.

(Claim 14)

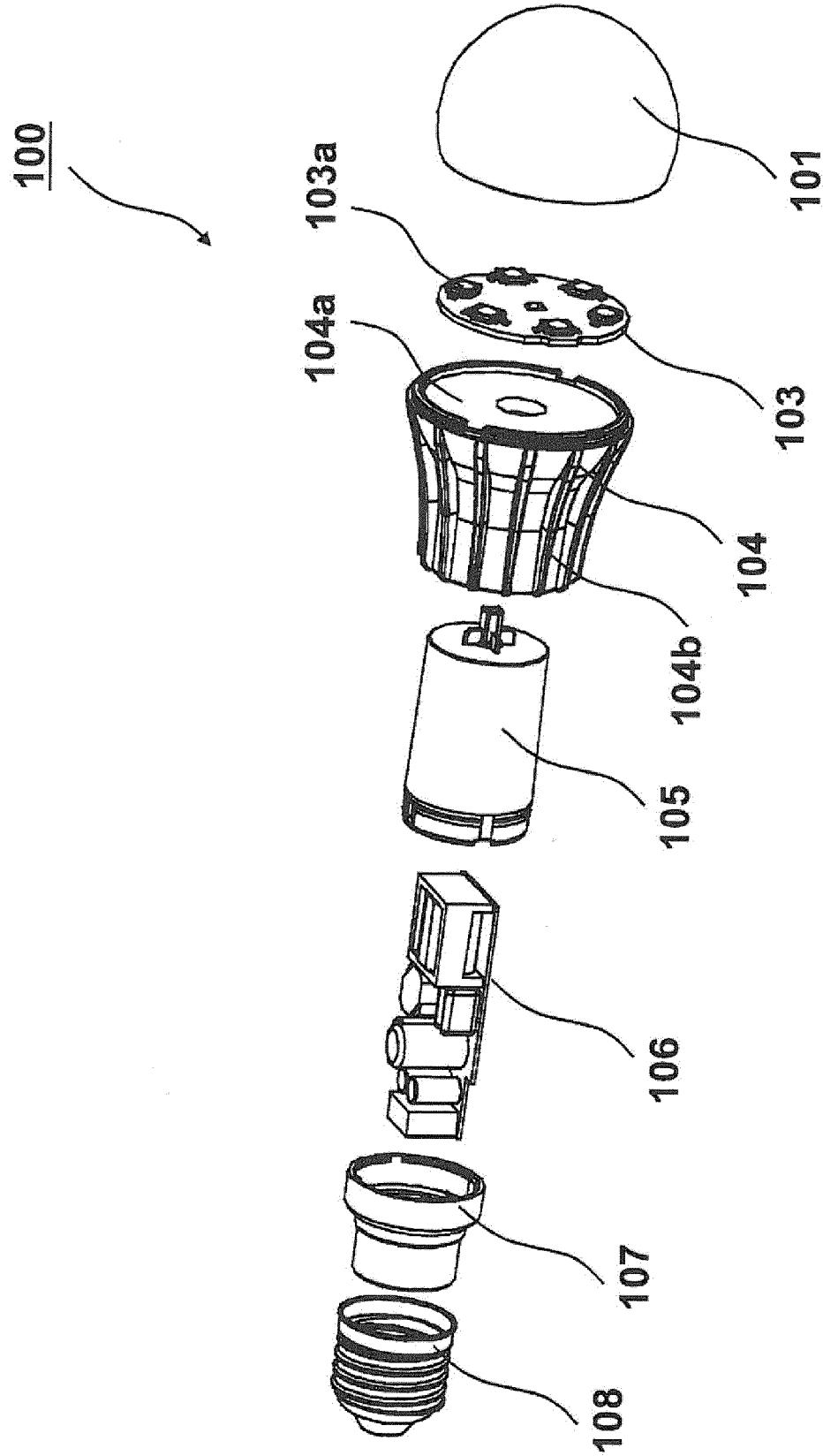
The lighting device of Claim 13, characterized in that the semiconductor light-emitting element is a light-emitting diode element.

(Fig. 1)

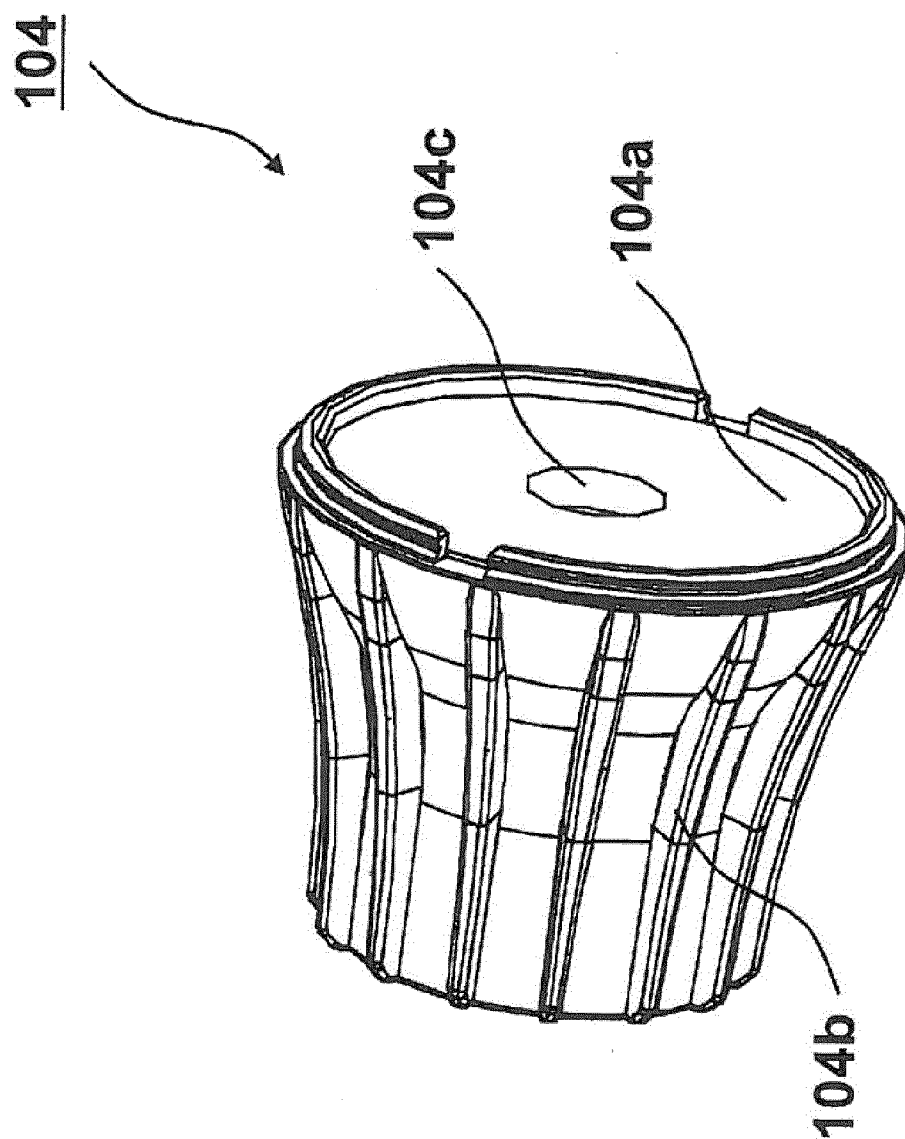
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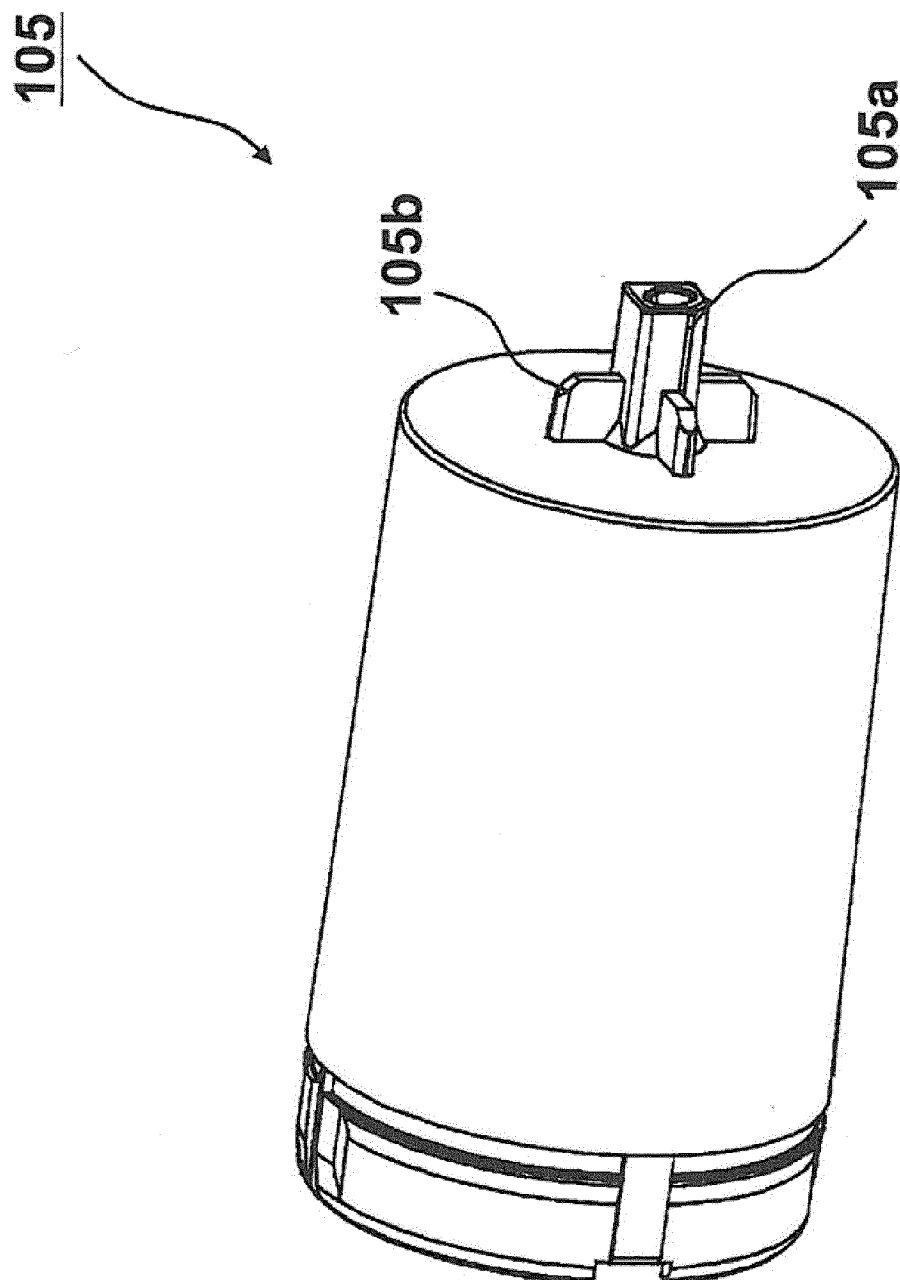
(Fig. 2)



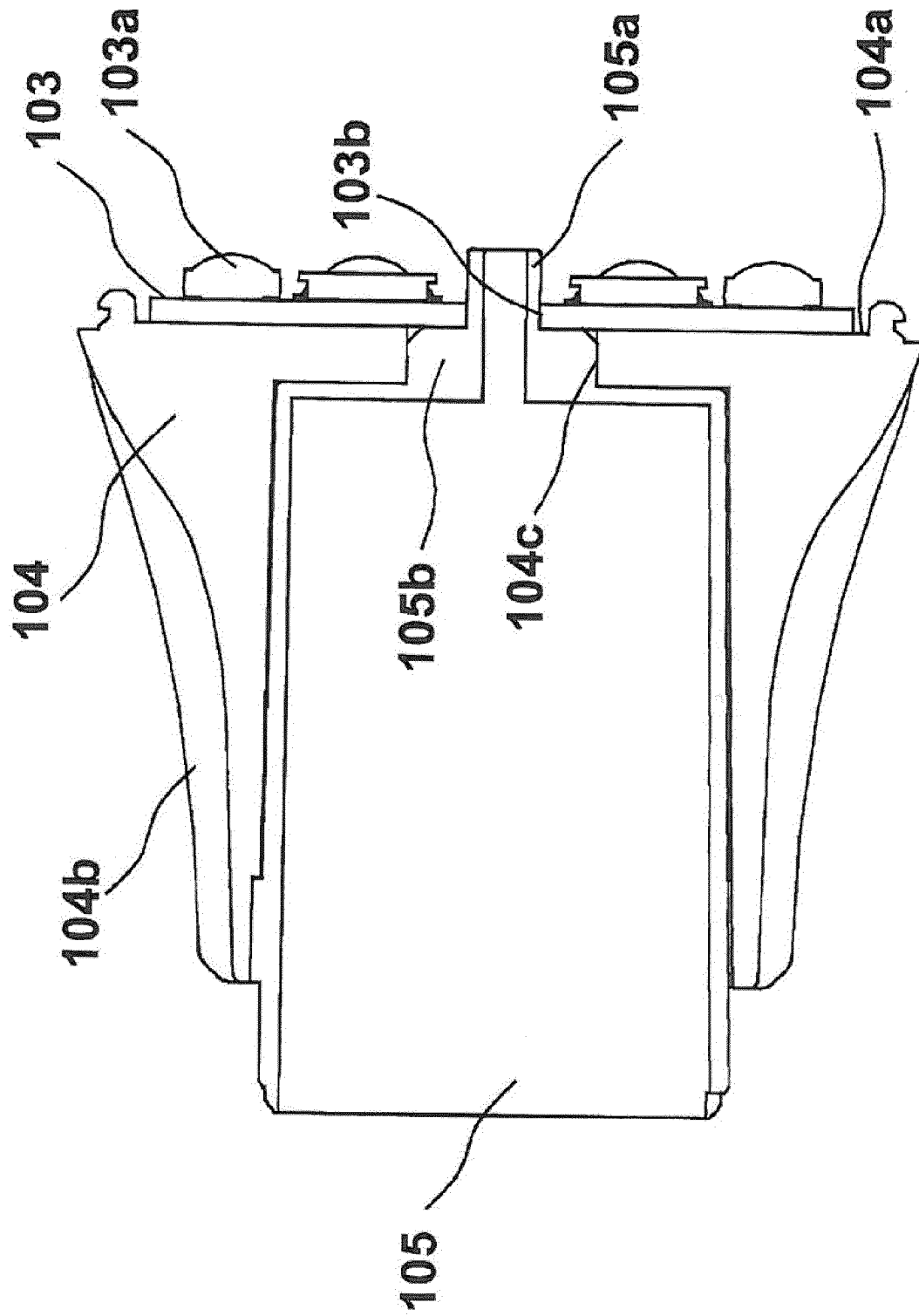
(Fig. 3)



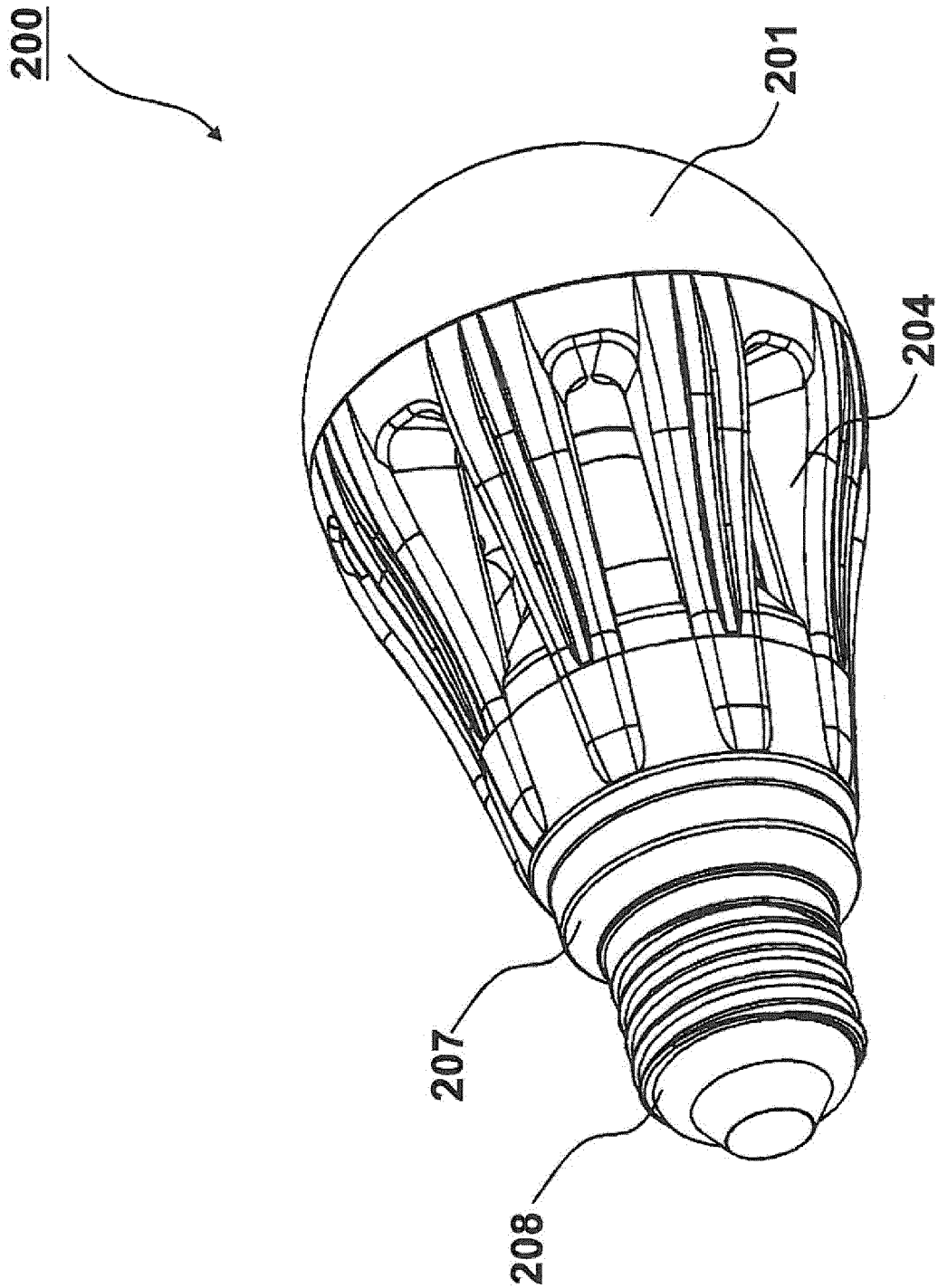
(Fig. 4)



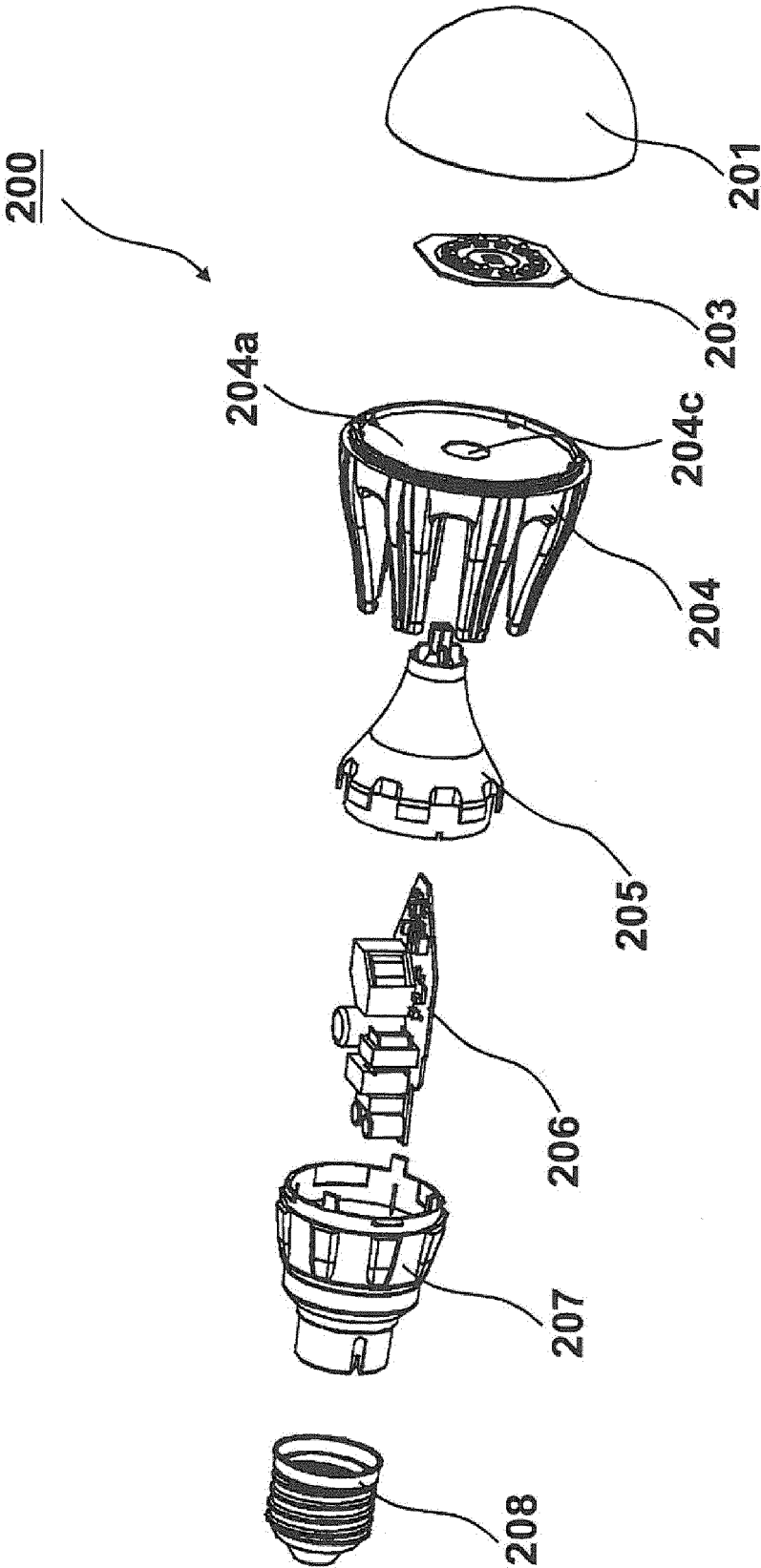
(Fig. 5)



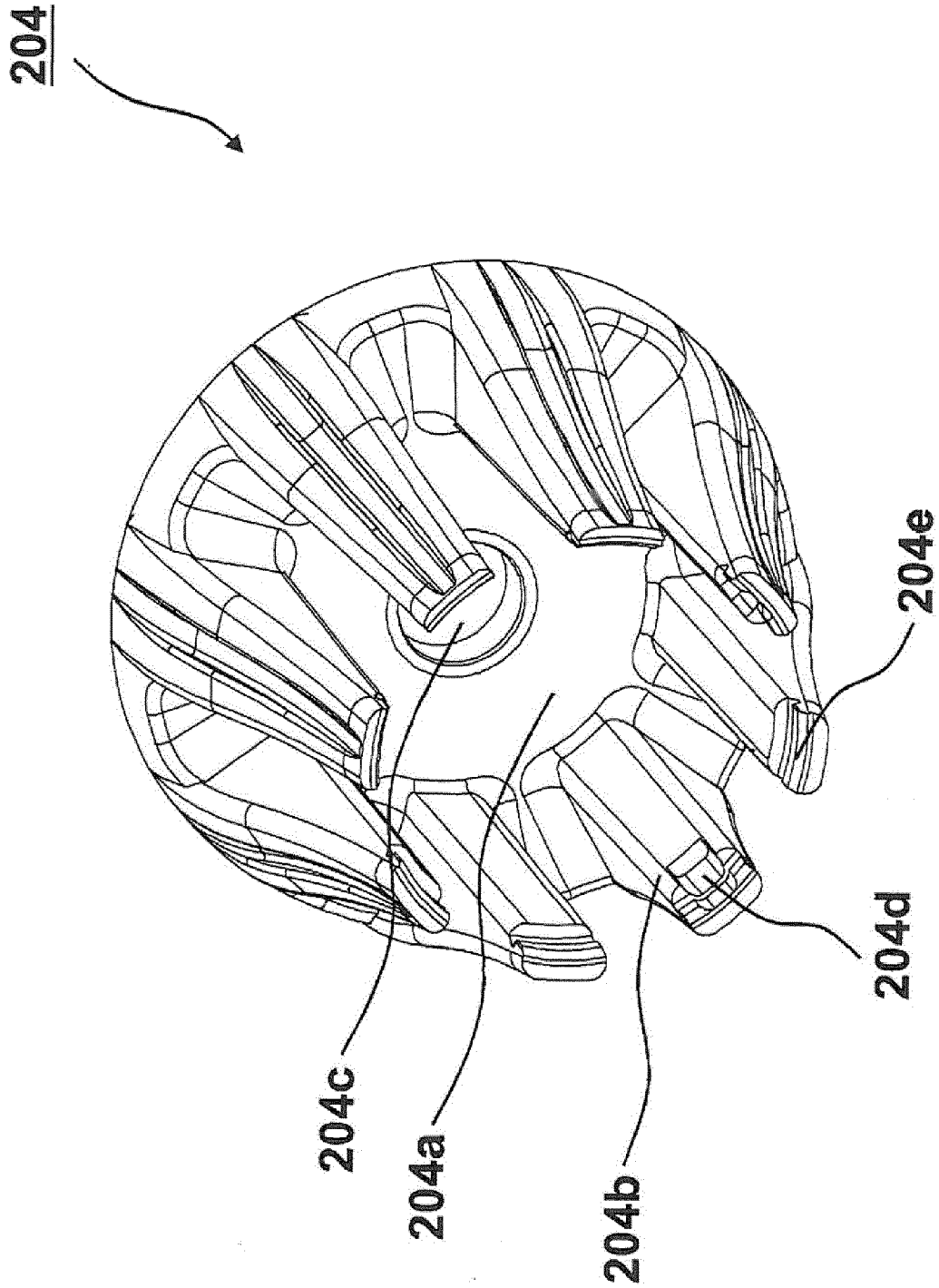
(Fig. 6)



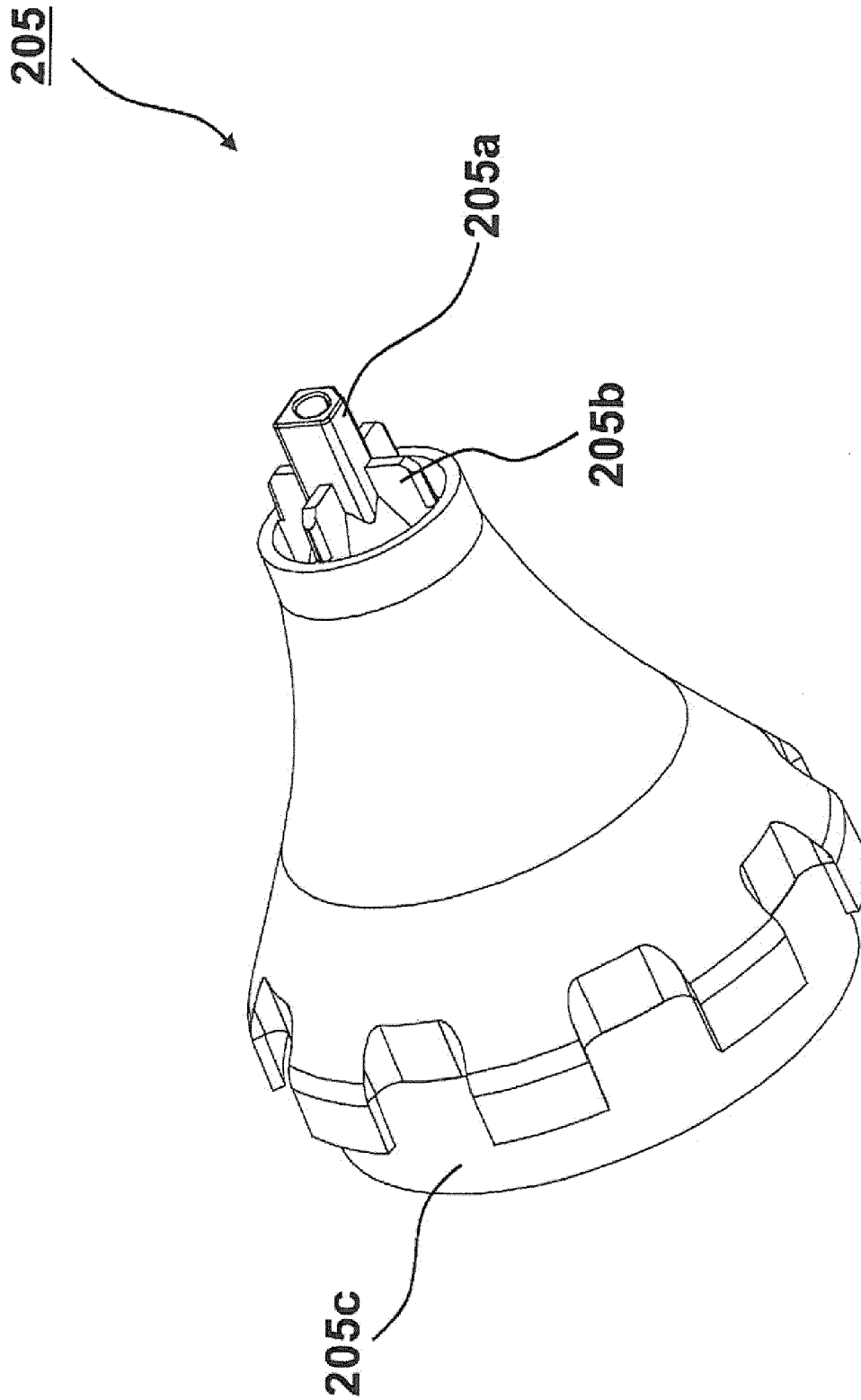
(Fig. 7)



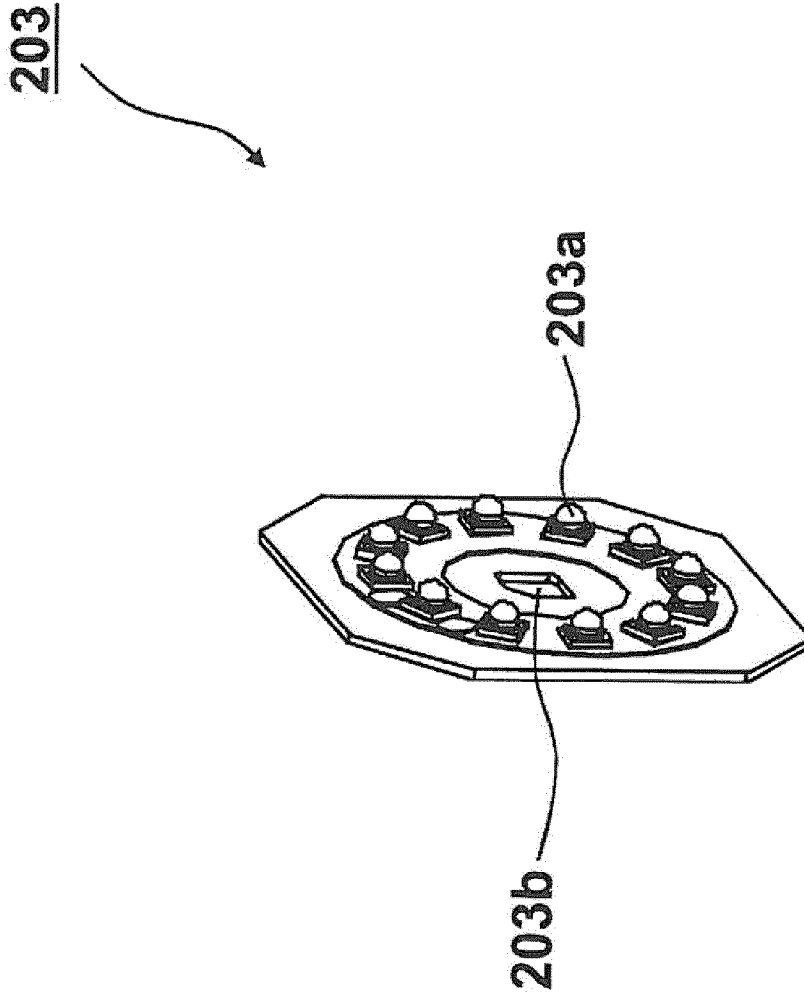
(Fig. 8)



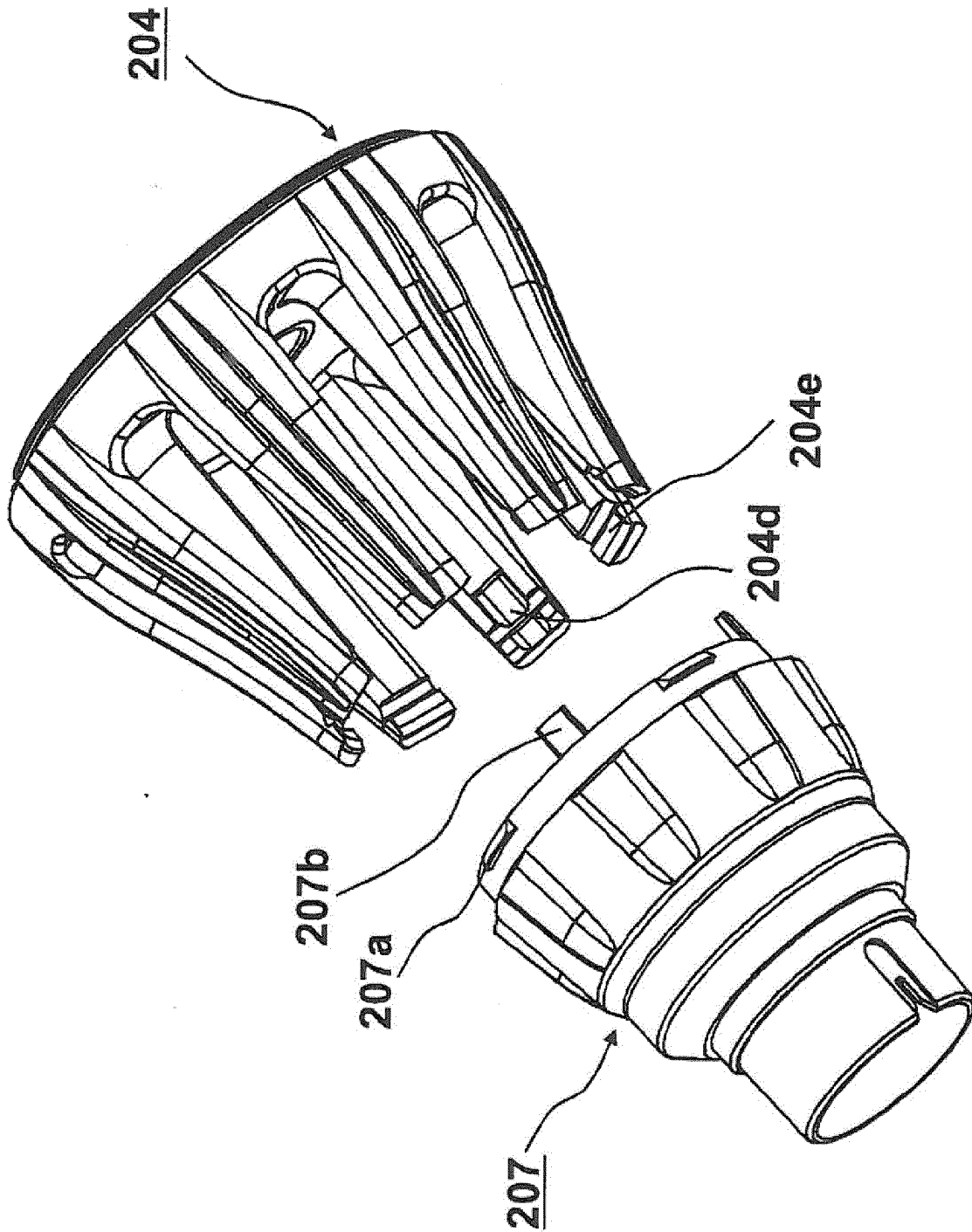
(Fig. 9)



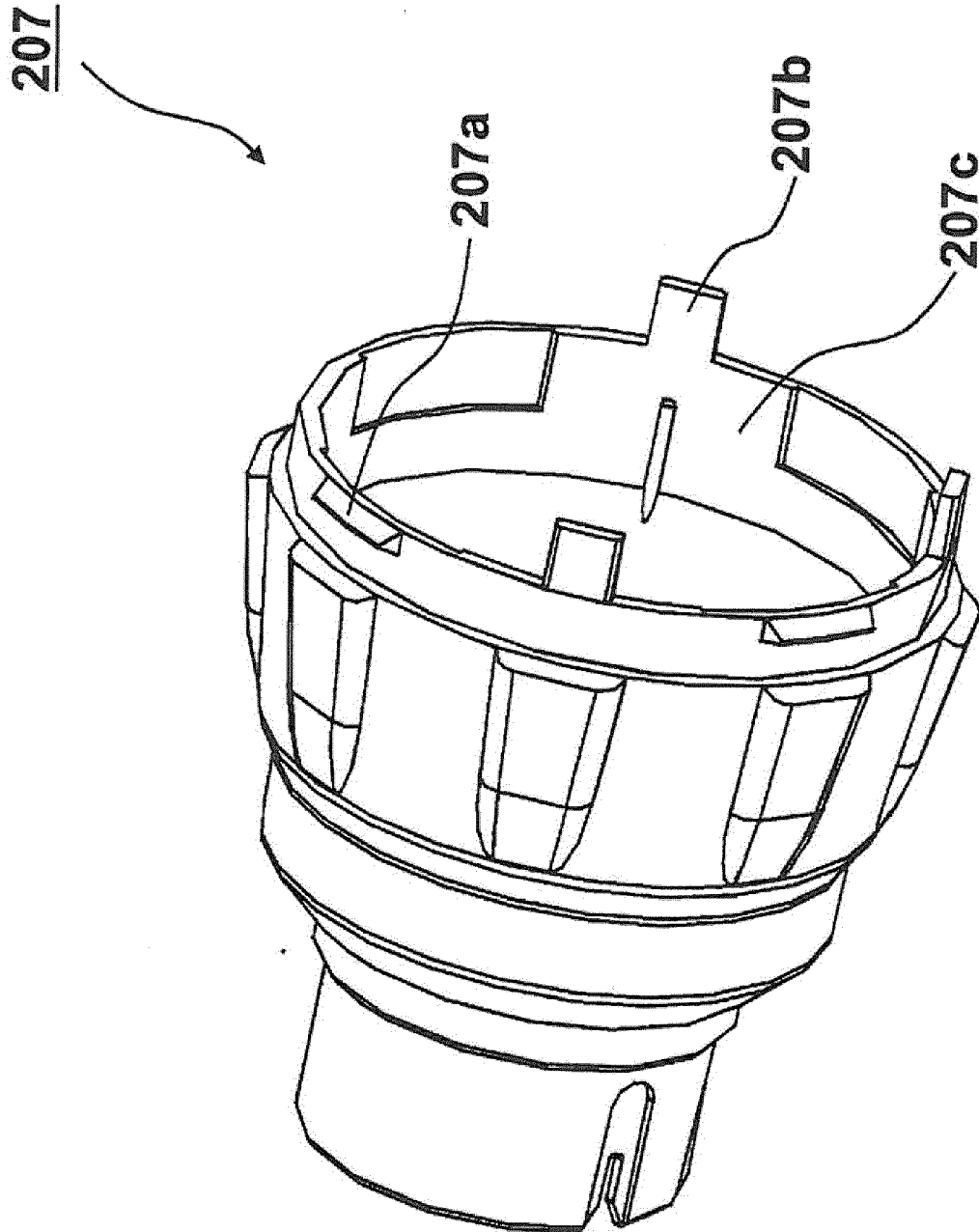
(Fig. 10)



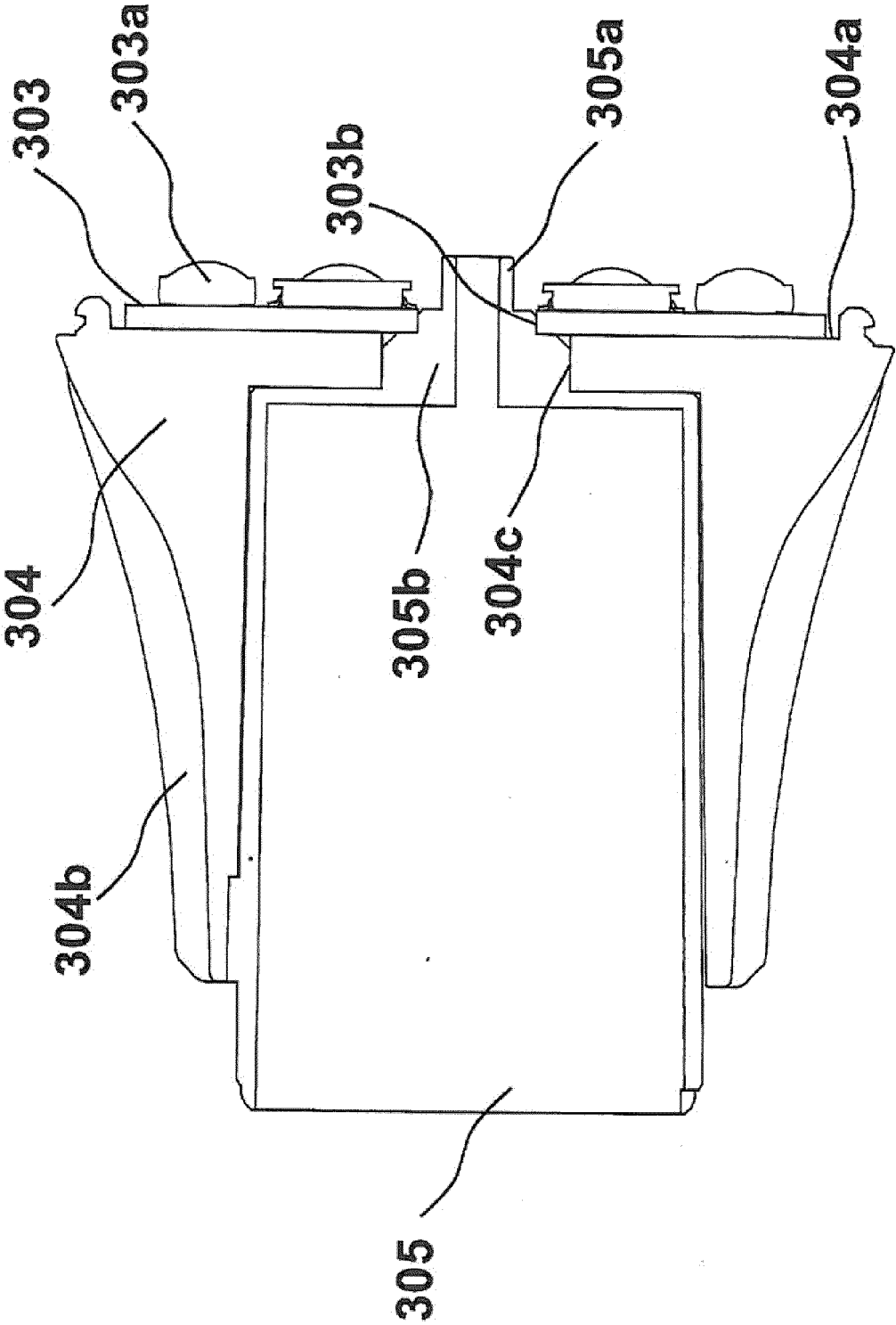
(Fig. 11)



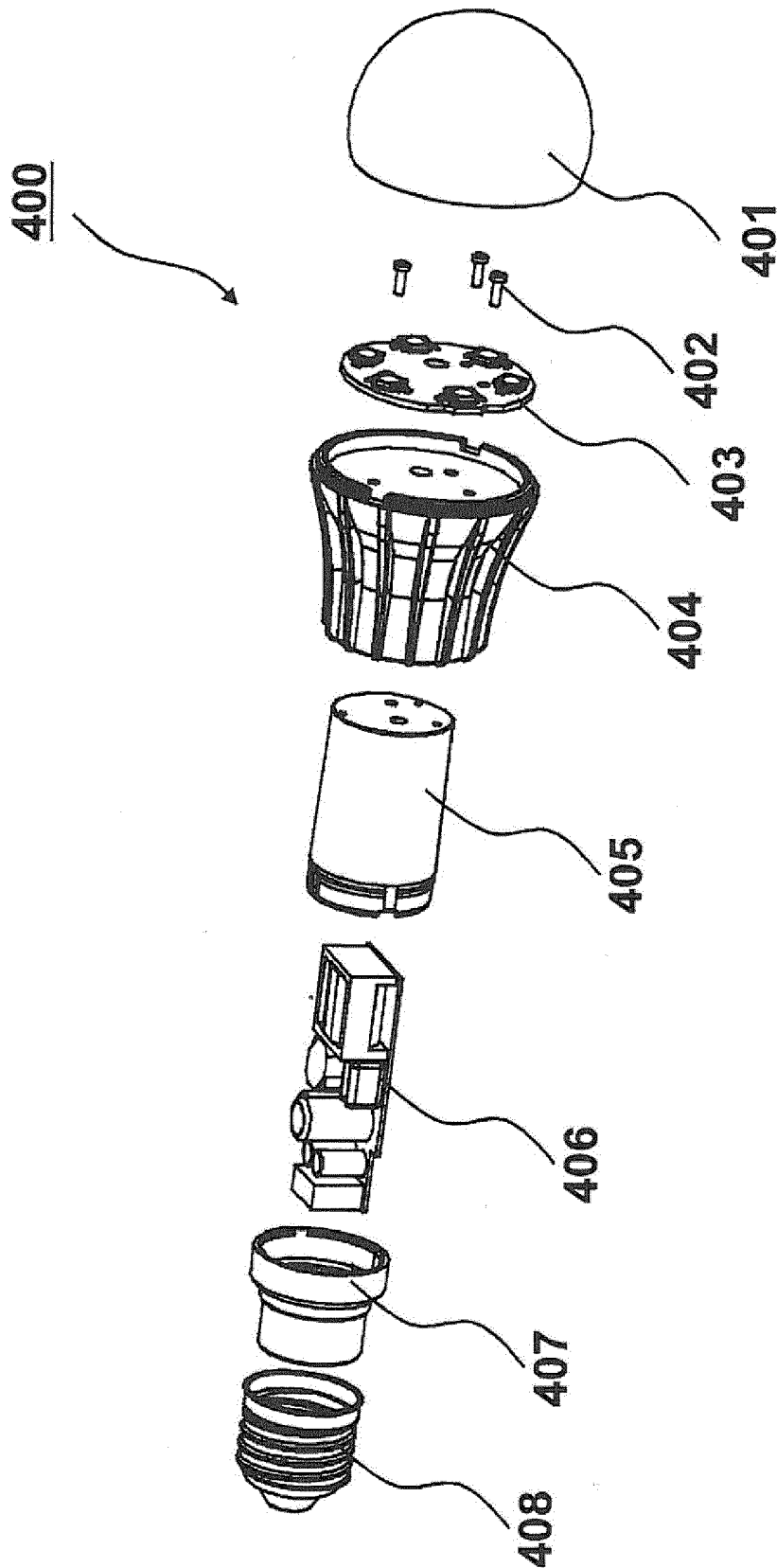
(Fig. 12)



(Fig. 13)



(Fig. 14)



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/050998

A. CLASSIFICATION OF SUBJECT MATTER
INV. F21K99/00
ADD. F21Y101/02

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)
F21K F21V

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/066142 A1 (STIMAC TOMISLAV J [US] ET AL) 8 April 2004 (2004-04-08) paragraph [0028] - paragraph [0045] figure 1	1,2,6-8, 13,14
X	WO 2010/089397 A1 (OSRAM GMBH [DE]; BREIDENASSEL NICOLE [DE]; HOETZL GUENTER [DE]; REINGR) 12 August 2010 (2010-08-12) page 9, line 6 - page 24, line 31 figures 7,13,14,20	1-14
A	US 2006/232974 A1 (LEE MING-SHUN [TW] ET AL) 19 October 2006 (2006-10-19) paragraph [0013] - paragraph [0022] figures 3,4	1



Further documents are listed in the continuation of Box C.



See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

19 April 2012

Date of mailing of the international search report

27/04/2012

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Blokland, Russell

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2012/050998

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