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(54) DOWNLIGHT

(57) A downlight (100), including: a light source apparatus (20) and a heat dissipation set (10) configured for fixing the light source apparatus (20) and dissipating heat. The heat dissipation set (10) includes a heat dissipation annulus (11) and a heat radiation plate (12). The heat dissipation annulus (11) is provided with an accommodation cavity (113) configured for accommodating the heat radiation plate (12) and defining an opening. The light source panel (21) is connected to the heat radiation plate (12) through the heat conduction face (212), and configured to guide light outward through the opening of the accommodation cavity (113). The heat radiation plate (12) receives heat at the heat conduction face (212) and radiates the received heat to an inner wall of the accommodation cavity (113). Both the light source panel (21) and the heat radiation plate (12) are arranged in a non-contact way with the inner wall of the accommodation cavity (113).

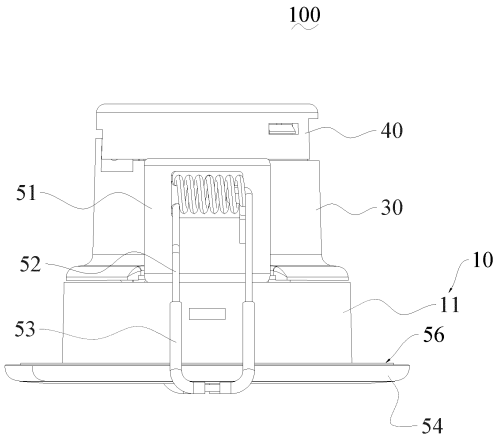

FIG. 1

EP 3 896 333 A1

Description

TECHNICAL FIELD

[0001] This application relates to the technical field of lighting equipment, and in particular to a downlight.

BACKGROUND

[0002] LED fire-proof downlights are widely used in hotels, conference rooms, factory offices, residences, institutions, schools, hospitals and places that require energy saving and high color rendering index.

[0003] At present, for fire-proof downlights on the market, the light source panel is generally stuck on the heat sink behind the lamp, in order to make the light emitted by the light source panel project from the front of the lamp, the front of the hardware face ring needs to be provided with light transmitting holes to expose the light source panel and cover the back of the light source panel with fire-proof cotton.

[0004] However, it is not conducive to the fire protection of the light source panel to create a penetration hole in the metal face ring; it is also not conducive to the heat dissipation of the light source panel itself by covering the light source panel with fireproof cotton. Moreover, because the light source panel and the heat sink are directly arranged on the hardware ring, the temperature of the hardware ring made of metal material rises quickly when it catches fire, so that the transient is quickly transformed into the light source panel, which damages the light source panel.

SUMMARY

[0005] An object of the embodiments of the present application is to provide a downlight, which aims to solve the problem that the light source panel and the heat sink in prior art are directly connected, which is not capable of delaying the damage of the light source panel when the downlight catches fire.

[0006] To achieve the above object, the technical solution adopted in the present application is to provide a downlight, which includes:

a light source apparatus, including a light source panel and a lighting bead, wherein the light source panel has a light exit face arranged for the lighting bead and a heat conduction face disposed opposite to the light exit face;

a heat dissipation set, including a heat dissipation annulus and a heat radiation plate, wherein the heat dissipation annulus is provided with an accommodation cavity configured for accommodating the heat radiation plate and defining an opening, the light source panel being connected to the heat radiation plate through the heat conduction face, and being configured to guide light outward through the opening of the accommodation cavity, wherein the light source panel and the heat radiation plate respectively define a gap relative to an inner wall of the accommodation cavity.

[0007] In some embodiments, a surface of the heat radiation plate connected to the heat conduction face completely covers the heat conduction face; a bottom of the accommodation cavity, the heat radiation plate, and the light source panel are sequentially arranged along the light, and the heat radiation plate is spaced apart from the bottom the accommodation cavity.

[0008] In some embodiments, the downlight further includes a driving structure connected to the heat radiation plate and configured to drive the light source apparatus, a bottom of the accommodation cavity defines a connecting hole, the connecting hole penetrates to an external space of the accommodation cavity, and the heat dissipation set further includes a connecting post passing through the connecting hole, with one end of the connecting post connected to the heat radiation plate and the other end of the connecting post connected to the driving structure.

[0009] In some embodiments, the driving structure includes: a drive box connected to the connecting post, and a drive board disposed in the drive box and electrically connected to the light source panel.

[0010] In some embodiments, the downlight further includes a wiring structure, the wiring structure includes a wiring terminal electrically connected to the drive board, and a wiring cover connected to the drive box, the wiring cover and the drive box are enclosed to form a wiring cavity for accommodating the wiring terminal, the wiring cover is provided with a wiring trough that communicates with the wiring cavity and allows wires to pass therethrough; the wiring structure further includes a first toothed plate located in the wiring cavity and connected to the drive box, and a second toothed plate located in the wiring cavity and connected to the wiring cover, the first toothed plate and the second toothed plate are respectively provided with a plurality of serrations, and the serrations of the first toothed plate and the serrations of the second toothed plate cooperatively hold the wires.

[0011] In some embodiments, the wiring structure further includes two side plates both connected to the drive box, and two ends of the first toothed plate are respectively connected to the two side plates, the wiring structure further includes an adjusting toothed plate stacked on the first toothed plate, the adjusting toothed plate is provided with the serrations and located between the first toothed plate and the second toothed plate, and two ends of the adjusting toothed plate are detachably connected to the two side plates respectively.

[0012] In some embodiments, the light source apparatus further includes a reflector cup located in the accommodation cavity, the reflector cup is disposed directly opposite to the light exit face and includes a cup sleeve sleeved in the accommodation cavity and a cup body

located in the cup sleeve and formed integrally with the cup sleeve, a sealing ring is further disposed between the cup sleeve and a cavity wall of the accommodation cavity.

[0013] In some embodiments, the cup body is provided with a switching groove, and the downlight further includes a change-over switch disposed in the switching groove and used for controlling the lighting bead, and a sealing cover for sealing the switching groove.

[0014] In some embodiments, a side surface of the cup sleeve is provided with engagement grooves, the engagement grooves extend along a circumference of the cup sleeve, and a groove wall of each engagement groove is provided with a guide groove leading to an outer end face of the cup sleeve, the downlight further includes a decorative ring located at the opening of the accommodation cavity and covering the cup sleeve, buckle pins each connected to the decorative ring at one end, and the other end of each buckle pin is inserted into each engagement groove along each guide groove, and rotates a predetermined arc along the circumference of the cup sleeve to engage the groove wall of the engagement groove by a snap-fit connection.

[0015] In some embodiments, the heat dissipation annulus includes: a heat dissipation cylinder provided with the accommodation cavity, and a annular heat dissipation flange located at the opening of the accommodation cavity and in connection with the heat dissipation cylinder; the decorative ring is stacked on the annular heat dissipation flange, and a surface of the annular heat dissipation flange facing away from the decorative ring is provided with a gasket.

[0016] The beneficial effects of the present application lie in that: the heat generated by the lighting bead and light source panel is conducted to the heat radiation plate through the heat conduction face by attaching the heat conducting radiation plate to the heat conduction face of the light source panel, and then the heat radiation plate radiates the received heat to the inner wall of the accommodation cavity, and the heat is dissipated through the heat dissipation annulus. The heat radiation plate and the light source panel are both located in the heat dissipation annulus, so there is no need to make holes on the heat dissipation annulus, which is beneficial to the fireproof of the downlight, and there is no need to cover fireproof cotton, as the heat can be dissipated through the heat dissipation annulus, which is beneficial to the heat dissipation of the downlight, furthermore, the heat radiation plate and the light source panel are arranged in a non-contact way with the inner wall of the accommodation cavity, that is, with a certain gap, after the heat dissipation annulus catches fire, the heat of the heat dissipation annulus will not be transferred to the light source panel quickly, thereby preventing the light source panel from being damaged quickly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] In order to more clearly explain the technical solutions in the embodiments of the present application, the drawings to be used in the embodiments or the description of the prior art will be briefly introduced below. It is obvious that the drawings in the following description are only some embodiments of the present application, for those of ordinary skill in the art, other drawings may be obtained based on these drawings without paying creative labor.

FIG. 1 is a schematic diagram showing a front view of a downlight provided by embodiments of the present application;

FIG. 2 is a schematic diagram showing a cross-sectional view of the downlight of FIG. 1 along a light exit direction;

FIG. 3 is schematic diagram showing a three-dimensional structure of a reflector cup of FIG. 2;

FIG. 4 is schematic diagram showing an exploded view of an embodiment of the downlight of FIG. 1;

FIG. 5 is schematic diagram showing an exploded view of another embodiment of the downlight of FIG. 1;

FIG. 6 is schematic diagram showing an exploded view of a further embodiment of the downlight of FIG. 1;

FIG. 7 is a bottom view of the downlight of FIG. 1;

FIG. 8 is a top view of the downlight of FIG. 1;

FIG. 9 is a front view of an additional embodiment of the downlight of FIG. 1.

[0018] The reference signs in the drawings are as follows:

100- downlight; 10- heat dissipation set; 11- heat dissipation annulus; 111- heat dissipation cylinder; 112- annular heat dissipation flange; 12- heat radiation plate; 13- connecting post; 14-sealing ring; 113-accommodation cavity; 51-spring bracket; 53- insulating layer; 54- decorative ring; 20- light source apparatus; 21- light source panel; 22- lighting bead; 23- reflector cup; 231- cup body; 232- cup sleeve; 55- buckle pin; 30- driving structure; 31- drive box; 311- lower cover; 312- upper cover; 32- drive board; 33- drive cavity; 40-wiring structure; 41- wiring cover; 42- wiring terminal; 45- wiring trough; 57-switching groove; 233- engagement groove; 234- guide groove; 43- second toothed plate; 44- adjusting toothed plate; 49- first toothed plate; 46- side plate; 58- change-over switch; 59- sealing cover; 56- gasket; 131- connecting hole; 24- connecting bolt; 52- spring; 211- light exit face; 212- heat conduction face.

DETAILED DESCRIPTION

[0019] In order to make the technical problems to be solved, technical solutions, and beneficial effects of the present application more clear, the present application

will be further described below in detail with reference to the accompanying drawings and the embodiments. It should be understood that the specific embodiments described herein are only used to explain the present application, and are not intended to limit the present application.

[0020] It should be noted that when an element is referred to as being "fixed to", "arranged at", or "disposed on" another element, it can be directly or indirectly fixed to / arranged at / disposed on the other element. When an element is referred to as being "connected to" another element, it can be directly or indirectly connected to the other element.

[0021] It should be understood that the terms "length", "width", "upper", "lower", "front", "rear", "left", "right", "vertical", "horizontal", "top", "bottom", "inner", "outer", etc. indicate orientations or positional relationships based on the orientations or positional relationships shown in the drawings, only for convenience of describing the present application and simplifying the description, rather than indicating or implying that the device or element referred to must have a particular orientation, or be constructed and operated in a particular orientation, therefore they should not be construed as limiting the present application.

[0022] In addition, the terms "first" and "second" are used for descriptive purposes only and cannot be understood as indicating or implying relative importance or implicitly indicating the number of technical features indicated. Therefore, the features defined with "first" and "second" may explicitly or implicitly include one or more of the features. In the description of the present application, the meaning of "a plurality of", "several", "various", or "a variety of' is two or more, unless specifically defined otherwise.

[0023] Referring to FIGS. 1-3, embodiments of the present application provides a downlight 100 which includes a light source apparatus 20 and a heat dissipation set 10. The light source apparatus 20 includes a light source panel 21 and a lighting bead 22. Optionally, the lighting bead 22 is electrically connected to the light source panel 21, the lighting bead 22 is set to be LED lighting bead 22, and a plurality of LED lighting beads 22 are provided. The LED lighting bead 22 has the characteristics of fast lighting speed, high brightness, energy saving and environmental protection. Referring to FIGS. 4-6, the light source panel 21 has a light exit face 211 arranged for the lighting bead 22 and a heat conduction face 212 disposed opposite to the light exit face 211. The heat generated by each lighting bead 22 in a lighted state is transferred to the light source panel 21. The heat dissipation set 10 is configured to fix the light source apparatus 20 and dissipate heat from the light source apparatus 20. The heat dissipation set 10 includes a heat dissipation annulus 11 and a heat radiation plate 12. Optionally, the heat dissipation annulus 11 is made of hardware material and the melting point of which is greater than 900°, and the heat radiation plate 12 is made of metal aluminum, which has good thermal conductivity and is rich in natural resources. The heat dissipation annulus 11 is provided with an accommodation cavity 113, and the accommodation cavity 113 defines an opening. The light source apparatus 20 is placed in the accommodation cavity 113, and the lighting bead 22 emits light outward through the opening of the accommodation cavity 113 and generates heat in a conductive state. The light source panel 21 is connected to the heat radiation plate 12 through the heat conduction face 212, the heat radiation plate 12 is located in the accommodation cavity 113 and there is a gap between the heat radiation plate 12 and the inner wall of the accommodation cavity 113, that is, the light source panel 21 and the heat radiation plate 12 are arranged in a non-contact way with the inner wall of the accommodation cavity 113, and the heat radiation plate 12 receives heat from the heat conduction face 212 and radiates the received heat to the inner wall of the accommodation cavity 113.

[0024] By attaching the heat radiation plate 12 to the heat conduction face 212 of the light source panel 21, the heat generated by the lighting bead 22 and the light source panel 21 is conducted to the heat radiation plate 12 through the heat conduction face 212, and the heat radiation plate 12 then radiates the received heat to the inner wall of the accommodation cavity 113 and dissipates the heat through the heat dissipation annulus 11. Both the heat radiation plate 12 and the light source panel 21 are located within the heat dissipation annulus 11, so there is no need to make holes in the heat dissipation annulus 11, which is beneficial to the fire protection of the downlight 100, and there is no need to cover with fireproof cotton, the heat can be dissipated through the heat dissipation annulus 11, which is conducive to the heat dissipation of the downlight 100. Further, the heat radiation plate 12 and the light source panel 21 are arranged in a non-contact way with the inner wall of the accommodation cavity 113, that is, with a certain gap, after the heat dissipation annulus 11 catches fire, the heat of the heat dissipation annulus 11 will not be transferred to the light source panel 21 quickly, thereby preventing the light source panel 21 from being damaged quickly.

[0025] Referring to FIGS. 1-9, in some embodiments, the surface of the heat radiation plate 12 connected to the light source panel 21 completely covers the heat conduction face 212, that is, the heat conduction face 212 is completely located on the heat radiation plate 12, such that the heat is quickly transferred to the heat radiation plate 12. The bottom of the accommodation cavity 113, the heat radiation plate 12 and the light source panel 21 are sequentially arranged along the exit direction of light, and the heat radiation plate 12 is placed parallel to the bottom of the accommodation cavity 113 and spaced apart from the accommodation cavity 113. Optionally, in this embodiment, the distance between the heat radiation plate 12 and the bottom of the accommodation cavity 113 is 5 mm.

[0026] In some embodiments, the downlight 100 further includes a driving structure 30 which is connected to the heat dissipation annulus 11 and configured to drive the light source apparatus 20. The bottom of the accommodation cavity 113 defines a connecting hole 131 penetrating the external space. The heat dissipation set 10 further includes a connecting post 13 pass through the connecting hole 131, with one end of the connecting post 13 connected to the heat radiation plate 12 and the other end of the connecting post 13 connected to the driving structure 30. A plurality of connecting holes 131 spaced apart can be provided, the number of the connecting posts 13 is adaptive to the number of the connecting holes 131, and they are set in one-to-one correspondence. An end face of the connecting post 13 at one end of the accommodation cavity 113 defines a threaded hole, and the light source panel 21 and the heat radiation plate 12 are provided with through holes corresponding to the positions of the respective threaded holes, such that the light source panel 21 and the heat radiation plate 12 are connected to each connecting post 13 through a connecting bolt 24.

[0027] In some embodiments, the driving structure 30 includes a drive box 31 connected to the connecting post 13 and a drive board 32 disposed in the drive box 31 and electrically connected to the light source panel 21. The drive box 31 includes a lower cover 311 connected to the connecting post 13 and an upper cover 312 sleeved with the lower cover 311. The lower cover 311 is inserted into the upper cover 312 to enclose to form a drive cavity 33, and the drive board 32 is located in the drive cavity 33 and installed on the lower cover 311. Further, two snap-fit structures are spaced apart from each other along the insertion direction of the lower cover 311. Both of the snap-fit structures are configured to engage the lower cover 311 with the upper cover 312, such that the lower cover 311 and the upper cover 312 are clamped by a dual snap-fit, thereby preventing the drive box 31 from being easily disassembled.

[0028] Referring to FIGS. 1-9, in some embodiments, the downlight 100 further includes a wiring structure 40. The wiring structure 40 includes a wiring terminal 42 electrically connected to the drive board 32, and a wiring cover 41, with one end of the wiring cover 41 hinged to the upper cover 312 and the other end of the wiring cover 41 connected to the upper cover 312 by a snap-fit connection. The wiring cover 41 and the upper cover 312 are enclosed to form a wiring cavity for accommodating the wiring terminal 42. The wiring cover 41 is provided with a wiring trough 45 that communicates with the wiring cavity and allows wires to pass therethrough, and the wires are used to connect the wiring terminal 42 and the power supply. The wiring structure 40 further includes a first toothed plate 49 located in the wiring cavity and connected to the drive box 31, and a second toothed plate 43 located in the wiring cavity and connected to the wiring cover 41. The first toothed plate 49 and the second toothed plate 43 are respectively provided with a plurality of serrations, and the serrations of the first toothed plate 49 and the serrations of the second toothed plate 43 cooperatively hold the wires. The wires are clamped between the first toothed plate 49 and the second toothed plate 43, thereby forming a labyrinth wiring, and increasing the pressure on the wires to form an over-tension.

[0029] In some embodiments, the wiring structure 40 further includes two side plates 46 both connected to the drive box 31, two ends of the first toothed plate 49 are respectively connected to the two side plates 46. The wiring structure 40 further includes an adjusting toothed plate 44 stacked on the first toothed plate 49, and the adjusting toothed plate 44 is provided with serrations and located between the first toothed plate 49 and the second toothed plate 43. Two ends of the adjusting toothed plate 44 are detachably connected to the two side plates 46, respectively. The adjusting toothed plate 44 is configured to adjust the gap between the first toothed plate 49 and the second toothed plate 43. Specifically, when the clamped wire is relatively thin, the adjusting toothed plate 44 is installed to reduce the gap between the first toothed plate 49 and the second toothed plate 43, such that the adjusting toothed plate 44 and the second toothed plate 43 cooperatively hold the wire; on the contrary, when the wire is relatively thick, the adjusting toothed plate 44 is removed, such that the first toothed plate 49 and the second toothed plate 43 directly hold the wire.

[0030] In some embodiments, the light source apparatus 20 further includes a reflector cup 23 located in the accommodation cavity 113. The reflector cup 23 is disposed opposite to the light exit face 211 and includes a cup sleeve 232 sleeved in the accommodation cavity 113 and a cup body 231 located in the cup sleeve 232 and formed integrally with the cup sleeve 232. The cup body 231 is configured for condensing the light generated by the lighting bead 22, and a sealing ring 14 is further disposed between the cup sleeve 232 and the cavity wall of the accommodation cavity 113. The sealing ring 14 can be made of soft materials such as silica gel, etc. The sealing ring 14 is configured to seal the gap between the cup sleeve 232 and the cavity wall of the accommodation cavity 113 to improve the waterproof performance of the downlight 100, thereby playing the role of sealing and waterproofing.

[0031] Referring to FIGS. 1-9, optionally, in some embodiments, the reflector cup 23 is configured to be a lens, and the lighting beads 22 are arranged at the center of the light source panel 21. After the downlight 100 is assembled, the lighting beads 22 are located at the center of the lens, which is beneficial for light distribution.

[0032] In some embodiments, the cup body 231 is provided with a switching groove 57. The downlight 100 further includes a change-over switch 58 disposed in the switching groove 57 for controlling the lighting bead 22 and a sealing cover 59 for sealing the switching groove 57. The change-over switch 58 may be configured to switch functions to achieve switching between various functions of the downlight 100, including dimming, color

adjustment or power adjustment. The sealing cover 59 is configured to seal the switching groove 57, such that the change-over switch 58 has waterproof protection function.

[0033] In some embodiments, the side surface of the cup sleeve 232 is further provided with an engagement groove 233, the extending direction of the engagement groove 233 is arranged along the circumference of the cup sleeve 232, and the groove wall of the engagement groove 233 is further provided with a guide groove 234 leading to the outer end face of the cup sleeve 232. The downlight 100 further includes a decorative ring 54 located at the opening of the accommodation cavity 113 and covering the cup sleeve 232, and a buckle pin 55 connected to the decorative ring 54 at one end, and the other end of the buckle pin 55 is inserted into engagement groove 233 along the guide groove 234 and rotates a predetermined arc along the circumference of the cup sleeve 232, so as to engage the groove wall of the engagement groove 233 by a snap-fit connection. Optionally, the decorative ring 54 is made of plastic, the surface of which is processed with nickel plating and subsequent wire drawing, and decorative ring 54 can be produced in various colors, such as sub-white, bright white and sub-black, to match the colors of other components of the downlight 100. The decorative ring 54 is connected to the reflector cup 23 by a snap-fit connection without defining an opening in the heat dissipating surface ring 11, and the decorative ring 54 can be removed from the reflector cup 23 without a tool, which is convenient for switching different decorative rings 54 to meet consumer needs, thereby improving user experience.

[0034] Referring to FIGS. 1-9, it can be understood that at least two buckle pins 55 are provided symmetrically, and the number of the engagement grooves 233 and the guide grooves 234 is adapted to the number of the buckle pins 55.

[0035] In some embodiments, the heat dissipation annulus 11 includes a heat dissipation cylinder 111 provided with an accommodation cavity 113 and a annular heat dissipation flange 112 located at the opening of the accommodation cavity 113 and in connection with the heat dissipation cylinder 111. The decorative ring 54 is stacked on the annular heat dissipation flange 112, and the surface of the annular heat dissipation flange 112 facing away from the decorative ring 54 is further provided with a gasket 56. Optionally, the annular heat dissipation flange 112 is inevitably deformed during processing. When the annular heat dissipation flange 112 is installed on the ceiling, a gap is easily generated between the annular heat dissipation flange 112 and the ceiling, which is unsightly. The gasket 56 made of a soft material is disposed between the ceiling and the annular heat dissipation flange 112, in this way, not only the gap can be sealed, but also the ugliness can be hidden, at the same time, the gasket 56 also plays the role of sealing and waterproofing, and can prevent the heating in the room from being discharged from the gap to result in energy waste.

[0036] In some embodiments, the surface of the heat dissipation annulus 11 connected to the driving structure 30 is further provided with two spring brackets 51. The spring brackets 51 is connected to the heat dissipation annulus 11 by butt welding, and each spring bracket 51 is provided with a spring 52, with an insulating layer 53 made of an insulating material covered on the spring 52. The insulating layers 53 can prevent the residual current or static electricity on the springs 52 causing the downlight 100 to flash and extinguish again after the downlight 100 is extinguished.

[0037] The above are only the preferred embodiments of the present application and are not intended to limit the present application. Any modification, equivalent replacement and improvement made within the spirit and principle of the present application should be included in the protection scope of the present application.

Claims

1. A downlight (100), comprising:

   a light source apparatus (20), comprising a light source panel (21) and a lighting bead (22), wherein the light source panel (21) has a light exit face (211) arranged for the lighting bead (22) and a heat conduction face (212) disposed opposite to the light exit face (211);
   a heat dissipation set (10), comprising a heat dissipation annulus (11) and a heat radiation plate (12), wherein the heat dissipation annulus (11) is provided with an accommodation cavity (113) configured for accommodating the heat radiation plate (12) and defining an opening, the light source panel (21) being connected to the heat radiation plate (12) through the heat conduction face (212), and being configured to guide light outward through the opening of the accommodation cavity (113), wherein the light source panel (21) and the heat radiation plate (12) respectively define a gap relative to an inner wall of the accommodation cavity (113).

2. The downlight (100) according to claim 1, wherein a surface of the heat radiation plate (12) connected to the heat conduction face (212) completely covers the heat conduction face (212); a bottom of the accommodation cavity (113), the heat radiation plate (12), and the light source panel (21) are sequentially arranged along the light, and the heat radiation plate (12) is spaced apart from the bottom the accommodation cavity (113).

3. The downlight (100) of claim 1, wherein the downlight (100) further comprises a driving structure (30) connected to the heat radiation plate (12) and configured

to drive the light source apparatus (20), a bottom of the accommodation cavity (113) defines a connecting hole (131), the connecting hole (131) penetrates to an external space of the accommodation cavity (113), and the heat dissipation set (10) further comprises a connecting post (13) passing through the connecting hole (131), with one end of the connecting post (13) connected to the heat radiation plate (12) and the other end of the connecting post (13) connected to the driving structure (30).

4. The downlight (100) of claim 3, wherein the driving structure (30) comprises: a drive box (31) connected to the connecting post (13), and a drive board (32) disposed in the drive box (31) and electrically connected to the light source panel (21).

5. The downlight (100) of claim 4, wherein the downlight (100) further comprises a wiring structure (40), the wiring structure (40) comprises a wiring terminal (42) electrically connected to the drive board (32), and a wiring cover (41) connected to the drive box (31), the wiring cover (41) and the drive box (31) are enclosed to form a wiring cavity for accommodating the wiring terminal (42), the wiring cover (41) is provided with a wiring trough (45) that communicates with the wiring cavity and allows wires to pass therethrough; the wiring structure (40) further comprises a first toothed plate (49) located in the wiring cavity and connected to the drive box (31), and a second toothed plate (43) located in the wiring cavity and connected to the wiring cover (41), the first toothed plate (49) and the second toothed plate (43) are respectively provided with a plurality of serrations, and the serrations of the first toothed plate (49) and the serrations of the second toothed plate (43) cooperatively hold the wires.

6. The downlight (100) of claim 5, wherein the wiring structure (40) further comprises two side plates (46) both connected to the drive box (31), and two ends of the first toothed plate (49) are respectively connected to the two side plates (46), the wiring structure (40) further comprises an adjusting toothed plate (44) stacked on the first toothed plate (49), the adjusting toothed plate (44) is provided with the serrations and located between the first toothed plate (49) and the second toothed plate (43), and two ends of the adjusting toothed plate (44) are detachably connected to the two side plates (46) respectively.

7. The downlight (100) of claim 1, wherein the light source apparatus (20) further comprises a reflector cup (23) located in the accommodation cavity (113), the reflector cup (23) is disposed directly opposite to the light exit face (211) and comprises a cup sleeve (232) sleeved in the accommodation cavity (113) and a cup body (231) located in the cup sleeve (232) and formed integrally with the cup sleeve (232), a sealing ring (14) is further disposed between the cup sleeve (232) and a cavity wall of the accommodation cavity (113).

8. The downlight (100) according to claim 7, wherein the cup body (231) is provided with a switching groove (57), and the downlight (100) further comprises a change-over switch (58) disposed in the switching groove (57) and used for controlling the lighting bead (22), and a sealing cover (59) for sealing the switching groove (57).

9. The downlight (100) according to claim 7, wherein a side surface of the cup sleeve (232) is provided with engagement grooves (233), the engagement grooves (233) extend along a circumference of the cup sleeve (232), and a groove wall of each engagement groove (233) is provided with a guide groove (234) leading to an outer end face of the cup sleeve (232), the downlight (100) further comprises a decorative ring (54) located at the opening of the accommodation cavity (113) and covering the cup sleeve (232), buckle pins (55) each connected to the decorative ring (54) at one end, and the other end of each buckle pin (55) is inserted into each engagement groove (233) along each guide groove (234), and rotates a predetermined arc along the circumference of the cup sleeve (232) to engage the groove wall of the engagement groove (233) by a snap-fit connection.

10. The downlight (100) of claim 9, wherein the heat dissipation annulus (11) comprises: a heat dissipation cylinder (111) provided with the accommodation cavity (113), and a annular heat dissipation flange (112) located at the opening of the accommodation cavity (113) and in connection with the heat dissipation cylinder (112); the decorative ring (54) is stacked on the annular heat dissipation flange (112), and a surface of the annular heat dissipation flange (112) facing away from the decorative ring (54) is provided with a gasket (56).

Amended claims in accordance with Rule 137(2) EPC.

1. A downlight (100), comprising:

a light source apparatus (20), comprising a light source panel (21) and a lighting bead (22), wherein the light source panel (21) has a light exit face (211) arranged for the lighting bead (22) and a heat conduction face (212) disposed opposite to the light exit face (211);
a heat dissipation set (10), comprising a heat dissipation base (11) configured for dispersing heat into atmosphere, and a heat radiation plate (12), wherein the heat dissipation base (11) is

provided with an accommodation cavity (113) configured for accommodating the heat radiation plate (12) and defining an opening, and a surface of the heat radiation plate (12) connected to the heat conduction face (212) is configured to completely cover the heat conduction face (212), the light source panel (21) being connected to the heat radiation plate (12) through the heat conduction face (212), and being configured to guide light outward through the opening of the accommodation cavity (113), and wherein a bottom of the accommodation cavity (113), the heat radiation plate (12), and the light source panel (21) are sequentially arranged along the light,

characterized in that,

the light source panel (21) and the heat radiation plate (12) respectively define a gap relative to an inner wall of the accommodation cavity (113); and the heat radiation plate (12) is spaced apart from the bottom of the accommodation cavity (113).

2. The downlight (100) of claim 1, wherein the downlight (100) further comprises a driving structure (30) connected to the heat radiation plate (12) and configured to drive the light source apparatus (20), a bottom of the accommodation cavity (113) defines a connecting hole (131), the connecting hole (131) penetrates to an external space of the accommodation cavity (113), and the heat dissipation set (10) further comprises a connecting post (13) passing through the connecting hole (131), with one end of the connecting post (13) connected to the heat radiation plate (12) and the other end of the connecting post (13) connected to the driving structure (30).

3. The downlight (100) of claim 2, wherein the driving structure (30) comprises: a drive box (31) connected to the connecting post (13), and a drive board (32) disposed in the drive box (31) and electrically connected to the light source panel (21).

4. The downlight (100) of claim 3, wherein the downlight (100) further comprises a wiring structure (40), the wiring structure (40) comprises a wiring terminal (42) electrically connected to the drive board (32), and a wiring cover (41) connected to the drive box (31), the wiring cover (41) and the drive box (31) are enclosed to form a wiring cavity for accommodating the wiring terminal (42), the wiring cover (41) is provided with a wiring trough (45) that communicates with the wiring cavity and allows wires to pass therethrough; the wiring structure (40) further comprises a first toothed plate (49) located in the wiring cavity and connected to the drive box (31), and a second toothed plate (43) located in the wiring cavity and connected to the wiring cover (41), the first toothed plate (49) and the second toothed plate (43) are respectively provided with a plurality of serrations, and the serrations of the first toothed plate (49) and the serrations of the second toothed plate (43) cooperatively hold the wires.

5. The downlight (100) of claim 4, wherein the wiring structure (40) further comprises two side plates (46) both connected to the drive box (31), and two ends of the first toothed plate (49) are respectively connected to the two side plates (46), the wiring structure (40) further comprises an adjusting toothed plate (44) stacked on the first toothed plate (49), the adjusting toothed plate (44) is provided with the serrations and located between the first toothed plate (49) and the second toothed plate (43), and two ends of the adjusting toothed plate (44) are detachably connected to the two side plates (46) respectively.

6. The downlight (100) of claim 1, wherein the light source apparatus (20) further comprises a reflector cup (23) located in the accommodation cavity (113), the reflector cup (23) is disposed directly opposite to the light exit face (211) and comprises a cup sleeve (232) sleeved in the accommodation cavity (113) and a cup body (231) located in the cup sleeve (232) and formed integrally with the cup sleeve (232), a sealing ring (14) is further disposed between the cup sleeve (232) and a cavity wall of the accommodation cavity (113).

7. The downlight (100) according to claim 6, wherein the cup body (231) is provided with a switching groove (57), and the downlight (100) further comprises a change-over switch (58) disposed in the switching groove (57) and used for controlling the lighting bead (22), and a sealing cover (59) for sealing the switching groove (57).

8. The downlight (100) according to claim 6, wherein a side surface of the cup sleeve (232) is provided with engagement grooves (233), the engagement grooves (233) extend along a circumference of the cup sleeve (232), and a groove wall of each engagement groove (233) is provided with a guide groove (234) leading to an outer end face of the cup sleeve (232), the downlight (100) further comprises a decorative ring (54) located at the opening of the accommodation cavity (113) and covering the cup sleeve (232), buckle pins (55) each connected to the decorative ring (54) at one end, and the other end of each buckle pin (55) is inserted into each engagement groove (233) along each guide groove (234), and rotates a predetermined arc along the circumference of the cup sleeve (232) to engage the groove wall of the engagement groove (233) by a snap-fit connection.

9. The downlight (100) of claim 8, wherein the heat dissipation base (11) comprises: a heat dissipation cylinder (111) provided with the accommodation cavity (113), and a annular heat dissipation flange (112) located at the opening of the accommodation cavity (113) and in connection with the heat dissipation cylinder (112); the decorative ring (54) is stacked on the annular heat dissipation flange (112), and a surface of the annular heat dissipation flange (112) facing away from the decorative ring (54) is provided with a gasket (56).

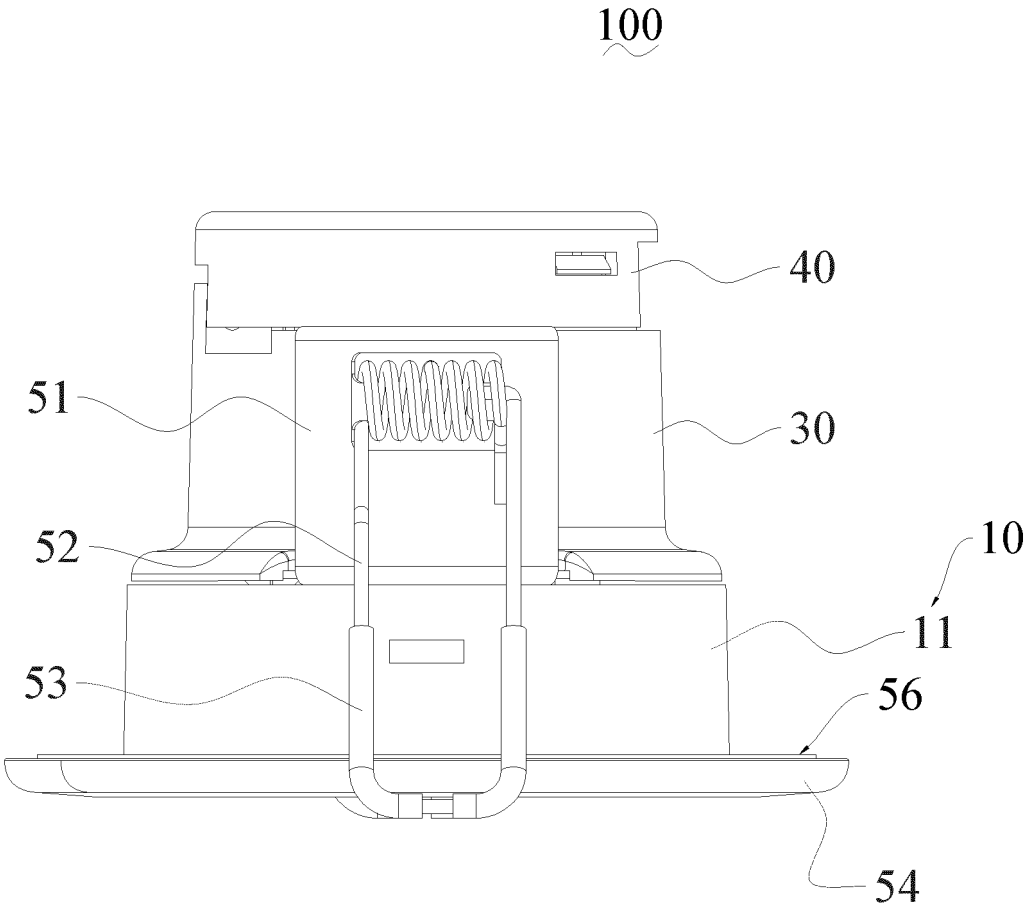

FIG. 1

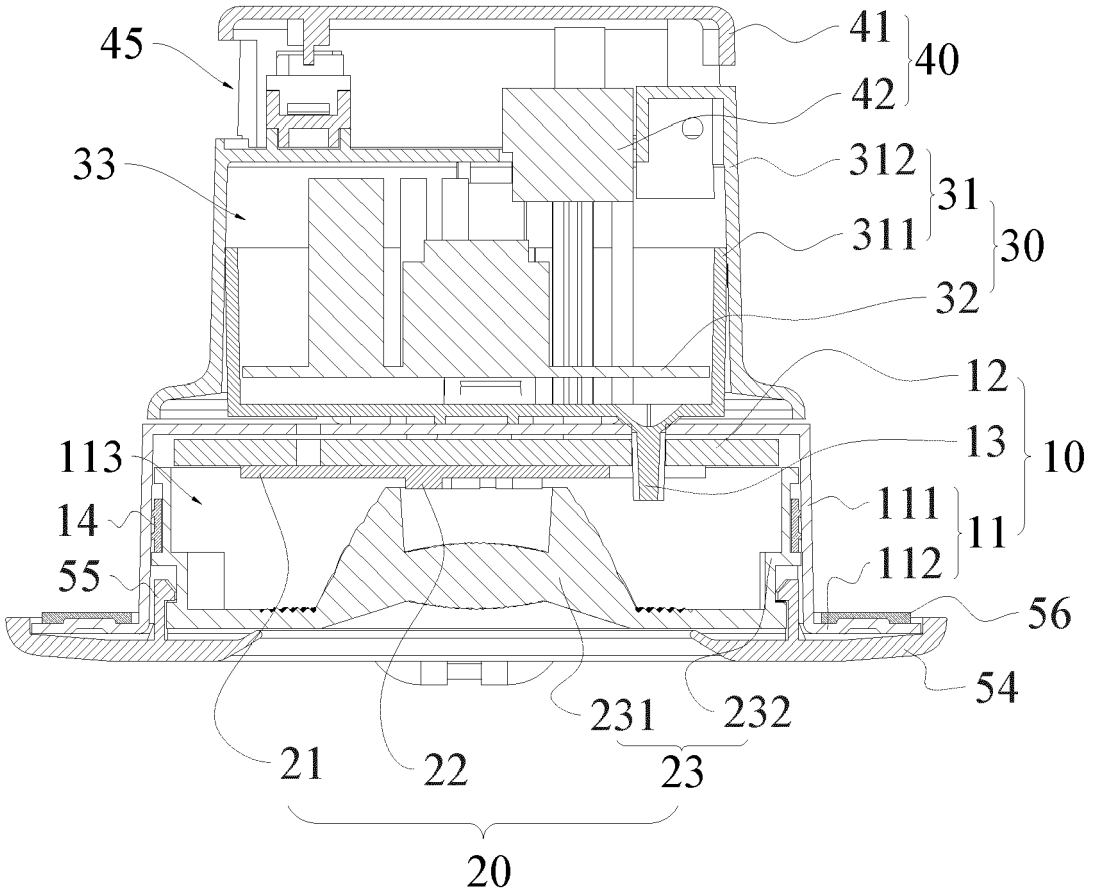
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FIG. 2

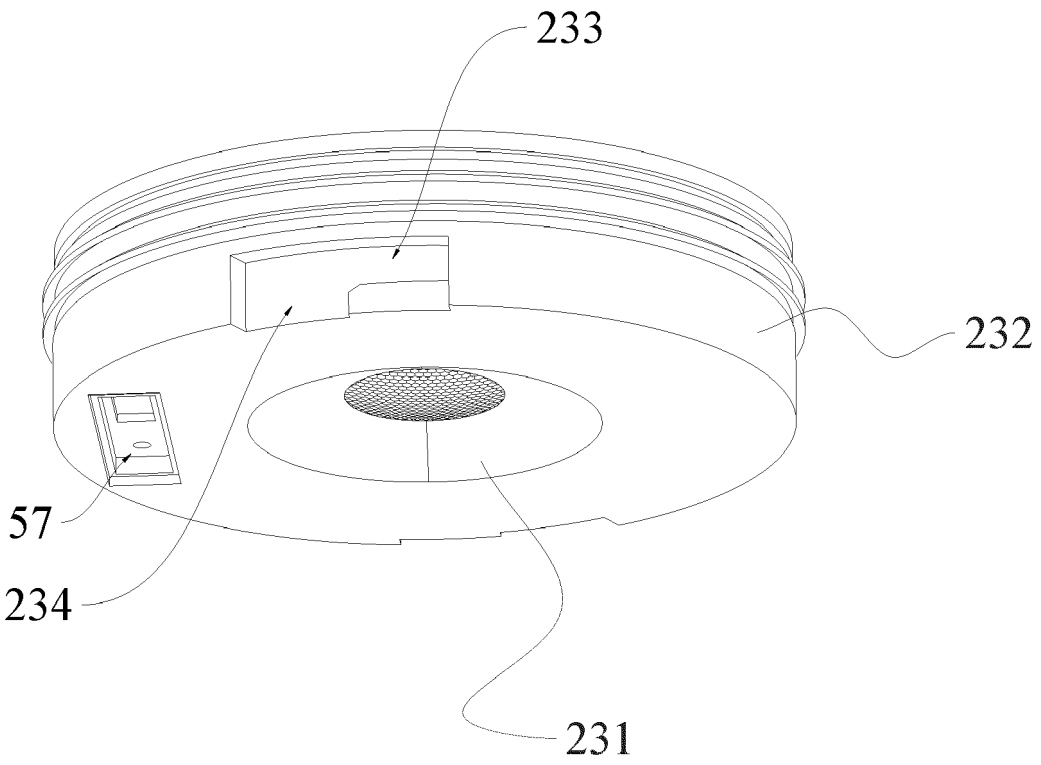

FIG. 3

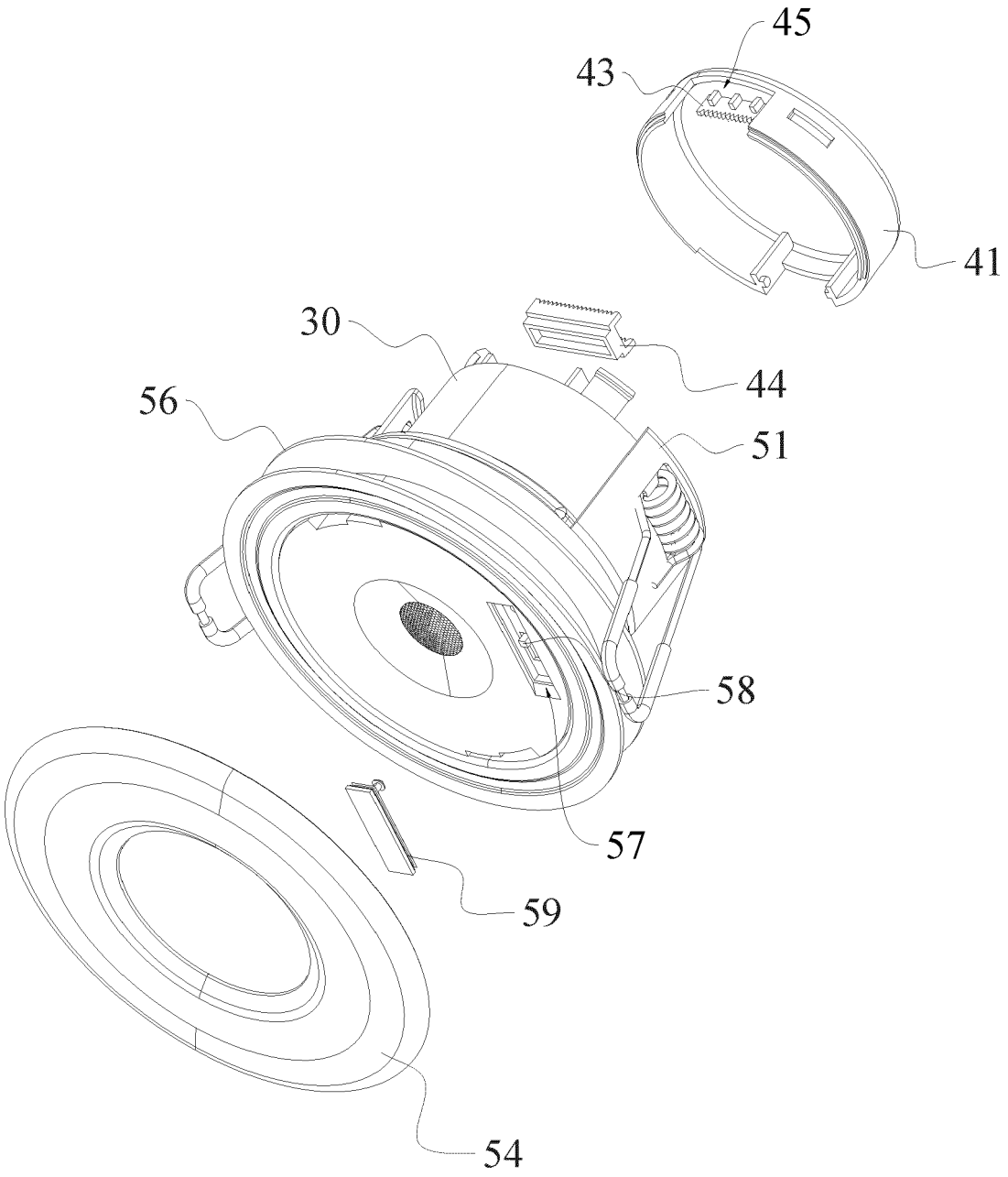

FIG. 4

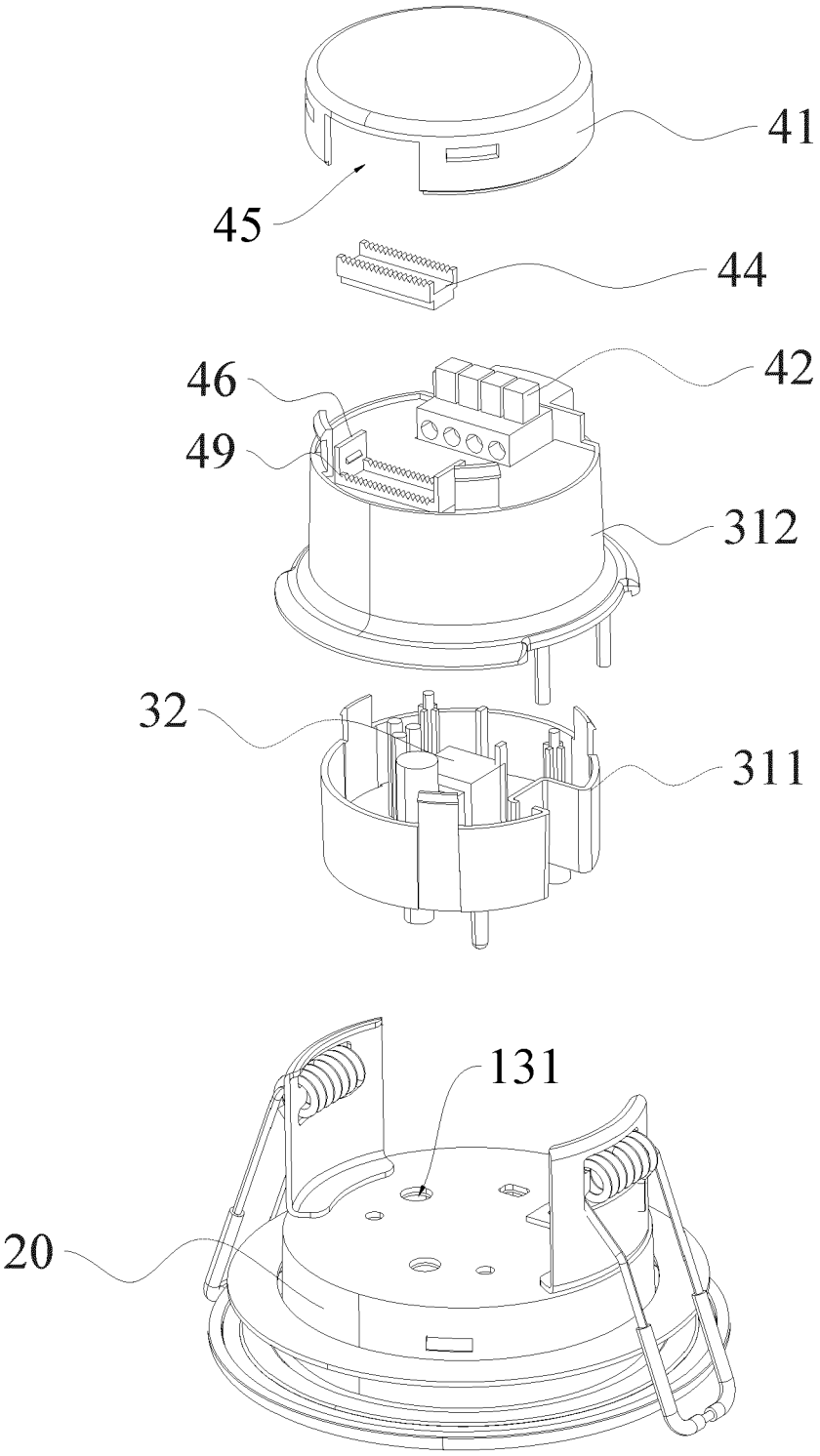

FIG. 5

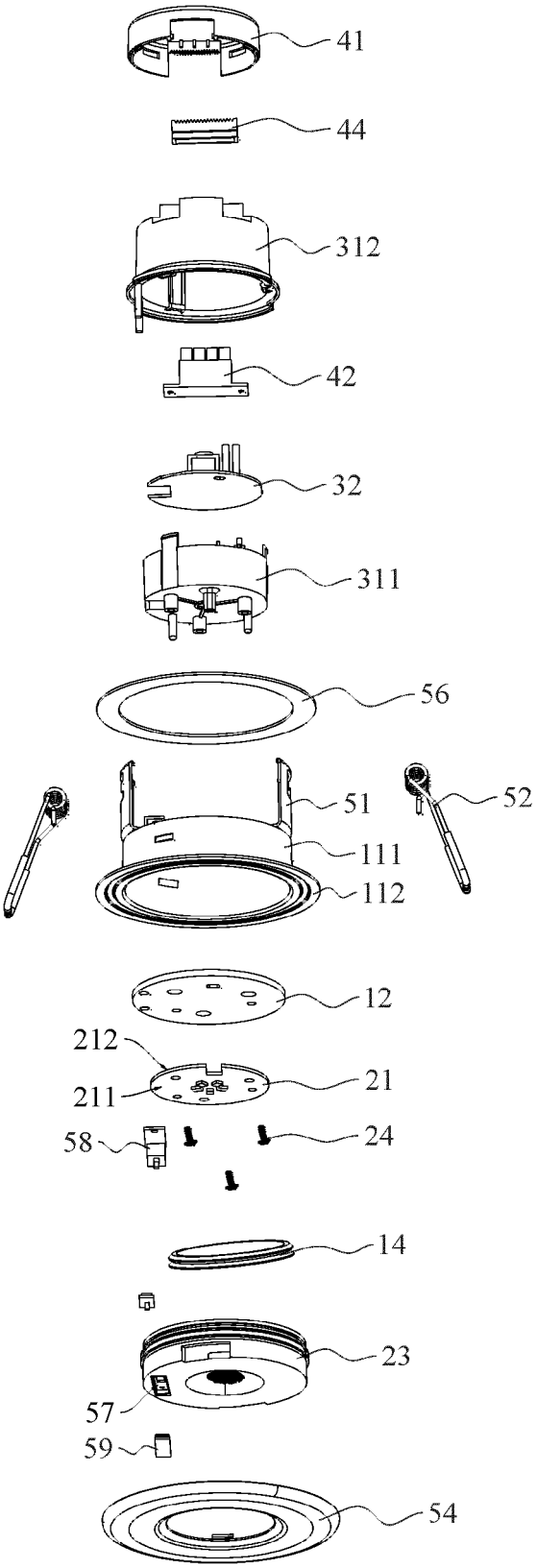
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FIG. 6

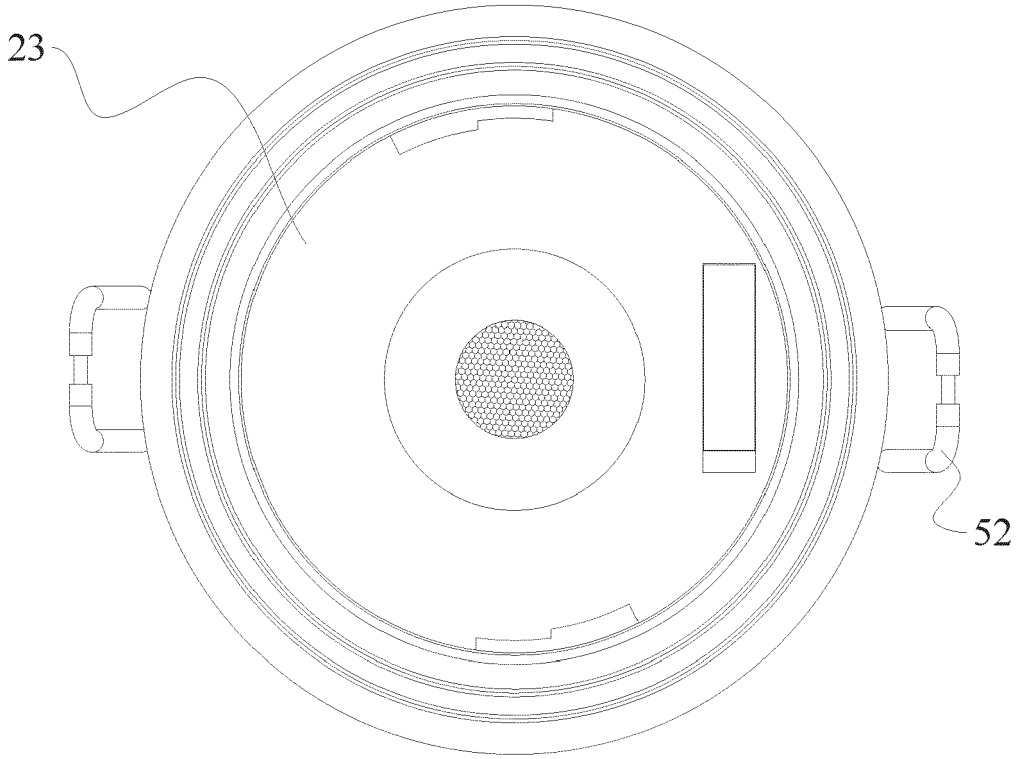

FIG. 7

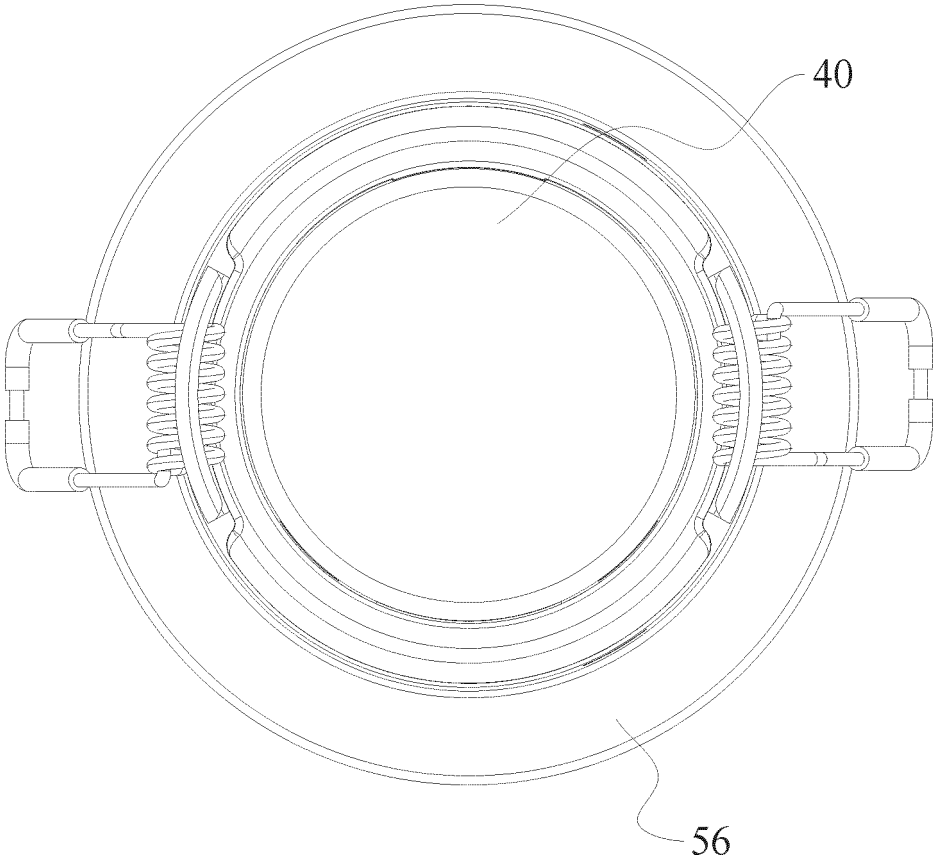

FIG. 8

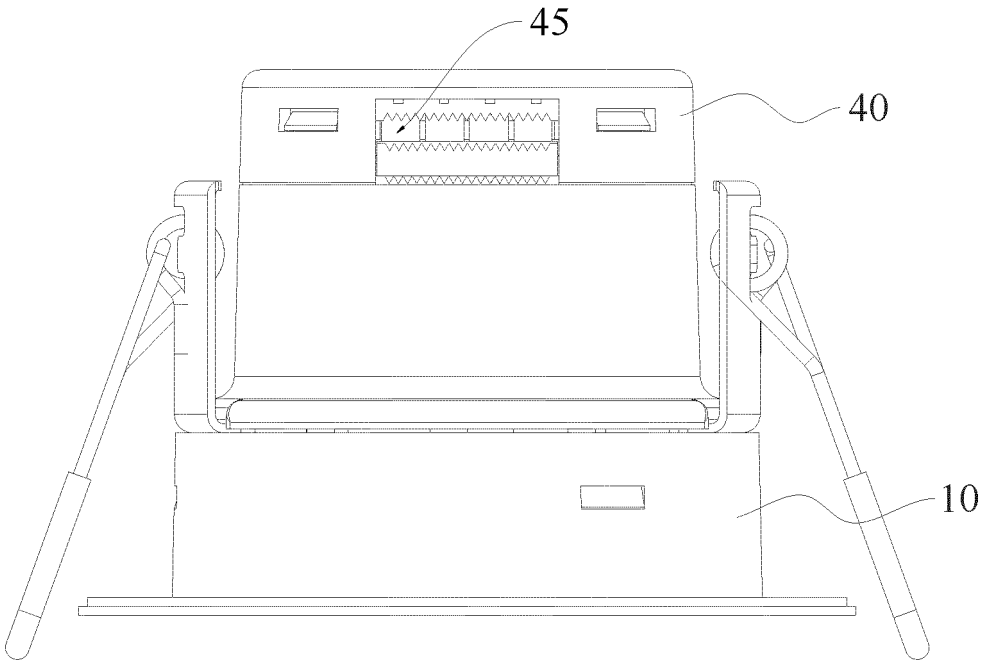

FIG. 9

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Application Number
EP 20 18 0427

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	4 November 2020	Demirel, Mehmet

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