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(71) Applicant: **Hangzhou Hpwinner Opto Corporation**
Hangzhou, Zhejiang 310015 (CN)

(72) Inventors:
- **CHEN, Kai**
  Hangzhou
  Zhejiang 311305 (CN)
- **HUANG, Jian Ming**
  Hangzhou
  Zhejiang 311305 (CN)

(74) Representative: **London IP Ltd**
Lymington Business Centre
Solent House
Cannon Street
Lymington, Hampshire SO41 9BR (GB)

(54) **LED LIGHTING DEVICE**

(57) This invention introduces one type of LED lighting device, including: Lamp housing; LED module; electrical appliance; lamp connecting member; therein, the Lamp housing is connected to one lamp pole through the lamp connecting member; the Lamp housing contains bottom case and top cover, and the top cover and the bottom case constitute one cavity that accommodating the LED module and the electrical appliance; the top cover is connected with one side of the bottom case through rotation; the lamp connecting member is in the type of straight arm or bent arm. The LED lighting device in this invention is featured by simple structure and rational design.

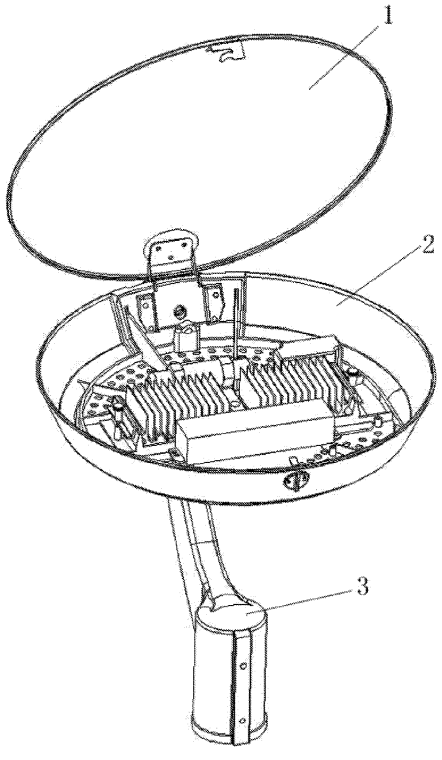

Figure 1

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Description

Technical Field

[0001] This invention refers to one type of LED lighting device, especially one type of LED lighting device with simple structure and rational design.

Background Technology

[0002] Along with the restriction against carbon emission and advocation of energy conservation and emission reduction in the international society, LED light source becomes the object of exploration when people are searching for alternative light source. LED light source has the advantages different from traditional light source, e.g., directional luminance, continuously-improved lighting effect, continuously-reduced price, energy conservation, environmental protection and vibration protection, and those features present unique advantages along with the development of technology, bringing a very broad prospect for the application of LED lamp.

[0003] Core component of LED lighting device is light source, and most of the light sources of current LED lighting device in the market are made through integration, which requires designing different internal light source for different LED lighting device, and such design mode will undoubtedly bring a great waste under the condition that many enterprises are throwing themselves into the LED lighting market. In comparison, module of LED light source has a great advantage.

[0004] In addition, the LED lighting device under current technology still has the following defects:

First, the structure is complicated;
Second, it is unable for the design of current structure to realize toolless disassembly and assembly of top cover and bottom case in a convenient and effective way;
Third, when the LED lighting device is connected to the lamp pole, the wiring between the LED lighting device and the lamp pole is invisible, which causes an inconvenient installation process of wiring between the LED lighting device and the lamp pole.
Fourth, most of the LED lamp holders present a rectangular shape, and it requires alignment and match during assembly of top cover and bottom case, and the requirement for installation personnel is high and it is inconvenient.

Description of the Invention

[0005] This invention provides a type of LED lighting device with simple structure and rational design.

[0006] The technical solution for this invention is as follows:

An LED lighting device, including:
a lamp housing;
an LED module;
an electrical Appliance;
a lamp connecting member; therein,
the lamp housing is connected to a lamp pole through the lamp connecting member;
the lamp housing contains a bottom case and a top cover, and the top cover and the bottom case constitute one cavity that accommodating the LED module and the electrical appliance; one side of the top cover is connected with one side of the bottom case through rotation;
the lamp connecting member is in the type of straight-arm or bent-arm.

[0007] In an optimized mode of execution of this invention, the bent-arm-type lamp connecting member contains a bent-arm-type main body and a bent-arm-type cover plate, and the bent-arm-type main body has an opening along its direction, the bent-arm-type cover plate is covered on the opening of the bent-arm-type main body along the direction of the lamp connecting member in a removable way, and between the bent-arm-type main body and the bent-arm-type cover plate constitute a cavity used for wiring.

[0008] In an optimized mode of execution of this invention, the straight-arm-type lamp connecting member is connected to a angle-adjustable connecting member, and the straight-arm-type lamp connecting member is connected to the angle-adjustable connecting member through an adjustable connection angle, and the angle-adjustable connecting member is connected to the lamp pole.

[0009] In an optimized mode of execution of this invention, the angle-adjustable connecting member contains one gear pressing plate and the connecting piece connected to the lamp pole, and in the gear pressing plate it is equipped with a gear groove; the straight-arm-type lamp connecting member is connected to the connecting piece in a pivotal way; in the connecting piece it is equipped with gear fixedly, the gear teeth of the gear can be geared into the gear groove on the gear pressing plate, and in the meantime, the gear pressing plate is connected to the straight-arm-type lamp connecting member.

[0010] In an optimized mode of execution of this invention, the end connecting the connecting piece and the straight-arm-type lamp connecting member is equipped with symmetrical engaging lugs, the straight-arm-type lamp connecting member is connected to the engaging lug through a shaft, and the gear is set up on the inner side or outer side of the engaging lug.

[0011] In an optimized mode of execution of this invention, the gear pressing plate is connected to the straight-arm-type lamp connecting member through a screw.

[0012] In an optimized mode of execution of this invention, the bottom case is connected to one side of the top cover in a rotational way through a hinge component; therein,

the hinge component contains one hinge and one flip hinge in the pivotal connection,
the hinge contains the first connection sheet and the first connection end, and the hinge is connected to the bottom case through the first connection sheet in a fixed way;
the flip hinge contains the second connection sheet and the second connection end, and the flip hinge is connected to the inner side of the top cover through the second connection sheet in a fixed way;

[0013] In addition, the first connection end and the second connection end are connected in a pivotal way.

[0014] In an optimized mode of execution of this invention, one side of the top cover is connected to one side of the bottom case through a hinge.

[0015] In an optimized mode of execution of this invention, a turn-over slot to realize specified turn-over of the connecting point between the top cover and the bottom case is set up in the position of the hinge for the installation of the bottom case.

[0016] In an optimized mode of execution of this invention, the bottom case is connected to the other side of the top cover through a rotary switch.

[0017] In an optimized mode of execution of this invention, the rotary switch contains the first card, the second card and the rotary knob, therein,

[0018] The first card is set up on the inner side of the top cover in a fixed way, and one bayonet is set up in the first card;

[0019] One end of the rotary knob enters the bottom case through the outer side of the bottom case, and the second card is installed on such end of the rotary switch in a fixed way, and rotation of the rotary switch will drive the second card to rotate and enter the bayonet;

[0020] Limit structure and semi-limit structure are set up on the inner side of the bottom case and corresponding position of the second card; the second card has idle state and clamping state; the space between the limit structure and the semi-limit structure limits the rotation stroke of the second card under idle state; through the application of force on the second card by the rotary knob, the semi-limit structure is turned over, the second card is stuck in the bayonet and enables the second card to maintain the clamping state, and the rotation angle of the second card is limited between the bayonet and the semi-limit structure, in order to realize the locking between the first card and the second card.

[0021] In an optimized mode of execution of this invention, the sliding contact surface of the semi-limit structure and the second card has a certain gradient.

[0022] In an optimized mode of execution of this invention, the LED lighting device is featured by: the lamp connecting member has a cavity used for wiring, the lamp connecting member is connected to the bottom case, and a wiring hole is set up in the connecting point of the bottom case and the lamp connecting member.

[0023] In an optimized mode of execution of this invention, the LED lighting device is featured by: the straight-arm-type lamp connecting member contains a cylinder and a connecting piece that is set up in one end of the cylinder, the straight-arm-type lamp connecting member is connected to the bottom case through the connecting piece, and the cylinder has a cavity used for wiring.

[0024] In an optimized mode of execution of this invention, it further contains the conduit, and male screw tube is set up in one end of the conduit, threaded wiring hole is set up inside the bent-arm-type lamp connecting member or the angle-adjustable connecting member, and the male screw tube matches the threaded wiring hole.

[0025] In an optimized mode of execution of this invention, the Lamp housing is in circular or elliptical shape; the electrical appliance contains power supply.

[0026] In the meantime, this invention provides one type of the angle-adjustable connecting member.

[0027] This invention also provides one type of LED lighting device with the angle-adjustable connecting member.

[0028] A type of modular and circular LED lighting device includes Lamp housing, power supply and module; the Lamp housing is in circular shape, the Lamp housing is connected to the lamp pole through a bent-arm-type lamp connecting member, the Lamp housing contains bottom case and top cover; the top cover is connected to one side of the bottom case in a rotational way, and the other side is connected through rotary switch, the top cover is connected to the bottom case to form the space holding the power supply and module.

[0029] One type of straight-arm-type LED lighting device includes Lamp housing, LED module, electrical appliance and lamp connecting member; the lamp connecting member is a straight-arm-type lamp connecting member, the Lamp housing contains bottom case and top cover, and the bottom case and the top cover constitute one cavity that accommodating the LED module and the electrical appliance; the bottom case is connected with one side of the top cover in a rotational way; the straight-arm-type lamp connecting member is connected to the bottom case.

[0030] Compared with current technology, the beneficial effects of this invention are as follows:

First. The LED lighting device in this invention is featured by simple structure and rational design;

Second. In an optimized mode of execution of the LED lighting device in this invention, the lamp housing is connected to the lamp pole through a bent-arm-type lamp connecting member, and such bent-arm-type lamp connecting member is jointly composed of bent-arm-type main body and bent-arm-type cover plate through mutual connection, and the bent-arm-type cover plate can be removed, in order to realize visible wiring during the installation process of LED lighting device for the convenience of installation.

Third. Through the setup of straight-arm-type lamp connecting member in the LED lighting device in this invention, it evidently reduces the packaging volume

of the whole lamp product for the convenience of package and transportation, which greatly reduces the cost of package and transportation;
Fourth. The LED lighting device in this invention is also equipped with a angle-adjustable connecting member aiming at the straight-arm-type lamp connecting member, which has the function of adjusting the angle of installation of the lamp;
Fifth. Most of the weight of the angle-adjustable connecting member in this invention is distributed to the screw connecting the gear pressing plate and the straight-arm-type lamp connecting member, in the meantime, the shaft connecting the straight-arm-type lamp connecting member and the engaging lug also bears the radial force, so the connection of the straight-arm-type lamp connecting member and the angle-adjustable connecting member is more solid and the connection strength is improved;
Sixth. The angle-adjustable connecting member in this invention applies the meshing of gear pressing plate and the gear, and the range of adjustable angle is large and the two pieces are not easy to dislocate or fall off;
Seventh. In an optimized mode of execution of the LED lighting device in this invention, the top cover and one side of the bottom case is connected through a hinge, and toolless disassembly and assembly can be realized through a rotary switch for the other side; in the meantime, the rotation stroke of the second card in the rotation switch is limited through the limit structure and semi-limit structure set up correspondingly in the rotary switch, to prevent free rotation of the second card when the top cover and the bottom case are not connected and to realize the locking after the top cover and the bottom case are connected.

[0031] Of course, it is not necessary to simultaneously achieve all of the above-mentioned advantages during execution of any of the product in this invention.

Instructions of Attached Figures

[0032]

Figure 1 is the schematic diagram of overall structure in No. 1 execution example in this invention;

Figure 2 is the diagram of overall disassembly in No. 1 execution example in this invention;

Figure 3 is the schematic diagram of bent-arm-type main body in No. 1 execution example in this invention;

Figure 4 is the schematic diagram 1 of bottom case in No. 1 execution example in this invention;

Figure 5 is the schematic diagram of local parts of location B in Figure 4;

Figure 6 is the schematic diagram of connection between the hinge and bottom case in No. 1 execution example in this invention;

Figure 7 is the schematic diagram of the first card in No. 1 execution example in this invention;

Figure 8 is the schematic diagram 2 of bottom case in No. 1 execution example in this invention;

Figure 9 is the schematic diagram of local parts of location A in Figure 8;

Figure 10 is the schematic diagram of the first card and the second card before connection in No. 1 execution example in this invention;

Figure 11 is the schematic diagram of the first card and the second card after connection in No. 1 execution example in this invention;

Figure 12 is the three-dimensional schematic diagram of the straight-arm-type lamp connecting member of straight-arm-type LED lighting device in No. 2 execution example in this invention;

Figure 13 is the three-dimensional schematic diagram with closed top cover and bottom case of straight-arm-type LED lighting device in No. 2 execution example in this invention;

Figure 14 is the enlarged diagram of part C in Figure 13;

Figure 15 is the three-dimensional schematic diagram with opened top cover of straight-arm-type LED lighting device in No. 2 execution example in this invention;

Figure 16 is the disassembly diagram of the lamp housing and the straight-arm-type lamp connecting member of straight-arm-type LED lighting device in No. 2 execution example in this invention;

Figure 17 is the three-dimensional schematic diagram of hinge module of straight-arm-type LED lighting device in No. 2 execution example in this invention;

Figure 18 is the three-dimensional schematic diagram 1 of straight-arm-type LED lighting device in No. 3 execution example in this invention, in which the top cover and the bottom case are in closed state;

Figure 19 is the three-dimensional schematic dia-

gram 2 of straight-arm-type LED lighting device in No. 3 execution example in this invention, in which the top cover is in opened state;

Figure 20 is the schematic diagram of angle-adjustable connecting member in No. 3 execution example in this invention;

Figure 21 is the schematic disassembly diagram of angle-adjustable connecting member in No. 3 execution example in this invention;

Figure 22 is the schematic diagram of gear pressing plate of the angle-adjustable connecting member in No. 3 execution example in this invention;

Figure 23 is the schematic diagram of the angle-adjustable connecting member and lamp pole connection in No. 3 execution example in this invention.

Specific Methods of Execution

[0033] Further description of this invention is provided combining with specific examples of execution in the following. Please refer to the attached figures of the example of execution of this invention, and a more detailed description of this invention is provided in the following. However, this invention can be realized with many different methods, which shall not be subject to the limitation of execution example presented herein. On the contrary, the presentation of such examples of execution is to achieve sufficiency, integrity and openness and to enable the technical personnel in this technical field to fully comprehend the technical solution of this invention. In the attached figures, the size of certain layers and regions and relative size are possibly amplified for the purpose of clearness.

No. 1 example of execution

[0034] Please refer to Figure 1 to Figure 11, this example of execution provides a type of modular and circular LED lighting device, including Lamp housing, module 9 and power supply 10; the lamp housing is connected to the lamp pole through a bent-arm-type lamp connecting member 3 (hereinafter referred to as bent-arm-type 3); therein, the lamp housing contains bottom case 2 and top cover 1; top cover 1 is connected to one side of the bottom case 2 in a rotational way, and the other side is connected through rotary switch, and top cover 1 and bottom case 2 form the cavity holding power supply 10 and module 9 after buckling.

[0035] In this example of execution, e.g., the lamp housing is made of pure aluminum with optimization, which ensures that the whole lamp is functioning well with good heat dissipation.

[0036] In this example of execution, top cover 1 and bottom case 2 both present a circular shape, so the lamp in this example of execution is more convenient during installation and match when comparing with a lighting device in the shape of rectangle.

[0037] Of course, the shape of the lamp housing and the manufacturing materials can also be set and selected according to specific conditions, and the sample description mentioned above is non-mandatory limitation.

[0038] In this example of execution, some electrical appliance is installed inside the space formed by the connection of top cover 1 and bottom case 2, such as module 9, power supply 10, anti-thunder equipment 5, wiring pressing plate 6, waterproof wiring 7 and pressing line plate 8.

[0039] Therein, several second stiffener 202 are set up in the bottom case 2, and such second stiffener are diffusively distributed in the shape from center to the surrounding; and the second reinforcing rib 202 near the side of bent arm 3 is extended to the side wall of bottom case 2 from the bottom of bottom case 2, namely, the second reinforcing rib 202 near the side of bent arm 3 is higher than the second reinforcing rib in other parts, and as is showed in Figure 4, the purpose is to enable the lamp to bear more gravity.

[0040] In this example of execution, a raised beam 203 is set up in the position for installing module 9 on inner side of bottom case 2; module 9 is installed on the raised beam 203 through a hand-tightening screw 11 to play an auxiliary role of heat dissipation.

[0041] In this example of execution, one side of the bottom case 2 is connected to the lamp pole through bent arm 3, therein, the bottom case 2 and bent arm 3 are two independent parts that are connected through methods such as screw, etc; of course, bottom case 2 and bent arm 3 can also be integrated, but in this invention, they are divided into two parts in order to downsize the module and to lower the cost. In this example of execution, wiring hole is set up in the connecting location of bottom case 2 and bent arm 3.

[0042] Bent arm 3 is composed of two parts such as bent-arm-type main body 301 and bent-arm-type cover plate 302; bent-arm-type main body 301 presents an arc shape as a whole, and the lower end is connected to the lamp pole, and a wiring hole 3013 is set up in corresponding position of bent-arm-type main body 301 with the lamp pole, for the convenience of wire of lamp pole entering the bent-arm-type main body 301; the upper end of bent-arm-type main body 301 is connected to the outer side of the bottom case 2 and a wiring hole 3012 is set up in the bent-arm-type main body 301, for the convenience of wire from lamp pole providing power supply for the device inside the lamp housing after entering the lamp housing through the bent arm. As is showed in Figure 3, several first stiffener 3011 are set up on the inner side wall of bent-arm-type main body 301, and the distribution density of the first stiffener 3011 is gradually increased along the direction close to bottom case 2, so it can enable the bent arm 3 to bear more gravity. Furthermore, the LED lighting device in this example of execution can

also contain conduit, and male screw tube is set up on one end of the conduit, threaded wiring hole is set up correspondingly in the cavity inside bent arm 3, the male screw tube matches the threaded wiring hole. The conduit can be used to protect the wire.

[0043] An opening is set up on the arc surface on the outer side of bent-arm-type main body 301 along the direction of bent arm, bent-arm-type cover plate 302 is covered on the opening and is installed on bent-arm-type main body 301 through methods such as screw, etc, and bent-arm-type main body 301 and bent-arm-type cover plate 302 form a cavity used or wiring after installation.

[0044] In this example of execution, the bent arm 3 is divided into two parts such as bent-arm-type main body 301 and bent-arm-type cover plate 302, in order to realize visible wiring during the installation process of LED lighting device for the convenience of installation.

[0045] In this example of execution, top cover 1 is connected to one side of bottom case 2 through hinge 4. Therein, as in showed in Figure 2 to Figure 6, the end of hinge 4 is connected to the edge on outer side of bottom case 2, and a turn-over slot 204 is set up in the position on top of the edge of bottom case 2 corresponding to hinge 4, the other end of hinge 4 is connected to the inner side of top cover 1, so it realizes the connection of top cover 1 and bottom case 2; in this example of execution, a turn-over slot 204 is set up in bottom case 2, so it realizes the turn over of specified angle (such as 270°) of the connecting point of top cover land bottom case 2.

[0046] In a replaceable way, hinge 4 can be replaced with hinge module. Please refer to Figure 17 for the structural schematic diagram of an available type of hinge module. Hinge module 5 contains one hinge 51 of pivotal connection and one top cover hinge 52, therein, the hinge 51 contains the first connection sheet 511 and the first connection end 512, such hinge 51 is connected to bottom case 2 through the first connection sheet 511 in a fixed way; the top cover hinge 52 contains the second connection sheet 521 and the second connection end 522, such top cover hinge 52 is connected to the inner side of top cover 1 through the second connection sheet 521 in a fixed way; in addition, the first connection end 512 of hinge 51 is connected to the second connection end 522 of top cover hinge 52 through a pivotal connection end 53 in a pivotal way. Herein, it applies the hinge module containing hinge 51 and top cover hinge 52 to replace the hinge mentioned above, and the top cover turn-over will be more convenient after assembling top cover and bottom case.

[0047] Please refer to Figure 2, Figure 7 to Figure 11, toolless disassembly and assembly can be realized through a rotary switch for top cover 1 and the other side of bottom case, therein, the connecting points of hinge 4 & hinge module 5 and the connecting point of the rotary switch is set up on the two relative ends in the symmetric axis of the lamp housing.

[0048] Specifically, the rotary switch contains the first card 12 set up on top cover 1 while the second card 13 and rotary knob 14 set up on bottom case 2. As is showed in Figure 7, the first card 12 is fixed onto the inner side of top cover 1 through methods such as screw, and an arc-shape bayonet 121 is set up on the first card 12. As is showed in Figure 9, a raised plane 201 is set up on the inner side of bottom case 2 corresponding to the first card 12, for the convenience of installation of the second card 13; please refer to Figure 2, Figure 9, Figure 10 and Figure 11, one end of the rotary knob 14 enters the bottom case 2 through the outer side of the bottom case 2, and the punching position is located on the raised plane 201; the second card 13 presents a bent shape, and the bent part on one side which is fixed in the rotary knob 14 enters one end of the bottom case 2 and drives the second card 13 to rotate through the rotary knob 14. In this example of execution, toolless disassembly and assembly is realized through the connection of top cover 1 and bottom case 2 through the rotary knob, which brings convenient maintenance and greatly reduces the cost of maintenance.

[0049] In this example of execution and as is showed in Figure 9, there are a semi-limit structure 2011 and limit structure 2012 set up on the raised plane 201, the semi-limit structure 2011 and limit structure 2012 form a large circumferential angle and a small circumferential angle with the center of rotary knob 14, which is used for limiting the rotary stroke of the second card 13. Therein, the second card 13 is unable to turn over limit structure 2012 during the process of rotation; however, under the condition of applying force on the second card 13, it can turn over the semi-limit structure 2011; in a preferential way, the sliding contact surface of the semi-limit structure 2011 and the second card 13 has a certain gradient, for the convenience of the second card 13 overcoming the resistance smoothly to turn over the semi-limit structure 2011. Specific connecting mechanism of the first card 12 and the second card 13 is as follows:

[0050] As is showed in Figure 10, when top cover 1 and bottom case 2 are not connected, the second card 13 is located within the range of small circumferential angle formed by the connection between semi-limit structure 2011 & limit structure 2012 and the center of rotary knob 14, and it applies no force on the rotary knob 14 at this time, so it limits the rotary stroke of the second card within the space between semi-limit structure 2011 & limit structure 2012 during the idle state of the second card 13 and limits the second card 13 to rotate within a smaller range to prevent the inconvenience brought by the random rotation of the second card 13 when top cover 1 and bottom case are not connected.

[0051] As is showed in Figure 11, when top cover 1 and bottom case are connected, top cover 1 is covered on top of bottom case 2, and the first card 12 is right on top of the second card 13; it applies certain force on rotary knob 14 to drive the first card 12 to rotate and enables the first card 12 to turn over the semi-limit structure 2011 and to enter the bayonet 121, and it enables the first card 12 to turn to clamping state and then loosens the rotary

knob 14; at this time, the first card 12 is located within the bayonet 121 and semi-limit structure 2011, and under the function of semi-limit structure 2011, it realizes the locking between the first card 12 and the second 13, to prevent loosening between top cover 1 and bottom case 2.

[0052] To sum up, this example of execution provides one type of module LED lighting device in circular-shape, including Lamp housing, power supply and module; the lamp housing is in circular shape and connects with the lamp pole through a bent arm, and the bent arm is composed of bent-arm-type main body and bent-arm-type cover plate in a removable way; the lamp housing contains bottom case and top cover, the top cover and one side of the bottom case is connected through a hinge or a hinge module, and a turn-over slot is set up in the position of hinge in the bottom case, so it can realize the turn over of specified angle (such as 270°) of the top cover; top cover is connected with the other side of the bottom case through a rotary switch, which contains the first card set up on the top cover while the second card and rotary switch set up on the bottom case, and a semi-limit structure and a limit structure are set up in the position of the second card in the bottom case; this example of execution realizes the toolless disassembly and assembly through the connection of rotary switch, and limits the rotary range of the second card through the limit structure and semi-limit structure, to prevent random rotation of the second card when the top cover and the bottom case are not connected, and to realize the locking between the first card and the second after connection.

No. 2 example of execution

[0053] Please refer to Figure 12 to Figure 17, and it shows one type of straight-arm-type LED lighting device, including Lamp housing, LED module 9', electrical appliance and lamp connecting member, the lamp connecting member is a straight-arm-type lamp connecting member 4, the lamp housing contains bottom case 2' and top cover 1', and the bottom case 2' and the top cover 1' constitute one cavity that accommodating the LED module 9' and the electrical appliance, the bottom case 2' is connected with one side of the top cover 1' in a rotational way, the straight-arm-type lamp connecting member 4 is connected to the bottom case 2'. The electrical appliance may contain power supply, anti-thunder equipment, wiring pressing plate, waterproof wiring and pressing line plate, etc.

[0054] Please refer to Figure 12 and in this example of execution, the straight-arm-type lamp connecting member 4 contains one cylinder 41 and a connecting piece 42 that is set up in one end of such cylinder 41, and the straight-arm-type lamp connecting member 4 is connected to the bottom case 2' through the connecting piece 42, please refer to Figure 13.

[0055] In this example of execution, a cavity 43 is set up inside the straight-arm-type lamp connecting member 4 which is used for wiring, please refer to Figure 12; correspondingly, a wiring hole is set up in the position of bottom case 2' with straight-arm-type lamp connecting member 4, please refer to Figure 15 and Figure 16. Such design is to ensure the internal wiring inside the lamp.

[0056] In this example of execution, bottom case 2' is connected to one side of top cover 1' through hinge module 5 in a rotational way. Please refer to Figure 17, hinge module 5 contains one hinge 51 of pivotal connection and one top cover hinge 52, therein, the hinge 51 contains the first connection sheet 511 and the first connection end 512, such hinge 51 is connected to bottom case 2' through the first connection sheet 511 in a fixed way, please refer to Figure 15; the top cover hinge 52 contains the second connection sheet 521 and the second connection end 522, such top cover hinge 52 is connected to the inner side of top cover 1' through the second connection sheet 521 in a fixed way, please refer to Figure 15; in addition, the first connection end 512 of hinge 51 is connected to the second connection end 522 of top cover hinge 52 through a pivotal connection end 53 in a pivotal way, please refer to Figure 17. Herein, it sets up the hinge module containing hinge 51 and top cover hinge 52, and the top cover turn-over will be more convenient after assembling top cover and bottom case.

[0057] In this example of execution, the connecting position between straight-arm-type lamp connecting member 4 and bottom case 2' is corresponding to the set up position of hinge module 5, and a groove holding pivotal connection end 53 of the hinge module 5 is set up on the connecting piece 42 of straight-arm-type lamp connecting member 4, such groove is a straight slot which means that it can remove the part installed on connecting piece 42 corresponding to the pivotal connection end 53 to form the straight slot as mentioned, and of course, it may also set up the straight slot or groove through other methods generally used. Please refer to Figure 13 and Figure 14, the pivotal connection end 53 of the hinge module is suspended in the straight slot, which is not connected or fixed with the edge of such straight slot. However, this invention also contains the technical solution providing fixation for the pivotal connection end 53.

[0058] In this example of execution, top cover 1' is connected with the other side of the bottom case 2' through rotary switch 6, and the structure of rotary switch in this example of execution may be the same as or different from No.1 example of execution. Please refer to Figure 15 and Figure 16. Specifically, rotary switch 6 contains the first card set up on top cover 1' and the second card and rotary knob set up on bottom case 2', therein, the first card is fixed on the inner side of top cover through methods such as screw, and a buckle is set up on the first card, such as arc-shape bayonet. A raised plane is set up on the inner side of bottom case 2' corresponding to the first card, for the convenience of installation of the second card; one end of the rotary knob enters the bottom case 2' through the outer side of the bottom case 2', and the punching position is located on the raised plane; the

second card presents a bent shape, and the bent part on one side is installed on the other end of rotary knob in a fixed way and drives the second card to rotate through the rotary knob, and it enables the bent part of the second card to snap into the arc-shape bayonet. In this invention, tool less disassembly and assembly is realized through the connection of top cover 1 and bottom case 2 through the rotary knob, which brings convenient maintenance and greatly reduces the cost of maintenance.

[0059] In this example of execution, the outer contour of the amp housing is circular, and it can also be oval shape or any other shape that is suitable.

No. 3 example of execution

[0060] The difference between this example of execution and No. 2 example of execution is that in this example of execution, straight-arm-type lamp connecting member 4 is also connected with a connecting piece 7 with adjustable angle, and the straight-arm-type lamp connecting member 4 is connected with a connecting piece 7 with adjustable angle through an adjustable connection angle, please refer to Figure 18 and Figure 19. Through the cooperative application of angle-adjustable connecting member and straight-arm-type lamp connecting member, it can not only realize the effect of small packaging volume of the whole lamp due to the straight-arm-type design of the lamp connecting member, but can also realize the adjustable installation angle of the lamp housing relative to the lamp pole, and it also makes these become more convenient.

[0061] Please refer to Figure 20 and Figure 21, the connecting piece 7 with adjustable angle in this example of execution, includes gear pressing plate 71 and connecting piece 72 with the lamp pole, the joint pipe with label No. 411 is the central cylinder part of cylinder 41 in the straight-arm-type lamp connecting member 4 (the cylinder length in the figure is only for schematic and shall not be referenced as standard length), joint pipe 411 is connected with connecting piece 72 in a rotational way, therein, gear 721 is set up on the connecting piece 72 in a fixed way, gear pressing plate 71 is connected with joint pipe 411, a gear slot is set up on the gear pressing plate and such gear slot can be geared into the gear teeth of gear 721.

[0062] Please refer to Figure 23 and in this example of execution, two engaging lugs 722 are set up on one end of the connecting piece 72 in a symmetric way, joint pipe 411 is connected with engaging lug 722 through a shaft, two gears 721 are respectively set up on thinner side of engaging lug 722 and in a replaceable way, gear 721 can also be set up on the outer side of engaging lug 722. In this example of execution, bolt is used as shaft, and joint pipe 411 and engaging lug 722 can be rotated around the bolt in order to adjust the connecting angle; gear 721 and connecting piece 72 can be integrated, or gear 721 can be fixed onto connecting piece 72 through a screw. Connecting piece 72, gear pressing plate and gear 721 can be in die-casting molding with aluminum.

[0063] Please refer to Figure 22 and in this example of execution, gear pressing plate includes the pressing plate itself, and threaded hole 712 and several gear slots are set up on the pressing plate, and the overall shape and density of gear slot 711 matches the gear teeth of gear 721. Gear pressing plate is connected with the joint pipe 411 through screw 74.

[0064] Please refer to Figure 21 and in this example of execution, connecting piece 7 with adjustable angle also includes conduit 73, and one end of conduit 73 is equipped with male screw tube and threaded wiring hole is set up on the connecting piece 72, and male screw tube matches the threaded wiring hole. The conduit 73 can be used to protect the wire. The length of conduit is slightly longer than joint pipe 411 for the convenience of entrance of wire during installation and use. End cap 75 is set up in one end of the joint pipe 73, end cap 75 is connected with the screw thread of joint pipe 411, and one end of the conduit 73 passes through the wiring hole of end cap 75. The material of the end cap can be rubber and rubber end cap can protect the wire.

[0065] During application, joint pipe 411 is connected with engaging lug 722 through the bolt in a rotational way, gear pressing plate 71 is connected with joint pipe 411 through bolt 74 and the gear slot matches the gear teeth of gear 721. In case of any adjustment of the angle, screw 74 shall be loosened to separate the gear slot 711 of gear pressing plate 71 and the gear teeth of the gear 721, to adjust the joint pipe 411 and the connecting piece 72 to a suitable angle, and then tighten screw 74 to match the gear slot 711 of gear pressing plate 71 and the gear teeth of the gear 721, and it can fix the relative position of joint pipe 411 and the connecting piece 72, so joint pipe 411 and connecting piece cannot rotate around the bolt, and the adjustment of angle is completed.

[0066] Most of the weight of the lamp holder in this example of execution is distributed to the screw connecting the gear pressing plate and the joint pipe, in the meantime, the shaft connecting the joint pipe and the engaging lug also bears the radial force, so the connection of the joint pipe and the connecting piece is more solid and the connection strength is improved. In addition, the switching equipment in this example of execution applies the meshing of gear pressing plate and the gear, and the range of adjustable angle is large and the two pieces are not easy to dislocate or fall off.

[0067] Through the setting up of angle-adjustable connecting member, the straight-arm-type LED lighting device in this example of execution can also have the function of adjusting the angle of installation of the lamp.

No. 4 example of execution

[0068] This example of execution also provides one type of LED lighting device with the angle-adjustable connecting member as in the No. 3 example of execution.

[0069] The optimized examples of execution of this in-

vention disclosed above are only used for the statement of this invention. The optimized examples of execution do not give a detailed statement of all the details, and such examples of execution shall not limit this invention to be merely in the specific mode of execution as stated above. Evidently, it is suitable to make plenty of modifications and changes based on the contents of the instructions. The purpose for the instructions to select and describe those examples of execution specifically is to explain the principle and practical application of this invention in a better way, and to enable the technical personnel in the technical field to comprehend and utilize this invention in a better way. This invention shall be subject to the Claims and its full extent and any equivalent.

Claims

1. An LED lighting device, **characterized in that**, it including:

   a lamp housing;
   an LED module;
   electrical appliance;
   a lamp connecting member; wherein,
   the lamp housing is connected to a lamp pole through the lamp connecting member;
   the lamp housing contains bottom case and top cover, and the top cover and the bottom case constitute a cavity that accommodating the LED module and the electrical appliance; the top cover is rotatable connected with one side of the bottom case;
   the lamp connecting member is in the type of straight arm or bent arm.

2. The LED lighting device of Claim 1, the wherein the bent-arm-type lamp connecting member contains a bent-arm-type main body and bent-arm-type cover plate, and the bent-arm-type main body has an opening along its direction, the bent-arm-type cover plate is covered on the opening of the bent-arm-type main body detachably along the direction of the lamp connecting member, and it constitutes a cavity between the bent-arm-type main body and the bent-arm-type cover plate used for wiring.

3. The LED lighting device of Claim 1, the wherein: the straight-arm-type lamp connecting member is connected to a angle-adjustable connecting member , and the straight-arm-type lamp connecting member is connected to the angle-adjustable connecting member through a type of angle-adjustable, and the angle-adjustable connecting member is connected to the lamp pole.

4. The LED lighting device of Claim 3, wherein: the angle-adjustable connecting member contains a gear pressing plate and a connecting member connected to the lamp pole, and on the gear pressing plate it is equipped with gear grooves; the straight-arm-type lamp connecting member is pivotally-connected to the connecting member; in the connecting member it is equipped with gears, gear teeth of the gear can be geared with the gear grooves on the gear pressing plate, and in the meantime, the gear pressing plate is connected to the straight-arm-type lamp connecting member.

5. The LED lighting device of Claim 4, wherein: one end of the connecting member that connecting with the straight-arm-type lamp connecting member is equipped with symmetrical engaging lugs, the straight-arm-type lamp connecting member is connected to the engaging lugs through a shaft, and the gear is set up on the inner side or outer side of the engaging lugs.

6. The LED lighting device of Claim 4 or Claim 5, wherein: the gear pressing plate is connected to the straight-arm-type lamp connecting member through a screw.

7. The LED lighting device of any of Claim 1-5, wherein: the bottom case is connected to one side of the top cover pivotally through a hinge component; wherein, the hinge component contains a hinge and a flip hinge, two of which are connected to each other in pivotal connection,
   the hinge contains a first connection sheet and a first connection end, and the hinge is fixedly connected to the bottom case through the first connection sheet;
   the flip hinge contains a second connection sheet and a second connection end, and the flip hinge is fixedly connected to the inner side of the top cover through the second connection sheet;
   in addition, the first connection end and the second connection end are pivotally-connected.

8. The LED lighting device of any of Claim 1-5, wherein: one side of the top cover is connected to one side of the bottom case through a hinge.

9. The LED lighting device of Claim 8, wherein: a turn-over slot to realize the turn-over of the top cover with specified-angle around the connecting position between the top cover and the bottom case is set up on the shell at the position where the hinge-is installation bottom case.

10. The LED lighting device of any of Claim 1-5, wherein: said the other side of the bottom case is connected to the other side of the top cover through a rotary switch.

11. The LED lighting device of Claim 10, wherein: the

rotary switch contains a first card, a second card and a rotary knob, wherein,
the first card is set up fixedly in the inner side of the top cover, and a bayonet is set up in the first card; one end of the rotary knob penetrates into the bottom case through the outer side of the bottom case, and the second card is fixedly installed on this end of the rotary switch, and rotation of the rotary switch drives the second card to rotate and snap in the bayonet; a limit structure and a semi-limit structure are set up on the inner side of the bottom case with a position corresponding to the second card; the second card has idle state and clamping state; the space between the limit structure and the semi-limit structure limits the rotation stroke of the second card under idle state; through the application of force on the second card using the rotary knob, the second card passed the semi-limit structure, the second card is stuck in the bayonet and enables the second card to maintain the clamping state, and at this point the rotation angle of the second card is limited between the bayonet and the semi-limit structure, in order to realize the locking between the first card and the second card.

12. The LED lighting device of Claim 11, wherein: the sliding contact surface of the semi-limit structure that contact with the second card has a certain gradient.

13. The LED lighting device of any of Claim 1-5, wherein: the lamp connecting member has a cavity used for wiring, the lamp connecting member is connected to the bottom case, and a wiring hole is set up in the connecting point of the bottom case that connected with the lamp connecting member.

14. The LED lighting device of Claim 13, wherein: the straight-arm-type lamp connecting member contains a cylinder and a connecting part that set up in one end of the cylinder, the straight-arm-type lamp connecting member is connected to the bottom case through the connecting part, and the cylinder has a cavity used for wiring.

15. The LED lighting device of Claim 3, further contains a conduit, and a male screw tube is set in one end of the conduit, a threaded wiring hole is set up inside the bent-arm-type lamp connecting member or the angle-adjustable connecting member, and the male screw tube matches the threaded wiring hole.

16. The LED lighting device of Claim 1, wherein: the Lamp housing is circular or elliptical; the electrical appliance contains a power supply.

17. The angle-adjustable connecting member provided in any of Claim 3-6.

18. An LED lighting device provided with the angle-adjustable connecting member provided in any item of Claim 3-6.

19. A modular and circular LED lighting device, including a lamp housing, a power supply and a module, **characterized in that**: the lamp housing is in circular shape, the lamp housing is connected to a lamp pole through a bent-arm-type lamp connecting member, the lamp housing contains a bottom case and a top cover; one side of the top cover is connected to one side of the bottom case in a rotational way, and the other side of the top cover and the bottom case is connected to each other through a rotary switch, the top cover connecting with the bottom case forms a space holding the power supply and the module.

20. An straight-arm-type LED lighting device, including: a lamp housing, an LED module, an electrical appliance and a lamp connecting member, wherein: the lamp connecting member is a straight-arm-type lamp connecting member, the lamp housing contains a bottom case and a top cover, and the bottom case and the top cover together constitute a cavity that accommodating the LED module and the electrical appliance; one side of the bottom case is connected with one side of the top cover in a rotational way; the straight-arm-type lamp connecting member is connected to the bottom case.

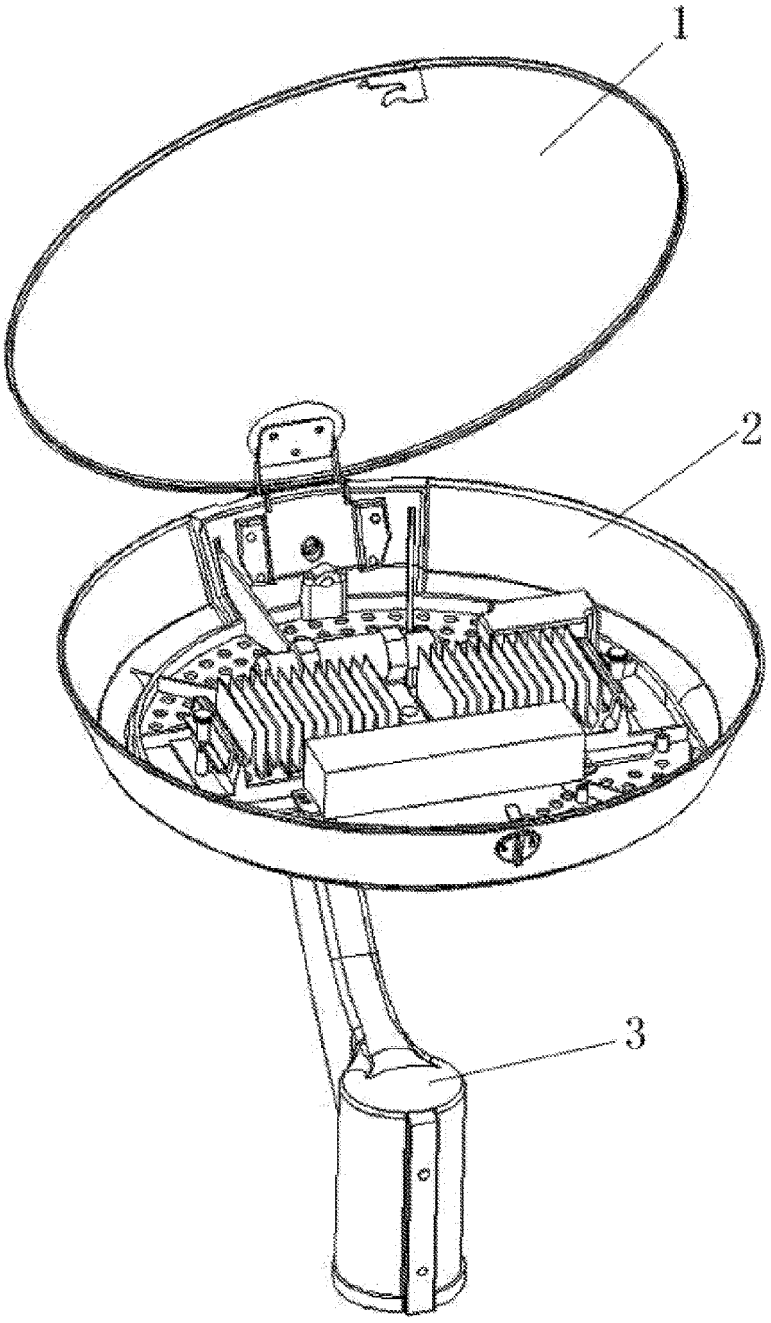

Figure 1

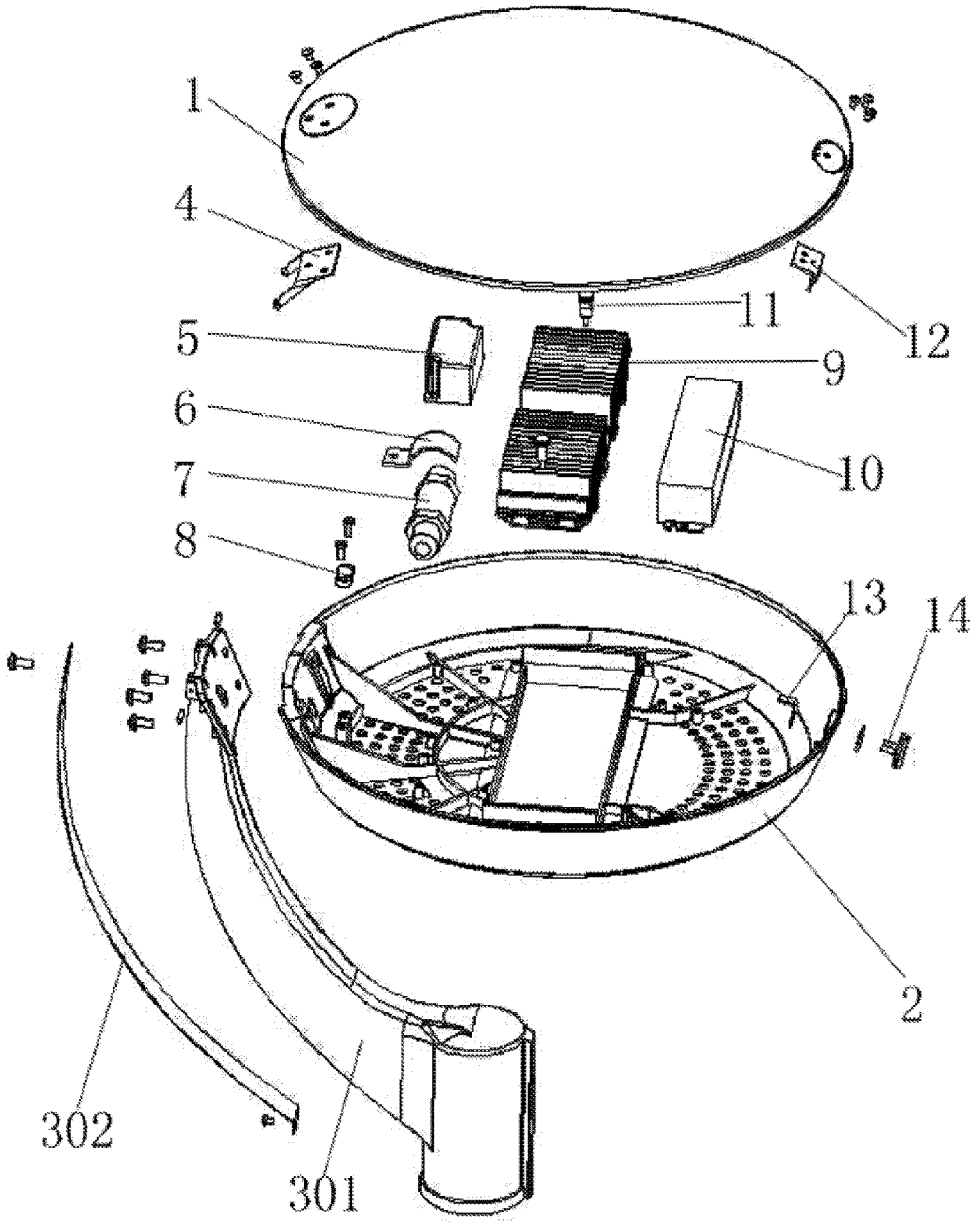

Figure 2

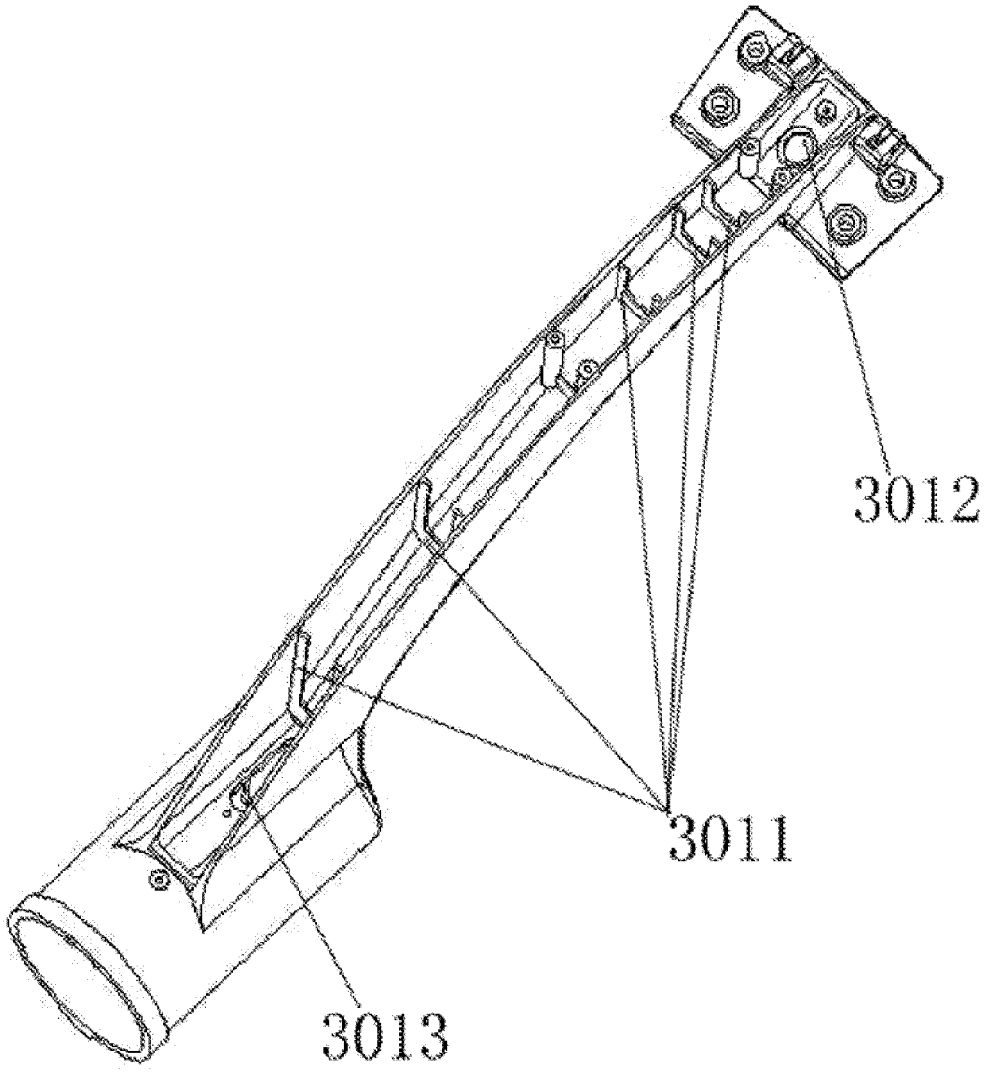

Figure 3

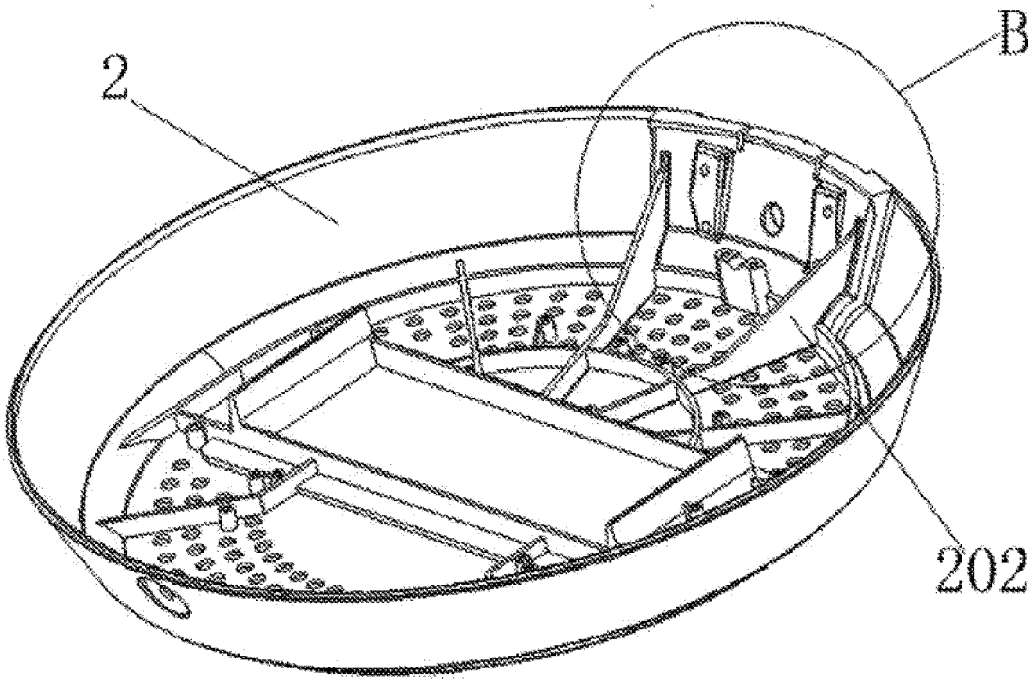

Figure 4

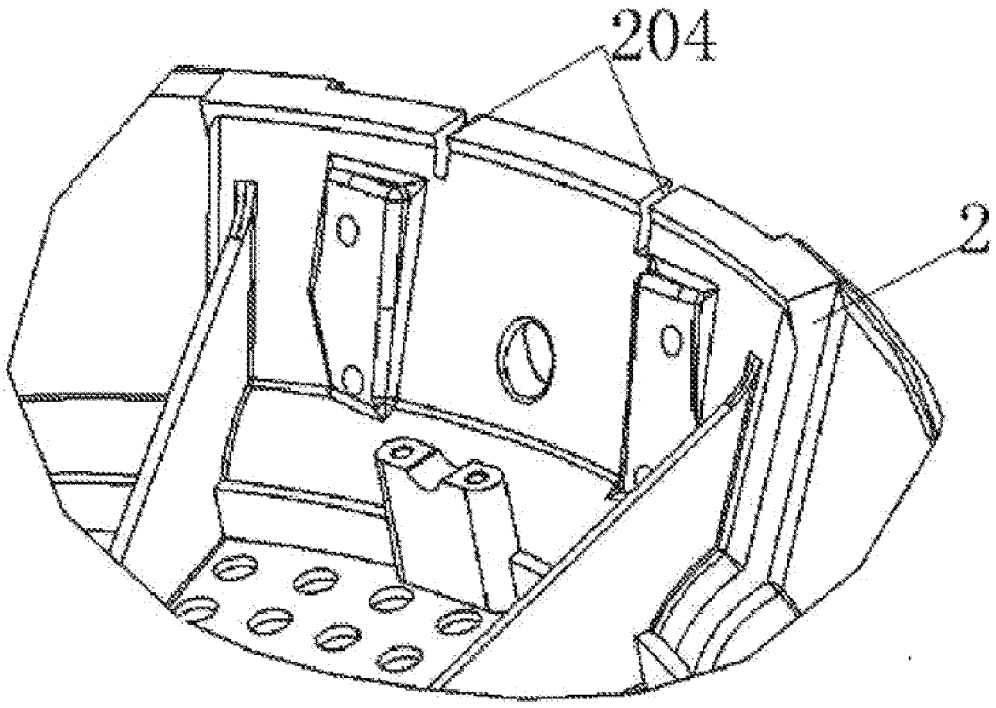

Figure 5

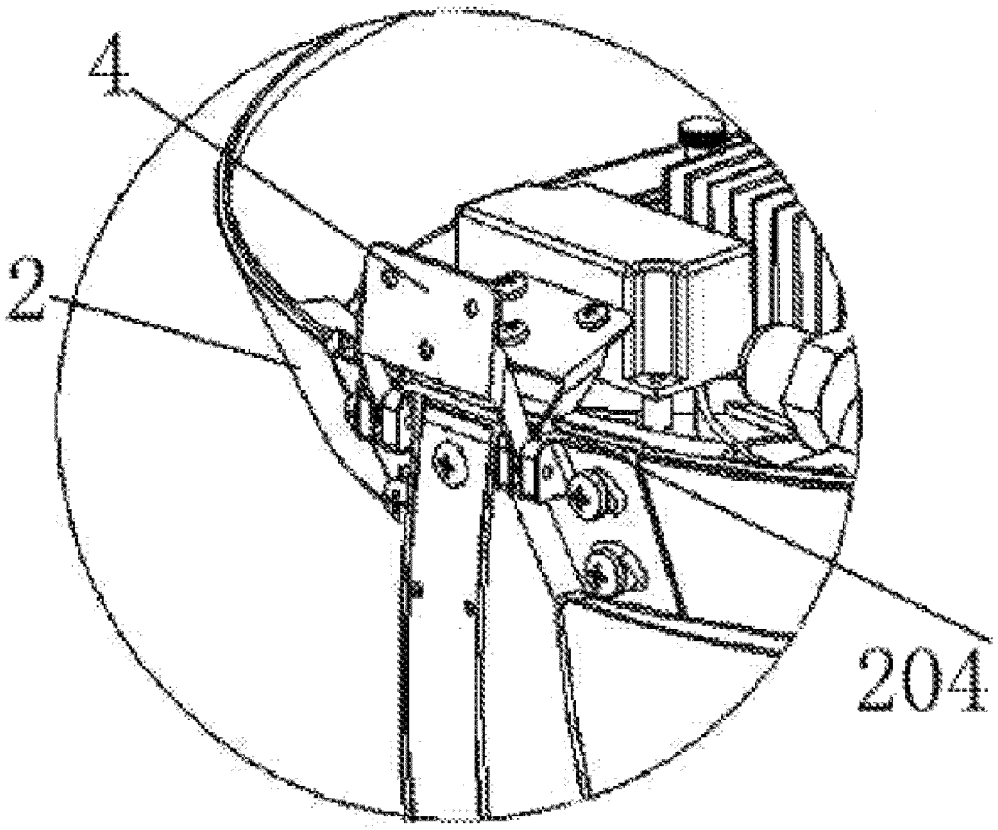

Figure 6

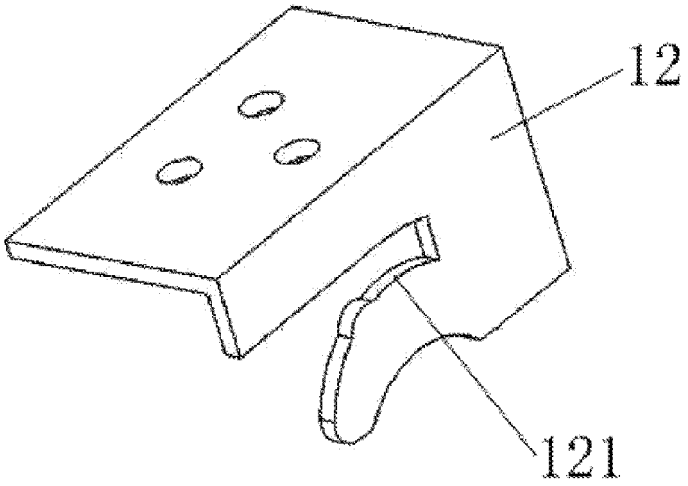

Figure 7

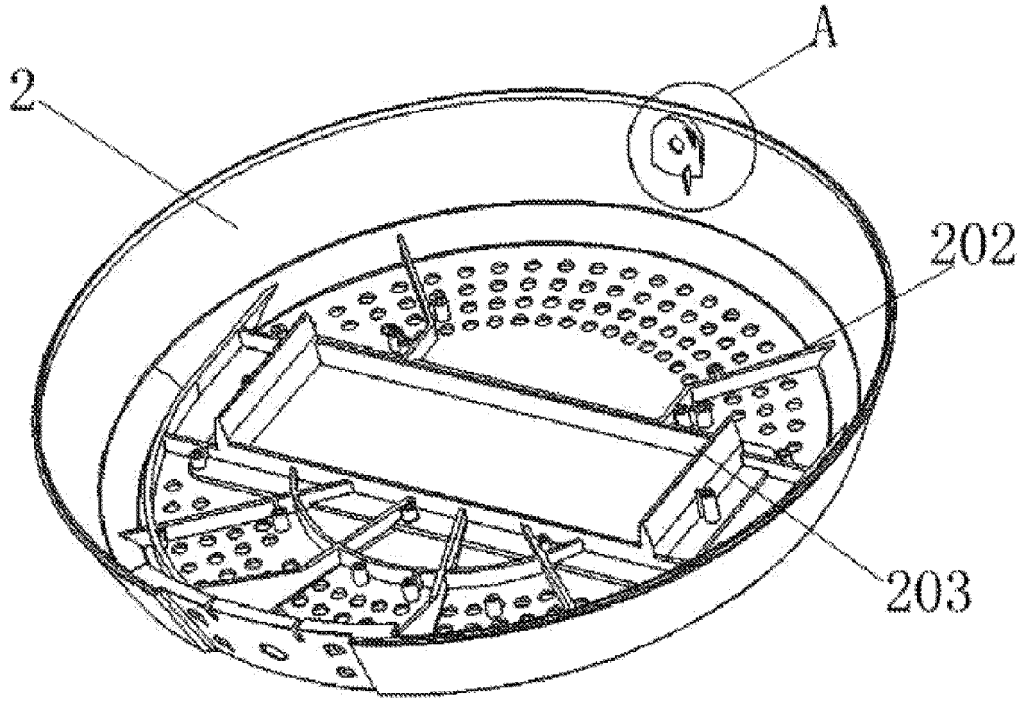

Figure 8

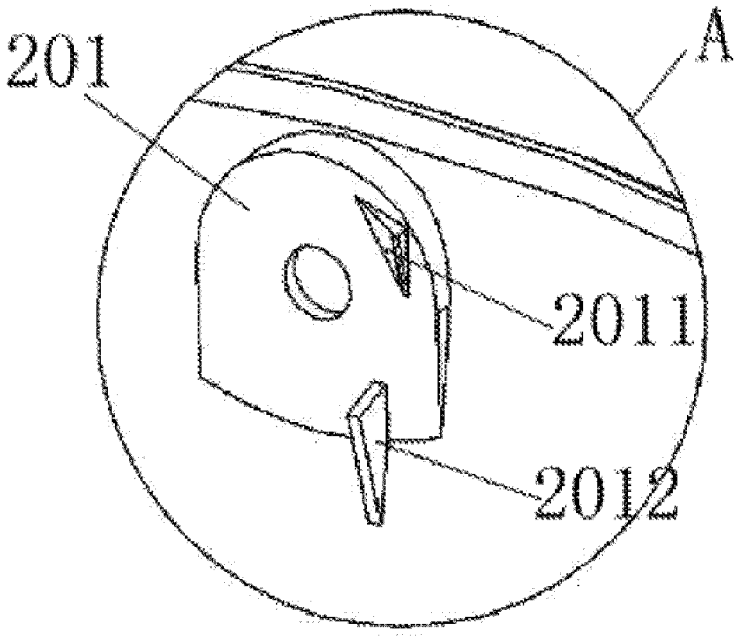

Figure 9

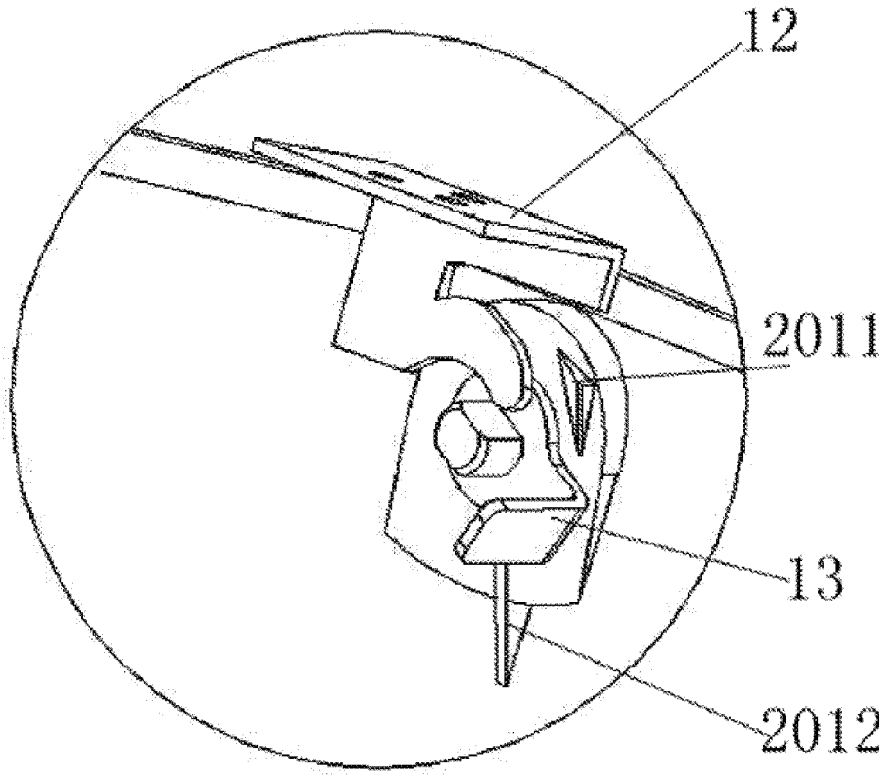

Figure 10

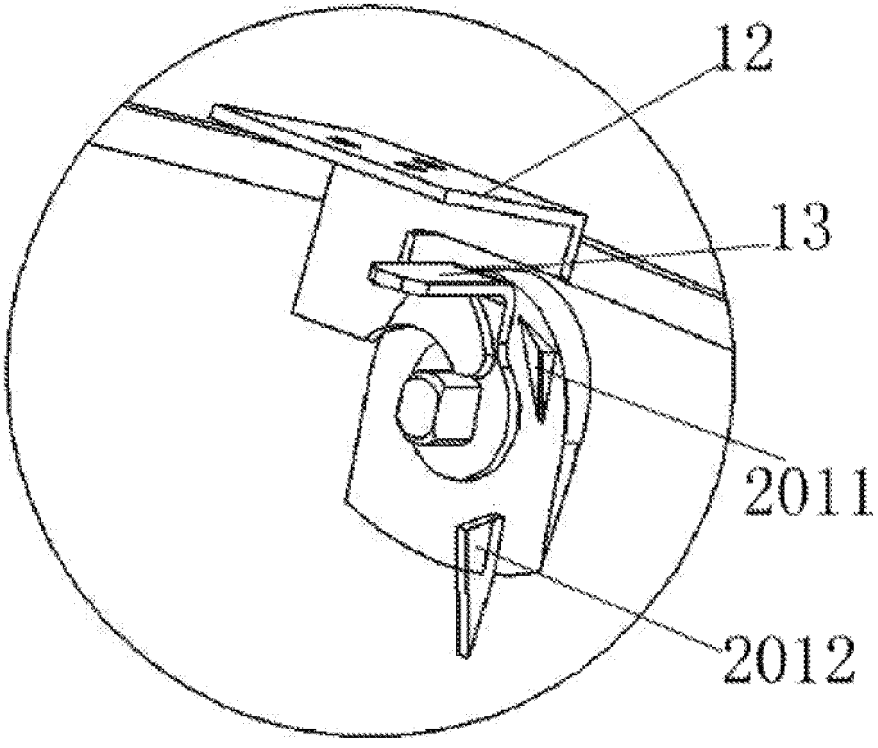

Figure 11

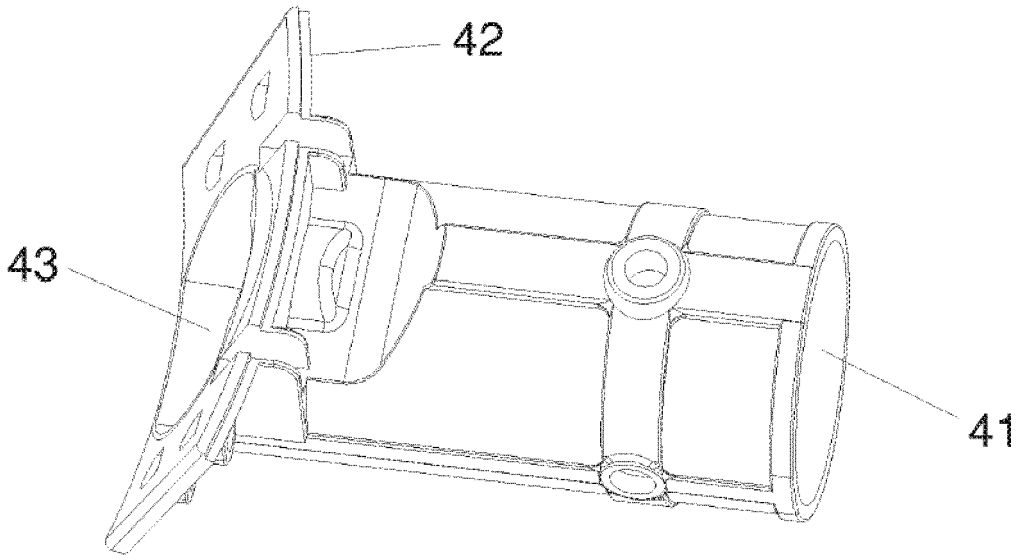

Figure 12

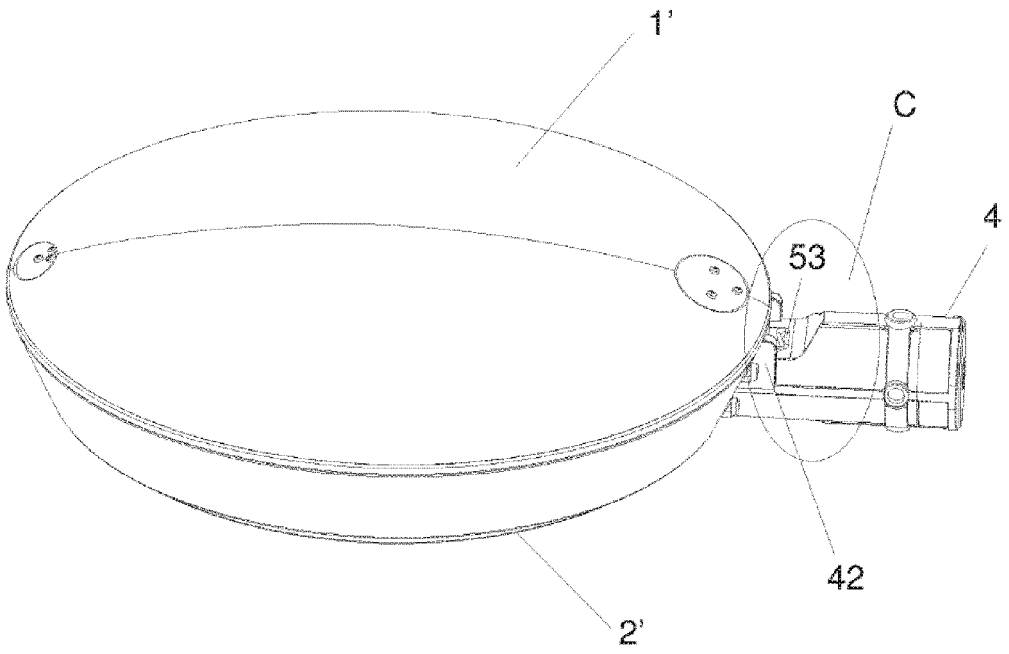

Figure 13

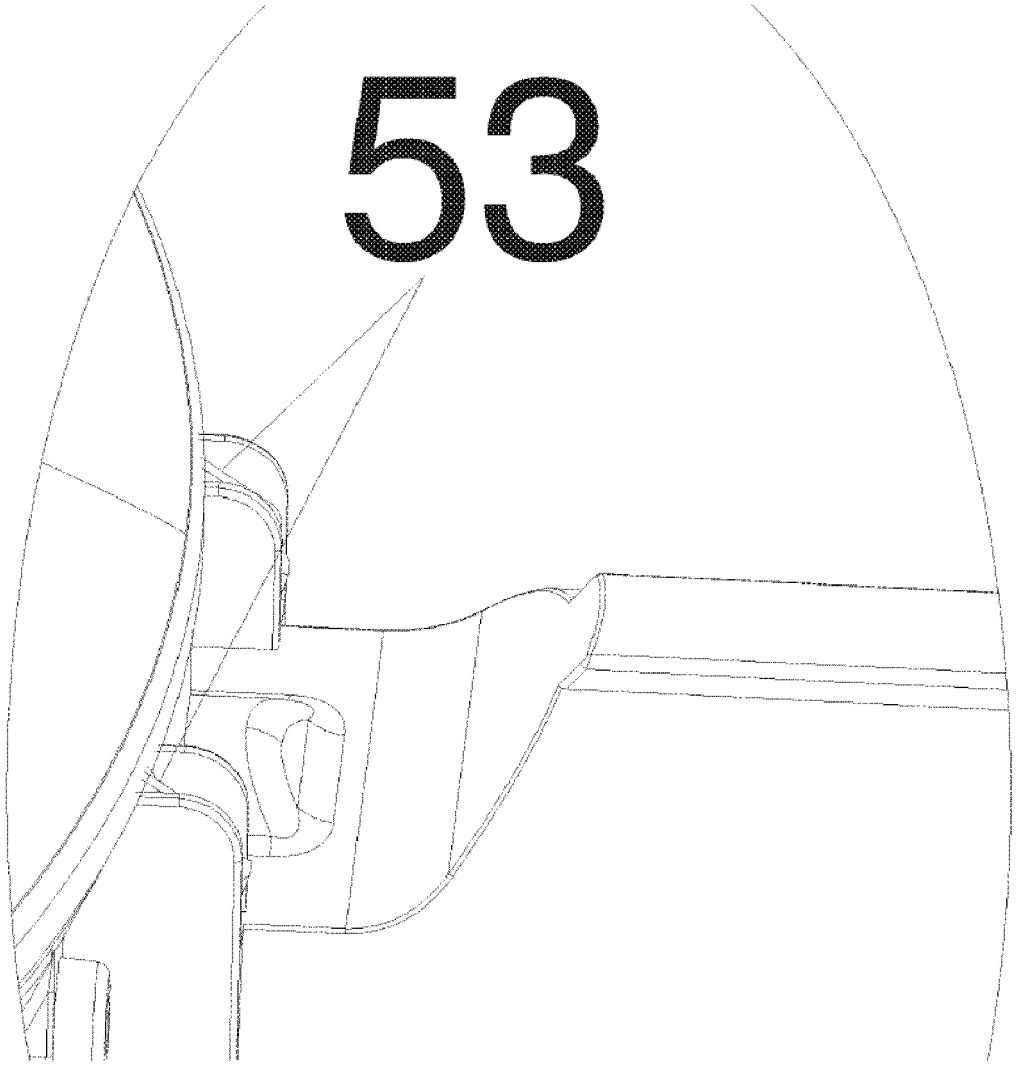

Figure 14

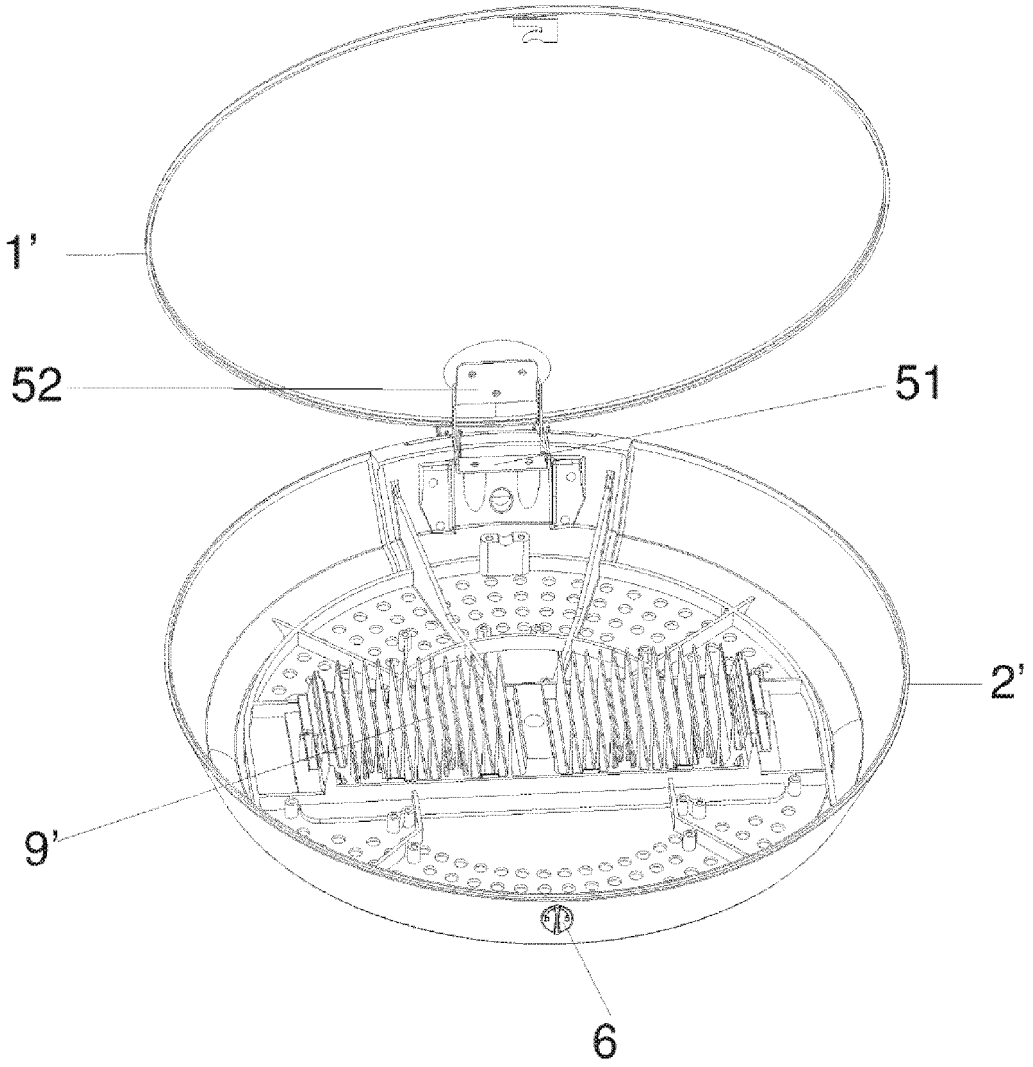

Figure 15

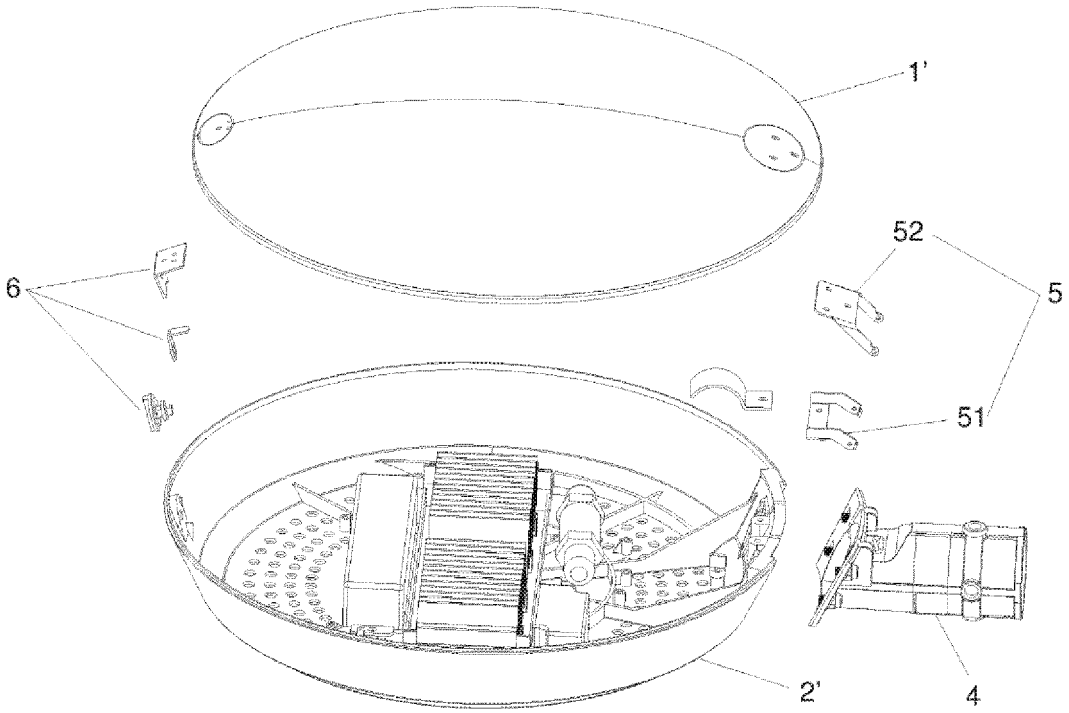

Figure 16

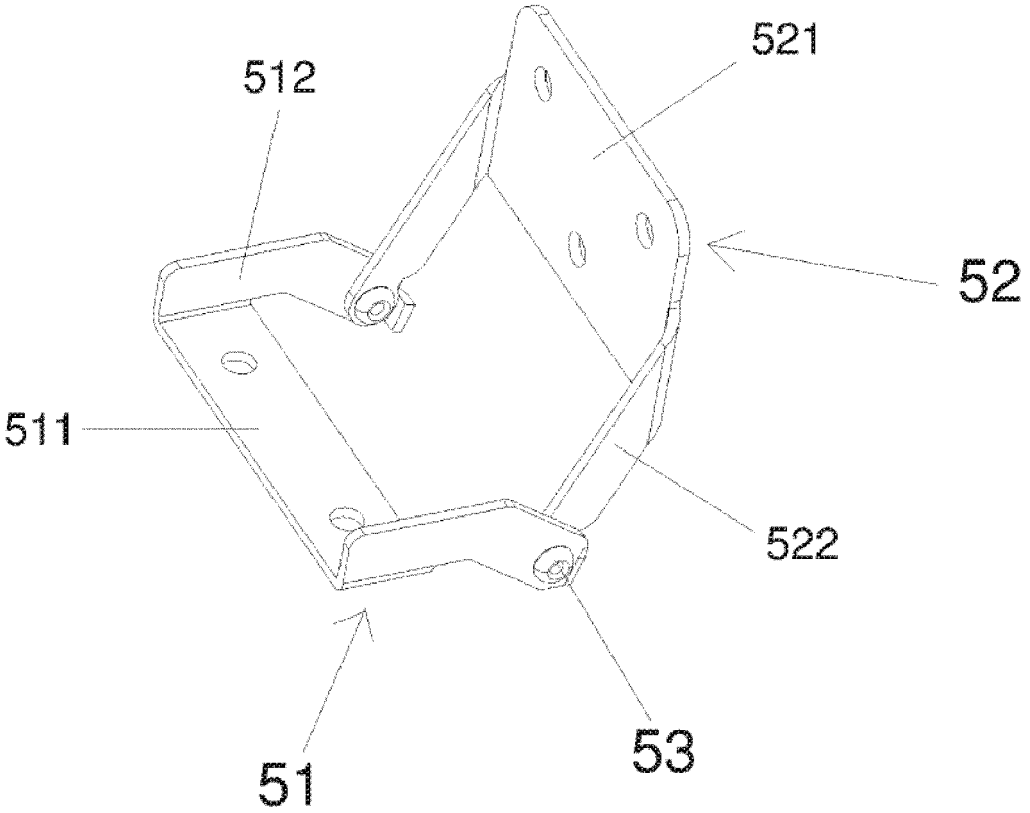

Figure 17

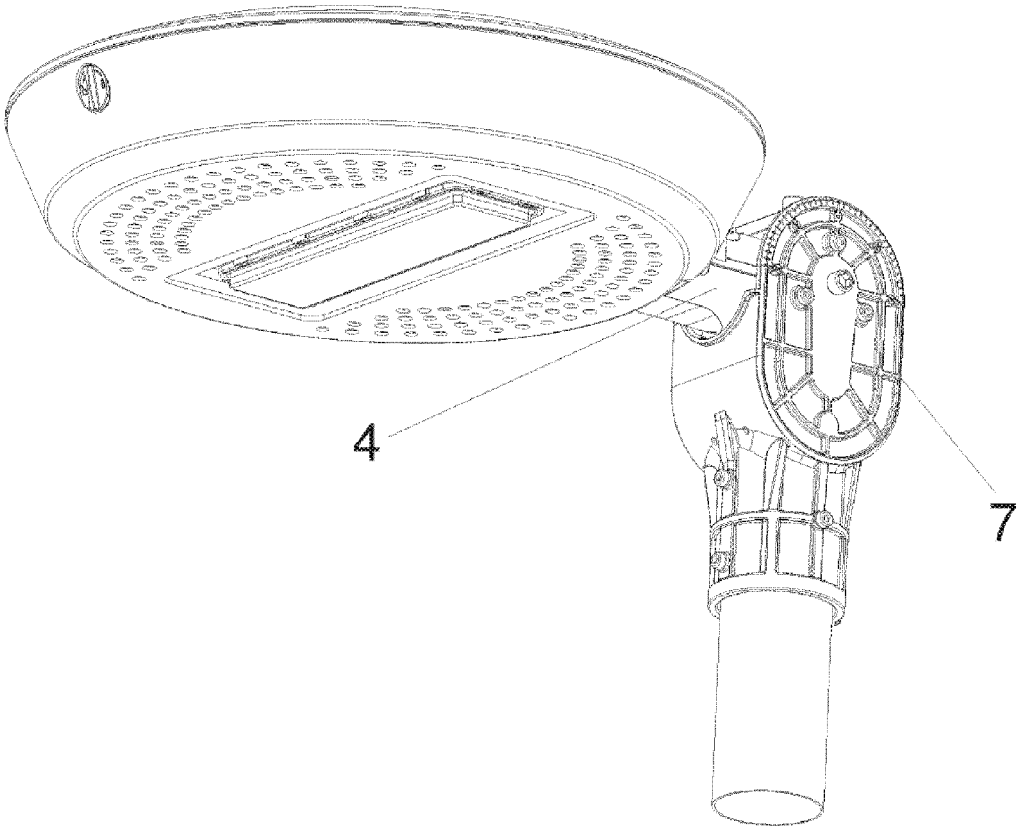

Figure 18

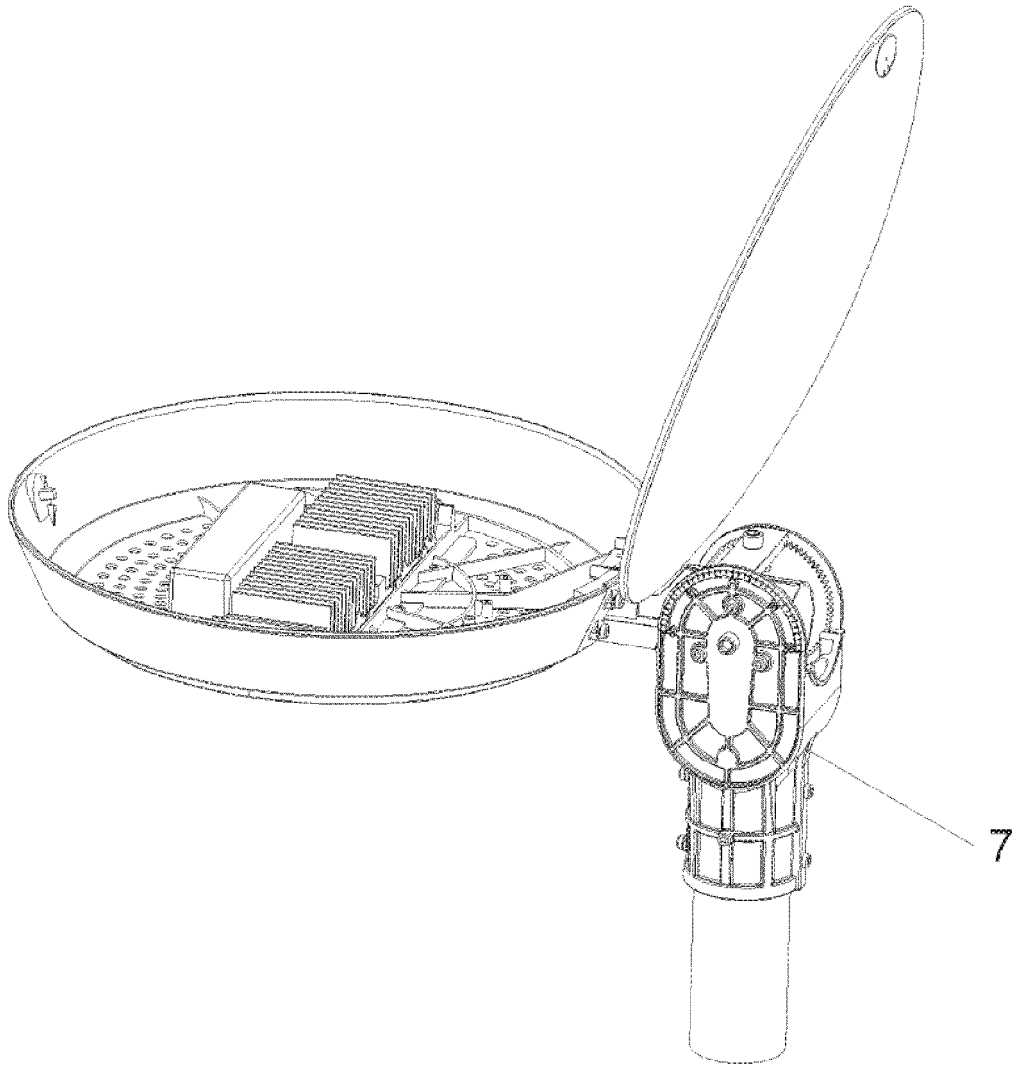

Figure 19

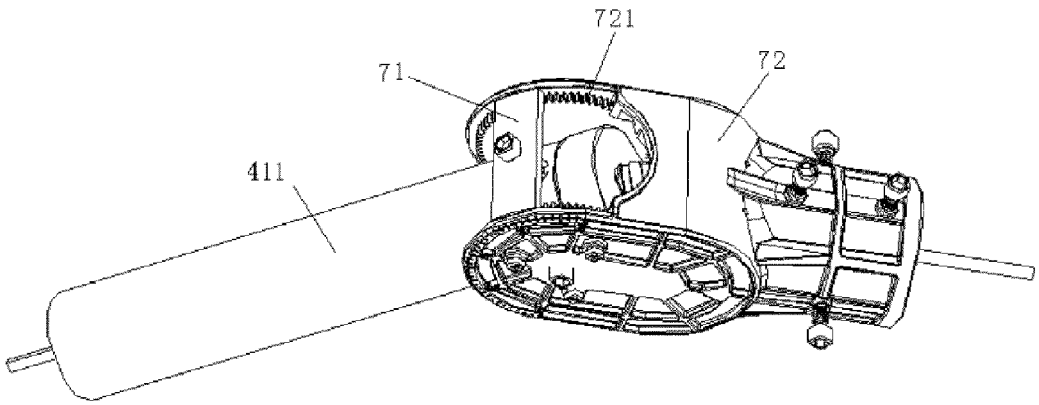

Figure 20

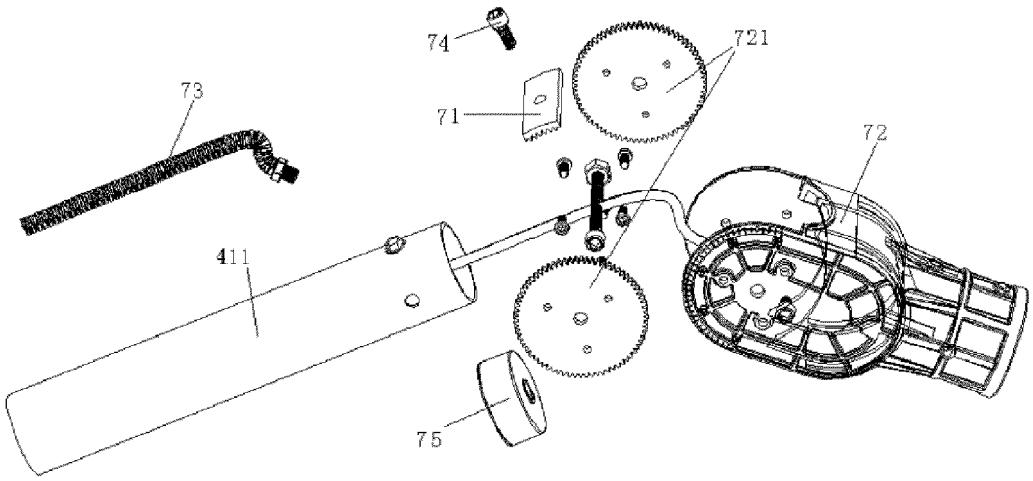

Figure 21

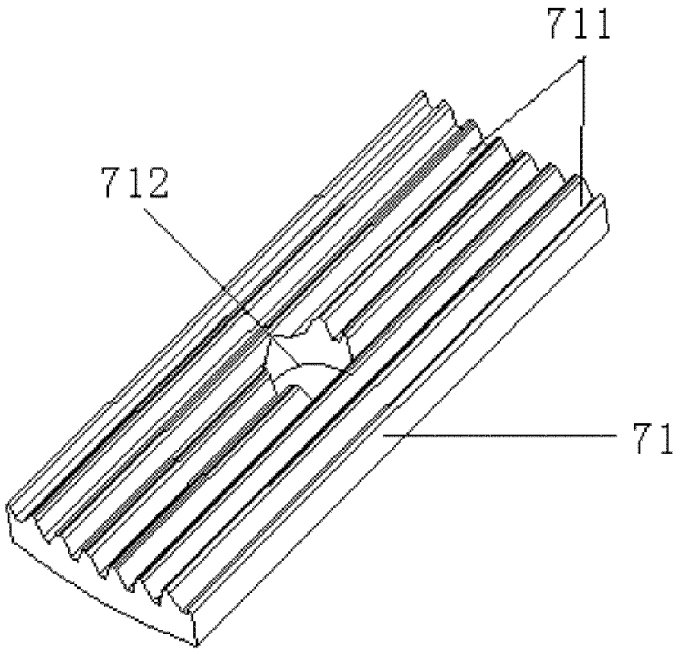

Figure 22

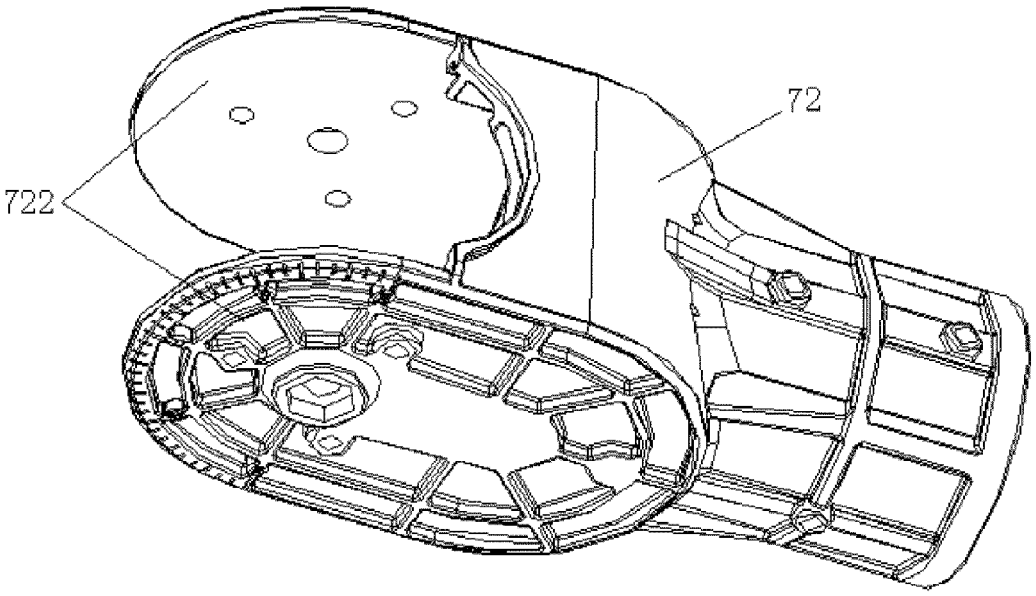

Figure 23

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/079682

A. CLASSIFICATION OF SUBJECT MATTER

F21S 2/00 (2006.01) i; F21V 17/08 (2006.01) i; F21V 17/10 (2006.01) i; F21V 21/14 (2006.01) i; F21Y 101/02 (2006.01) n
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)

F21

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 practicable, search terms used)

CNABS, CNTXT, VEN: LED?, light emitting diode, connect, diode?, shell?, housing, case, cavity, cover+, rotat+, twirl+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 204573675 U (HANGZHOU HPWINNER OPTO CO., LTD), 19 August 2015 (19.08.2015), claims 1-11, description, paragraphs [0004]-[0037], and figures 1-7	1, 3-8, 10, 13, 14, 16-18, 20
PX	CN 203868866 U (HANGZHOU HPWINNER OPTO CO., LTD), 08 October 2014 (08.10.2014), claims 1-10, description, paragraphs [0005]-[0069], and figures 1-11	1, 2, 8-13, 16, 19
X	CN 203517675 U (HANGZHOU HPWINNER OPTO CO., LTD), 02 April 2014 (02.04.2014), description, paragraphs [0013] and [0026]-[0034], and figures 1-4	17, 18
Y	CN 203517675 U (HANGZHOU HPWINNER OPTO CO., LTD), 02 April 2014 (02.04.2014), description, paragraphs [0013] and [0026]-[0034], and figures 1-4	1-10, 13-16, 19, 20
Y	CN 202371521 U (HANGZHOU HPWINNER OPTO CO., LTD), 08 August 2012 (08.08.2012), description, paragraphs [0030]-[0034], and figure 1	1-10, 13-16, 19, 20
Y	CN 101169236 A (IGUZZINI ILLUMINAZIONE S.P.A.), 30 April 2008 (30.04.2008), description, page 3, line 2 to page 4, 7th line from the bottom, and figures 1-5	10, 19

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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

"P" document published prior to the international filing date but later than the priority date claimed

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 August 2015 (12.08.2015)	**07 September 2015 (07.09.2015)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **HUANG, Fei** Telephone No.: (86-10) **62085815**

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/079682

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 203517675 U (HANGZHOU HPWINNER OPTO CO., LTD), 02 April 2014 (02.04.2014), description, paragraphs [0013] and [0026]-[0034], and figures 1-4	11, 12

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2015/079682

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 204573675 U	19 August 2015	None	
CN 203868866 U	08 October 2014	None	
CN 203517675 U	02 April 2014	None	
CN 202371521 U	08 August 2012	None	
CN 101169236 A	30 April 2008	IT MI20062061 A1	27 April 2008
		EP 1916474 A2	30 April 2008
		EP 1916474 A3	04 July 2012
		NO 20075415 B	28 April 2008
		IT 1375886 B	14 June 2010

Form PCT/ISA/210 (patent family annex) (July 2009)