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(54) **HERMETIC LIGHT TUBE**

(57) The present invention provides a hermetic light tube comprising a light-transmitting tubular body having a volume cavity and integrally formed; a light-emitting body; connection terminals; two end caps configured to be respectively adapted for mounting at the two ends of the tubular body, each of the end caps having a proximal end and a distal end wherein the proximal end is coupled to a corresponding one of open ends of the tubular body; a first seal arranged between the proximal end of each of the end caps and a corresponding one of the ends of the tubular body, the first seal being provided such that the end cap and the end of the tubular body with which the end cap is connected form a seal-tight connection; two decorative caps sleeved respectively on two end

caps; a second seal arranged between the distal end of each of the end caps and an outer end of a respective one of the decorative caps in a manner that the second seal is compressed by the outer end of the decorative cap to abut against the distal end of the end cap so that the end cap and the decorative cap with which the end cap is connected form a compression seal; and two gland covers hermetically encapsulating the outer end of a respective one of the decorative caps. The light tube of the present invention provides high sealing capability, flexible methods of wiring and mounting, and can achieve highly efficient uniform lighting with its wider illumination angle.

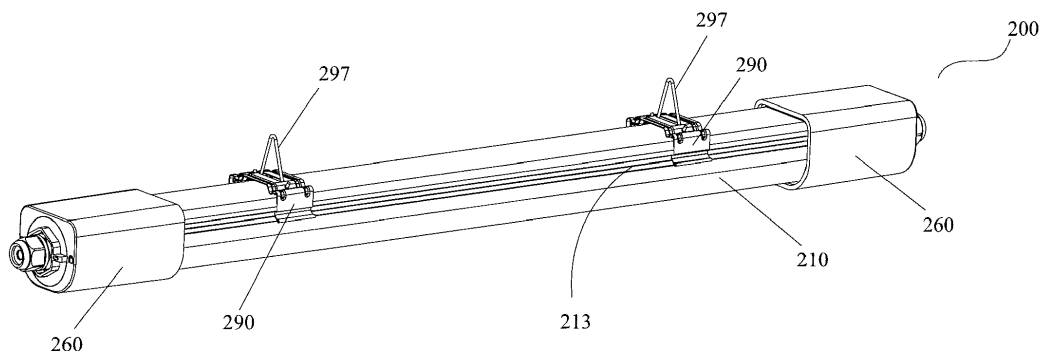


Fig. 2

Description

Technical Field of the Invention

[0001] This invention relates generally to a light tube, and particularly, to an LED light tube. More specifically, this invention relates to a waterproof hermetic LED light tube whose tube and two ends achieve a waterproof and dustproof structure, and which has an illumination pattern of a relatively wide angle of illumination and achieves highly efficient uniform lighting.

Background of the Invention

[0002] Fluorescent tube lamps are used extensively in commercial, industrial and household applications due to their low costs and high efficacy. Billions of fluorescent tubes have already been installed worldwide. In general, a current waterproof and dustproof fluorescent tube lamp 100 as shown in Fig. 1 comprises two half members: a light-transmitting cover 107 and a casing 105, which form in their inside a volume cavity for housing a tube lamp 103 after the two half members are engaged. On the edge between the light-transmitting cover 107 and the casing 105 is provided a sealing gasket 104 which forms a seal after the two half members are engaged by means of fixing clips 101. Inside two ends of the casing of the tube lamp are sockets 102 for safely matching with the tube lamp 103. The design of forming the casing with two half members is adopted because a fluorescent tube lamp has a shorter lifespan and has to be opened often for replacement and maintenance. However, adopting such design makes the sealing gasket 104 subject to damage, impairing waterproof sealability of the casing. Another drawback of this type of fluorescent tube lamps is that since one of the half members, i.e. the casing 105, is not light-transmitting, the light of the tube lamp 103 cannot be transmitted to the side of the casing 105, causing the angle of illumination of the tube lamp to be relatively narrower and light distribution to be uneven. Therefore, the ultimate angle of illumination of this type of light tube would be smaller than 180 degrees, the casing 105 side of the light tube unable to emit light and forming a dark zone, and thus this type of light tube is usually mounted flush on a wall or ceiling.

[0003] As a solid state light source, LEDs (light-emitting diodes) emerged in the sixties of the 20th century and are a product with long lifespan, firm structure, low power consumption and flexible dimensions. In various places, LED light fixtures are replacing conventional fluorescent light fixtures and becoming light sources with higher flexibility and efficiency. Nowadays, the lifespan of an LED is up to 50,000 hours with the LED almost intact during application, and therefore it is almost unnecessary to carry out any replacement or maintenance. This makes encapsulation of the LED tube lamp with a sealed casing a reliable solution.

[0004] Thus, an entirely new hermetic light tube is nec-

essary, which is not only capable of providing an LED tube lamp and its electronic components with a casing of reliable protection over a long period of time, but also capable of cost-effectively providing uniform illumination along the light tube with an angle of illumination of 180 degrees or more to cater for various illumination applications.

Summary of the Invention

[0005] The present invention has been developed to fulfill the needs mentioned above and therefore has a principle object of the provision of a light tube which has a durable and reliable sealed structure and can be applied in working environments requiring waterproof and dustproof capacity.

[0006] Another object of the present invention is to provide a light tube in which a plurality of low-power LEDs are used to obtain a natural and evenly-distributed lighting pattern with a wide angle of illumination and reduced glare.

[0007] Another object of the present invention is to provide a light tube which can be mounted by flexible methods, is suitable for hanging and flush mounting, and the mounting positions of which can be adjusted in horizontal and vertical directions. Multiple light tubes can be connected in series in a chain configuration with only one electric power input point, making installation of light tubes neat and tidy.

[0008] These and other objects and advantages of the present invention are satisfied by providing a light tube comprising:

- a light-transmitting tubular body formed integrally, having two open ends and forming a volume cavity therein;
- a light-emitting body housed in the volume cavity of the tubular body;
- at least one connection terminal for electrically connecting the light-emitting body to an external power source;
- two end caps configured to be respectively adapted for mounting at the two ends of the tubular body, the connection terminal being mounted at one of the two end caps, each of said end caps having a proximal end and a distal end wherein the proximal end is coupled to a corresponding one of the open ends of the tubular body;
- a first seal arranged between the proximal end of each of said end caps and a corresponding one of the open ends of the tubular body, the first seal being provided such that the end cap and said open end of the tubular body with which the end cap is connected form a seal-tight connection;
- two decorative caps sleeved respectively on said two end caps;
- a second seal arranged between the distal end of each of said end caps and an outer end of a respec-

tive one of the decorative caps in a manner that the second seal is compressed by the outer end of the decorative cap to abut against the distal end of the end cap, so that the end cap and the decorative cap with which the end cap is connected form a compression seal; and

two gland covers hermetically encapsulating the outer end of a respective one of the decorative caps, wherein the connection terminal is electrically connected to the external power source through the gland cover arranged on a side of the end cap in which the connection terminal is mounted.

[0009] In a preferred embodiment of the present invention, an outer peripheral surface of the first seal is provided with a circumferential groove engageable with the open end of the tubular body to enhance sealing effects. In some situations, the open end of the tubular body, the first seal and the respective end cap are fixedly connected together by means of fasteners. The decorative cap completely encapsulates the open end of the light-transmitting tubular body and the end cap.

[0010] For the sake of providing the ease of mounting, indicators for indicating lock and unlock positions of the gland cover are provided on an outer end face of the gland cover.

[0011] In some situations, two connection terminals electrically connectable to the external power source and respectively mounted in the two end caps of the light tube are arranged.

[0012] The connection terminals each comprise a live wire interface and a neutral wire interface such that each light tube is connected internally in parallel with the live and neutral wires, and a plurality of light tubes can be connected in series in the form of a daisy chain and/or can be connected in parallel with other light tubes through a junction box.

[0013] In an embodiment of the present invention, the light tube further comprises one or more mounting clips which are slidably snapped into two spaced longitudinal slots arranged along a lengthwise direction of the light-transmitting tubular body and by means of which the light tube is mounted on a desired mounting surface. Preferably, the mounting clip comprises two shoulders that are opposite to each other and a top face connecting the two shoulders, wherein each of said shoulders comprises a vertical portion, an oblique portion extending downward and inward from the vertical portion, and a lateral portion extending laterally from the oblique portion, the oblique portion slidably engageable with a respective one of the longitudinal slots of the light-transmitting tubular body. One or more mounting holes, through which the light tube is screwed on the desired mounting surface or hung on the desired mounting surface with a hanging hook or a rope, are provided on the top face of the mounting clip.

[0014] Preferably, the light tube of the present invention is an LED light tube, and the light-emitting body comprises a circuit board fixedly mounted between the two

end caps, and at least one LED light source mounted on the circuit board. The light-emitting body preferably comprises a plurality of LED light sources mounted in one straight line on the circuit board. The circuit board is supported on a heat-dissipating plate, and a thermally conductive material such as thermal conductive glue is applied between the circuit board and the heat-dissipating plate.

[0015] According to the present invention, the LED control circuit and other electronic components comprising drivers are not placed inside the tubular body of the light tube, but are mounted inside the end caps. This arrangement ensures that the control circuit is away from the high temperature caused by the heat generated by the LED light sources during normal operation, thereby enhancing the reliability and durability of the control circuit.

[0016] Preferably, an additional sensor or indicating device can be mounted on the decorative cap to control the ON/OFF or dimming or automatic operations of the LED light source.

[0017] Compared with the light tubes available in the prior art, the light-transmitting tubular body of the light tube of the present invention does not adopt the two-half-member structure of the prior art, but is integrally formed, thereby ensuring the lengthwise sealability of the tubular body itself. In the present invention, the two end caps connecting with the two ends of the light-transmitting tubular body are provided with two seals, and are further sleeved with the decorative caps and locked with the gland covers, providing a high degree of safety for the sealing of the end caps and the electronic components therein. Furthermore, since the entire tubular body can all transmit light, which increases the gross illumination surface area on the tubular body and in particular on the upper cavity, the light tube can emit light in a very wide angle which is 180 degrees or more. The mounting clips of the present invention are slidably mounted on the tubular body, so that it has become possible to adjust at will the horizontal position and vertical position of the light tube.

[0018] To have a better understanding of the invention, reference is made to the following detailed description of the invention and embodiments thereof in conjunction with the accompanying drawings.

Brief Description of the Drawings

[0019]

Fig. 1 is a front view of a fluorescent tube lamp of the prior art.

Fig. 2 is a perspective view of an LED light tube constructed according to an embodiment of the present invention.

Fig. 3 is an exploded view of the LED light tube of

Fig. 2.

Fig. 4 is an enlarged view of part A of Fig. 3.

Fig. 5 is a perspective view of the LED light tube of Fig. 2, showing another method of mounting the light tube.

Fig. 6 is a perspective view of an end of the LED light tube of Fig. 2, wherein a gland cover is in an unlock position.

Fig. 7 is a perspective view of an end of the LED light tube of Fig. 2, wherein the gland cover is in a lock position.

Fig. 8 is a perspective view of an end the LED light tube of Fig. 2, wherein the gland cover is removed and the inside of an end cap is exposed.

Fig. 9 is a perspective view of a mounting clip according to the present invention.

Detailed Description of the Invention

[0020] While this invention is illustrated and described in preferred embodiments, the LED light tube of the present invention may be produced in various configurations, sizes and forms from many different materials.

[0021] Referring now to the drawings, Figs. 1 to 9 provide an LED light tube 200 constructed according to a preferred embodiment of the present invention. The length and diameter of the LED light tube 200 can be designed according to actual requirements, for example the LED light tube 200 can be sized to dimensions suitable to replace fluorescent light fixtures. In this embodiment, the LED light tube 200 comprises a light-transmitting tubular body 210, LED light sources 220, connection terminals 230, end caps 240, first seals 250, decorative caps 260, second seals 270 and gland covers 280. Refer to the exploded views of Figs. 3 and 4 for details.

[0022] The light-transmitting tubular body 210 with a substantially square cross-section can be manufactured by extrusion molding. Using extrusion molding to manufacture the light-transmitting tubular body 210 can ensure that the tubular body is completely sealed and waterproof longitudinally (i.e. lengthwise). The length of the extrusion-molded light-transmitting tubular body 210 can be cut into a standard size to adapt to the space in which various models of fluorescent tube lamps or incandescent tube lamps are mounted. Although the tubular body shown in the figures has a substantially square cross-section, it can also have a circular, triangular or other cross-sectional shape. The light-transmitting tubular body 210 can be made from a material having light diffusion, reflection and transmission properties, which is advantageous for providing uniform light distribution and increasing the illumination angle of light distribution, so

that zones on the tubular body that are not illuminated by the LED light source can also receive reflected light and diffused light. The light-transmitting tubular body 210 comprises two open ends 211 that are opposite to each other. The LED light source strip is fed into the tubular body through the open end 211 to be positioned and mounted.

[0023] The LED light source 220 can be an LED, an LED package or an LED array. All the LED light sources 220 can be connected in series and/or in parallel. In this embodiment, the LED light sources 220 are mounted axially along one straight line on the circuit board 221; the circuit board on which the LED light sources 220 are mounted is placed on a heat-dissipating plate 223 in a thermally conductive manner; a thermally conductive material such as thermally conductive glue can be applied between the circuit board and the heat-dissipating plate to dissipate heat generated when the LED emits light. The heat-dissipating plate 223 can be made from a material having good heat-dissipating capacity, such as aluminium or aluminium alloy which is not only easy to be processed, but also makes the overall weight of a light fixture lighter. The circuit board 221 uses a metal-core printed circuit board (MCPCB) having good thermal management capacity, or can be of conventional FR4 or CEM type. For use in combination with a long tubular body, the circuit board 221 can be a long continuous circuit board formed by electrically connecting multiple sections of printed circuit board (PCB). This one-straight-line arrangement of the LED light sources is cost-effective in terms of the capability of a heat-dissipating plate and the light output efficiency of a light tube. The number of the LED light sources 220 in the light tube 200 is selected to cater for actual needs and the power required by particular applications.

[0024] Two ends of the light-transmitting tubular body 210 are each connected with one end cap 240, inside which a control circuit 225 for controlling the LED light sources 220 is mounted. Such an arrangement of the control circuit not only prevents the control circuit 225 from being subjected to the high temperature caused by the heat generated by the LED light sources, but also ensures that the light emission of the LED light sources through the tube would not be hindered by the control circuit, unlike the LED light tube of the prior art where the control circuit is disposed inside the tube. The control circuit is not the essence of the present invention and therefore not described in detail herein. The end cap 240 has a proximal end 241 coupled to the light-transmitting tubular body, and a distal end 242. Between the proximal end 241 and the open end 211 of the light-transmitting tubular body is placed a first seal 250, which is provided such that the end cap 240 and the open end 211 of the light-transmitting tubular body 210 form a seal-tight connection.

[0025] As shown in Fig. 4, the first seal 250 is a seal ring made from silicon rubber, on the outer peripheral surface of which a circumferential groove 251 is formed,

the circumferential groove 251 engageable with the open end 211 of the light-transmitting tubular body 210 to enhance the sealing effects between the end cap 240 and the light-transmitting tubular body 210. By passing two screws 212 through screw holes of the end cap 240 and the first seal 250 and into matching screw holes on the open end 211 of the light-transmitting tubular body 210, the end cap 240 and the light-transmitting tubular body 210 can be fixed together. The mounting torque of the screws 212 is controlled to ensure that the first seal 250 provides seal-tight connection between the end cap 240 and the light-transmitting tubular body 210.

[0026] The connection terminal 230 is placed close to the distal end 242 of the end cap 240. The connection terminal 230 comprises two groups of interfaces, one group of which is a live wire interface 231 (L) and another group of which is a neutral wire interface 232 (N). Each group of interfaces has two quick connection points connected with the live and neutral wires of an external cable. Moreover, the connection terminal 230 further comprises two permanent connection points. Two wires 224 are connected to the permanent connection points of one end of the tube and are then passed through the inside of the tube to be connected to the two corresponding permanent connection points at the connection terminal 230 in the end cap of another end of the tube. Such a configuration of interfaces allows a plurality of light tubes to be connected together in parallel (by connecting multiple tubes with cables from the quick connection points at the same end of the tube, and with all the cables connected to a junction box) and/or in series (by connecting the quick connection points of two ends of the tube) in the form of a daisy chain, so that just one group of input power supply is needed to supply power to a relatively large network of light tubes, simplifying and saving human and material resources for wiring and connecting.

[0027] The decorative cap 260 is in the form of a cavity and has an outer end 261 provided with a window 262. The decorative cap 260 is tightly sleeved on the end cap 240 and the open end 211 of the light-transmitting tubular body 210 to completely encapsulate the entire end cap 240 and the open end 211, delivering a sense of smoothness and elegance. Specifically, four projections 243 are disposed on the outer peripheral surface of the proximal end 241 of the end cap 240 and engage with four corresponding slots (not shown) on the inner peripheral surface of the decorative cap 260 to tightly lock the decorative cap 260 on the end cap 240. The second seal 270, which is placed on the distal end 242 of the end cap 240 via two positioning poles (not shown), is provided between the distal end 242 of the end cap and the outer end 261 of the decorative cap. In this embodiment, the second seal 270 is in the form of a silicon rubber seal ring. When the decorative cap 260 is sleeved on the end cap 240, the second seal 270 is compressed by the outer end 261 of the decorative cap to abut against the distal end 242 of the end cap, so that the end cap 240 and the decorative cap 260 form a compression seal. Through

the window 262 of the decorative cap 260, the second seal 270 and the connection terminal 230 can be seen, facilitating connecting a cable to the connection terminal. The window 262 also serves as an outlet for the cable of the light tube 200 connected to external power supply. Moreover, a sensor and/or an indicating device 261 is installed on the outer surface of the decorative cap 260 as shown in Fig. 5. The sensor and/or the indicating device 261 is connected with the control circuit mounted inside the end cap 240. The sensor can be for example a passive infrared sensor, a light sensor, a microwave movement sensor, etc.; the ON/OFF and dimming operations of the LED light tube can be controlled with such sensors. The indicator can be for example one indicating whether the LED light tube is connected to power supply, one indicating whether the LED light tube is in standby status, etc.

[0028] The gland cover 280, which is a waterproof cable gland cover, comprises a gland cover body component 281 and a cylindrical boss component 282. The gland cover body component 281 and the cylindrical boss component 282 are assembled together to form the gland cover 280. The dimensions of the gland cover 280 match the window 262 of the decorative cap 260. The neck of the gland cover body component 281 has injection-molded threads, and matching threads are also arranged on the inner lateral face of the distal end 242 of the end cap. When the gland cover 280 is rotated to a lock position, pressure towards the inside of the tube is formed to press the second seal 270 against the distal end 242 of the end cap. The decorative cap 260 can be sealed to completely separate it from the external environment by screwing the gland cover 280 into the end cap 240. The cable 285 of external power supply is extended into the gland cover 280 to connect with the connection terminal 230 in order to supply power to the control circuit 225 and the LED light sources 220. The waterproof cable gland cover is known by the skilled person in the art, and is therefore not described in detail herein.

[0029] Referring now to Figs. 6 and 7, indicators 283 for showing the lock and unlock positions of the gland cover 280 are provided on the outer end face of the gland cover 280. As shown in Fig. 6, when the gland cover body component 281 is rotated such that the arrow thereon points to the unlock marking, which indicates that the gland cover 280 has been rotated to the unlock position, the entire gland cover 280 can be detached. When the gland cover body component 281 is rotated such that the arrow thereon points to the lock marking, which indicates that the gland cover 280 has been rotated to the lock position and is tightly pressing the second seal 270, the waterproof seal mounting is completed.

[0030] In order to connect to the power supply cable 285, the gland cover 280 must be unlocked and separated from the decorative cap 260. Then the power supply cable 285 is passed through the gland cover body component 281 and the cylindrical boss component 282 and connected to the live wire interface 231 and neutral wire

interface 232 of the connection terminal 230. After the connection, the gland cover 280 is screwed into the outer end 261 of the decorative cap 260 and tightened to the lock position, at which point of time the cylindrical boss component 282 has been tightened to completely seal the gap with the external power supply cable 285.

[0031] Referring now to Figs. 2, 3 and 9, the figures show a hanging method for mounting the LED light tube of the present invention and the mounting clips used therein. In this respect, two spaced longitudinal slots 213 are arranged along the lengthwise direction of the light-transmitting tubular body 210. In this embodiment, two mounting clips 290 are used, each of the mounting clips comprising two shoulders 291 that are opposite to each other and a top face 292 connecting the two shoulders 291. The shoulder 291 comprises a vertical portion 293, an oblique portion 294 extending downward and inward from the vertical portion 293, and a lateral portion 295 extending outward and laterally from the oblique portion 294. The oblique portions 294 of the two shoulders of the mounting clip 290 are configured to be slidably snappable into corresponding longitudinal slots 213 of the light-transmitting tubular body 210. A horizontal mounting hole 296 is opened along the longitudinal direction on the top face 292 of the mounting clip 290; a lateral mounting hole 296A is opened at the connection point of each shoulder 291 and the top face 292. Two claws of a hanging hook 297 go through the horizontal mounting hole 296 and then hook the lateral mounting holes 296A, by means of which the LED light tube is hung onto a desired mounting surface including a ceiling or other mounting surfaces.

[0032] Fig. 5 shows a flush mounting method for mounting the LED light tube of the present invention. It is different from the mounting clips shown in Fig. 2 in that: the mounting clip 290 does not necessarily have to be provided with the lateral mounting holes 296A. By passing self-tapping screws 298 through the horizontal mounting hole 296 of the top face 292 of the mounting clip 290, the LED light tube can be fixed in a flush mounting manner on a desired mounting surface including a wall, a ceiling or other mounting surfaces.

[0033] Since the mounting clip 290 can be moved along the lengthwise direction of the light-transmitting tubular body 210, the distance between two mounting clips 290 can be adjusted, and the hanging height can be adjusted by adjusting the length of a rope passed through the hanging hook. Thus mounting the light tube of the present invention is very flexible, it is only necessary to adjust the distance between two mounting clips to match the hanging holes already existing on a ceiling or on a wall without drilling new holes.

[0034] Therefore, the present invention provides a new type of hermetic waterproof LED light tube, which does not only provide high sealing capacity and flexible methods of wiring and mounting, but can also distribute light evenly across a wider illumination angle of 180 degrees or more and extract light more effectively.

[0035] Having sufficiently described the nature of the

present invention according to some preferred embodiments, the invention, however, should not be limited to the structures and functions of the embodiments and drawings. It is stated that insofar as its basic principle is not altered, changed or modified it may be subjected to variations of detail. Numerous variations and modifications that are easily obtainable by means of the skilled person's common knowledge without departing from the scope of the invention should fall into the scope of this invention.

Claims

1. A hermetic light tube comprising:

a light-transmitting tubular body having two open ends and forming a volume cavity therein; a light-emitting body housed in the volume cavity of the tubular body; at least one connection terminal for electrically connecting the light-emitting body to an external power source; two end caps configured to be respectively adapted for mounting at the two ends of the tubular body, the connection terminal being mounted at one of the two end caps, each of said end caps having a proximal end and a distal end wherein the proximal end is coupled to a corresponding one of the open ends of the tubular body;

characterized in that the light-transmitting tubular body is formed integrally and the hermetic light tube further comprises:

a first seal arranged between the proximal end of each of said end caps and a corresponding one of the open ends of the tubular body, the first seal being provided such that said end cap and said open end of the tubular body with which the end cap is connected form a seal-tight connection; two decorative caps sleeved respectively on said two end caps; a second seal arranged between the distal end of each of said end caps and an outer end of a respective one of the decorative caps in a manner that the second seal is compressed by the outer end of the decorative cap to abut against the distal end of the end cap, so that the end cap and the decorative cap with which the end cap is connected form a compression seal; and two gland covers hermetically encapsulating the outer end of a respective one of the decorative caps, wherein the connection terminal is electrically connected to the external power source through the gland cover arranged on a side of

the end cap in which the connection terminal is mounted.

2. The light tube of claim 1, **characterized in that** an outer peripheral surface of the first seal is provided with a circumferential groove engageable with the open end of the tubular body to enhance sealing effects.
3. The light tube of claim 2, **characterized in that** the open end of the tubular body, the first seal and the respective end cap are fixedly connected together by means of fasteners.
4. The light tube of claim 1, **characterized in that** the decorative cap completely encapsulates the open end of the light-transmitting tubular body and the end cap.
5. The light tube of claim 1, **characterized in that** indicators for indicating lock and unlock positions of the gland cover are provided on an outer end face of the gland cover.
6. The light tube of claim 1, **characterized in that** two connection terminals electrically connectable to the external power source and respectively mounted in the two end caps of the light tube are arranged, the connection terminals each comprising a live wire interface and a neutral wire interface to allow for connection of a plurality of light tubes together in parallel and/or in series in the form of a daisy chain.
7. The light tube of claim 1, **characterized in that** the light tube further comprises one or more mounting clips which are slidably snapped into two spaced longitudinal slots arranged along a lengthwise direction of the light-transmitting tubular body and by means of which the light tube is mounted on a desired mounting surface.
8. The light tube of claim 7, **characterized in that** the mounting clip comprises two shoulders that are opposite to each other and a top face connecting the two shoulders, wherein each of said shoulders comprises a vertical portion, an oblique portion extending downward and inward from the vertical portion, and a lateral portion extending outward and laterally from the oblique portion, the oblique portion slidably engageable with a respective one of the longitudinal slots of the light-transmitting tubular body.
9. The light tube of claim 8, **characterized in that** one or more mounting holes, through which the light tube is screwed on the desired mounting surface or hung on the desired mounting surface with a hanging hook or a rope, are provided on the top face of the mounting clip.

10. The light tube of any one of claims 1 to 9, **characterized in that** the light tube is an LED light tube, preferably the light-emitting body comprises a circuit board fixedly mounted between the two end caps, and at least one LED light source mounted on the circuit board.
11. The light tube of claim 10, **characterized in that** the circuit board is supported on a heat-dissipating plate, and a thermally conductive material is applied between the circuit board and the heat-dissipating plate.
12. The light tube of claim 10, **characterized in that** a control circuit of the LED light source is mounted inside one of the end caps.
13. The light tube of claim 10, **characterized in that** a sensor or an indicating device electrically connected with the control circuit of the LED light source is mounted on the decorative cap to control ON/OFF or dimming operations of the LED light source.
14. The light tube of claim 10, **characterized by** comprising a plurality of LED light sources mounted on the circuit board in one straight line, two straight lines, a zigzag line, a dotted line, a dotted line and a patterned line.
15. The light tube of any one of claims 1 to 9, **characterized in that** the light tube produces an illumination pattern having an illumination angle greater than 180 degrees.

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

1. A hermetic light tube (200) comprising:
 - a light-transmitting tubular body (210) having two open ends (211) and forming a volume cavity therein;
 - a light-emitting body housed in the volume cavity of the tubular body (210);
 - at least one connection terminal for electrically connecting the light-emitting body to an external power source;
 - two end caps (240) configured to be respectively adapted for mounting at the two ends of the tubular body (210), the connection terminal (230) being mounted at one of the two end caps (240), each of said end caps (240) having a proximal end (241) and a distal end (242) wherein the proximal end (241) is coupled to a corresponding one of the open ends (211) of the tubular body (210);
 - the light-transmitting tubular body (210) is

formed integrally and the hermetic light tube (200) further comprises:

- a first seal (250) arranged between the proximal end (241) of each of said end caps (240) and a corresponding one of the open ends (211) of the tubular body (210), the first seal (250) being provided such that said end cap (240) and said open end (211) of the tubular body (210) with which the end cap (240) is connected form a seal-tight connection;
- two decorative caps (260) sleeved respectively on said two end caps (240);
- a second seal (270) arranged between the distal end (242) of each of said end caps (240) and an outer end (261) of a respective one of the decorative caps (260) in a manner that the second seal (270) is compressed by the outer end (261) of the decorative cap (260) to abut against the distal end (242) of the end cap (240), so that the end cap (240) and the decorative cap (260) with which the end cap (240) is connected form a compression seal; and
- two gland covers (280) hermetically encapsulating the outer end (261) of a respective one of the decorative caps (260), wherein the connection terminal (230) is electrically connected to the external power source through the gland cover (280) arranged on a side of the end cap (240) in which the connection terminal (230) is mounted, and **characterized in that** one or more mounting clips (290) which are slidably snapped into two spaced longitudinal slots (213) arranged along a lengthwise direction of the light-transmitting tubular body (210) and by means of which the light tube (200) is mounted on a desired mounting surface.
2. The light tube (200) of claim 1, **characterized in that** an outer peripheral surface of the first seal (250) is provided with a circumferential groove (251) engageable with the open end (211) of the tubular body (210) to enhance sealing effects.
 3. The light tube (200) of claim 2, **characterized in that** the open end (211) of the tubular body (210), the first seal (250) and the respective end cap (240) are fixedly connected together by means of fasteners.
 4. The light tube (200) of claim 1, **characterized in that** the decorative cap (260) completely encapsulates the open end (211) of the light-transmitting tubular body (210) and the end cap (240).
 5. The light tube (200) of claim 1, **characterized in that** indicators (283) for indicating lock and unlock positions of the gland cover (280) are provided on an outer end face of the gland cover (280).
 6. The light tube (200) of claim 1, **characterized in that** two connection terminals (230) electrically connectable to the external power source and respectively mounted in the two end caps (240) of the light tube (200) are arranged, the connection terminals (230) each comprising a live wire interface (231) and a neutral wire interface (232) to allow for connection of a plurality of light tubes (200) together in parallel and/or in series in the form of a daisy chain.
 7. The light tube (200) of claim 1, **characterized in that** the mounting clip (290) comprises two shoulders (291) that are opposite to each other and a top face (292) connecting the two shoulders (291), wherein each of said shoulders (291) comprises a vertical portion (293), an oblique portion (294) extending downward and inward from the vertical portion (293), and a lateral portion (295) extending outward and laterally from the oblique portion (294), the oblique portion (294) slidably engageable with a respective one of the longitudinal slots (213) of the light-transmitting tubular body (210).
 8. The light tube (200) of claim 7, **characterized in that** one or more mounting holes (296, 296A), through which the light tube (200) is screwed on the desired mounting surface or hung on the desired mounting surface with a hanging hook (297) or a rope, are provided on the top face (292) of the mounting clip (290).
 9. The light tube (200) of any one of claims 1 to 8, **characterized in that** the light tube (200) is an LED light tube, preferably the light-emitting body comprises a circuit board (221) fixedly mounted between the two end caps (240), and at least one LED light source (220) mounted on the circuit board (221).
 10. The light tube (200) of claim 9, **characterized in that** the circuit board (221) is supported on a heat-dissipating plate (223), and a thermally conductive material is applied between the circuit board (221) and the heat-dissipating plate (223).
 11. The light tube (200) of claim 9, **characterized in that** a control circuit (225) of the LED light source (220) is mounted inside one of the end caps (240).
 12. The light tube (200) of claim 9, **characterized in that** a sensor or an indicating device electrically connected with the control circuit (225) of the LED light source (220) is mounted on the decorative cap (260) to control ON/OFF or dimming operations of the LED light source (220).

13. The light tube (200) of claim 9, **characterized by** comprising a plurality of LED light sources (220) mounted on the circuit board (221) in one straight line, two straight lines, a zigzag line, a dotted line, a dotted line and a patterned line. 5
14. The light tube (200) of any one of claims 1 to 8, **characterized in that** the light tube (200) produces an illumination pattern having an illumination angle greater than 180 degrees. 10

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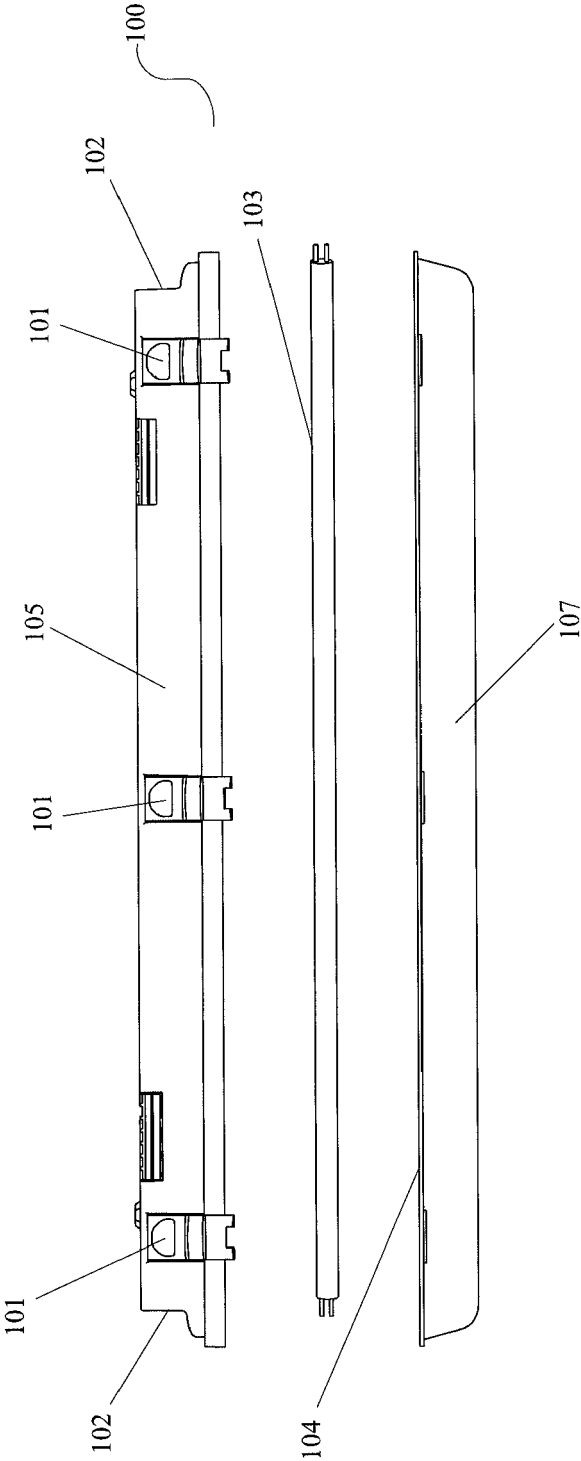


Fig. 1

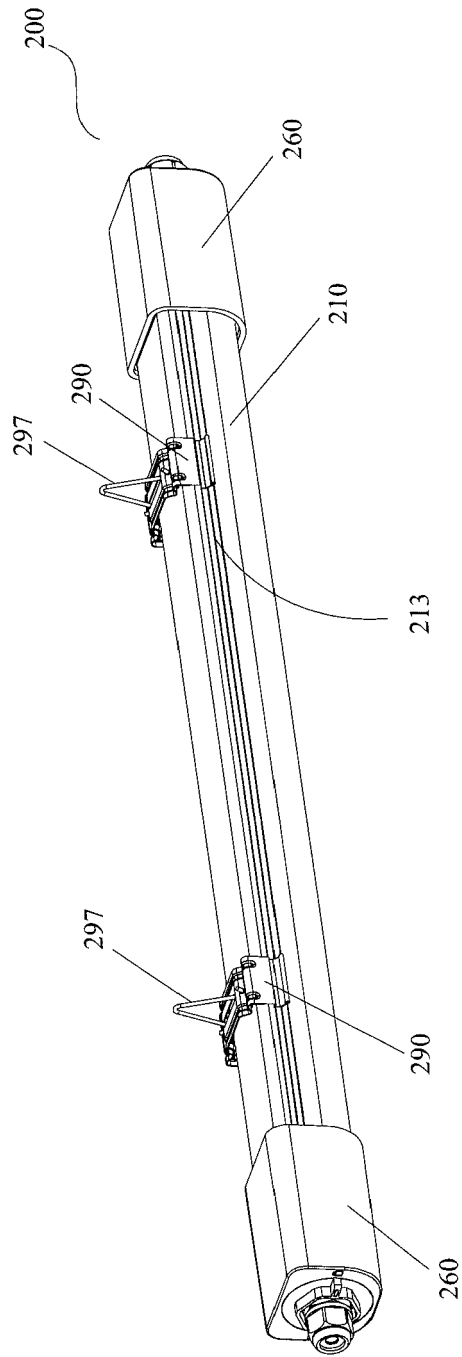


Fig. 2

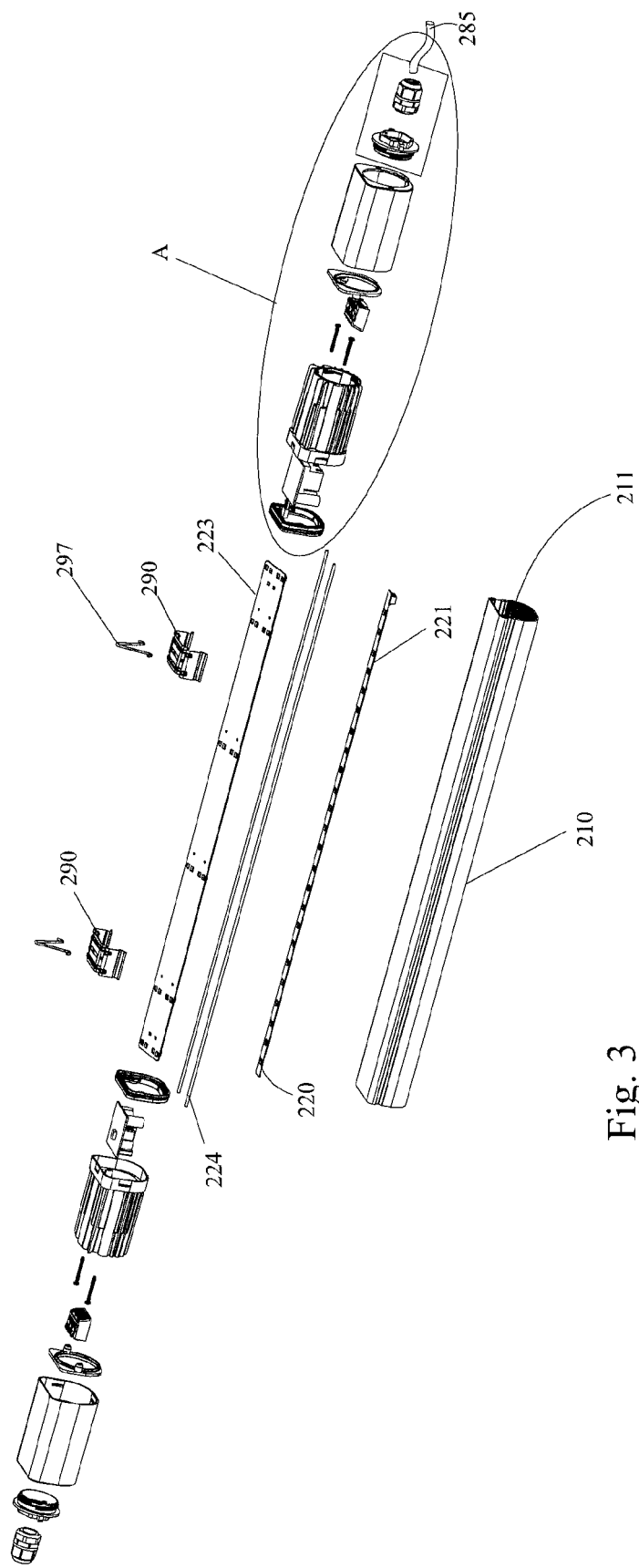


Fig. 3

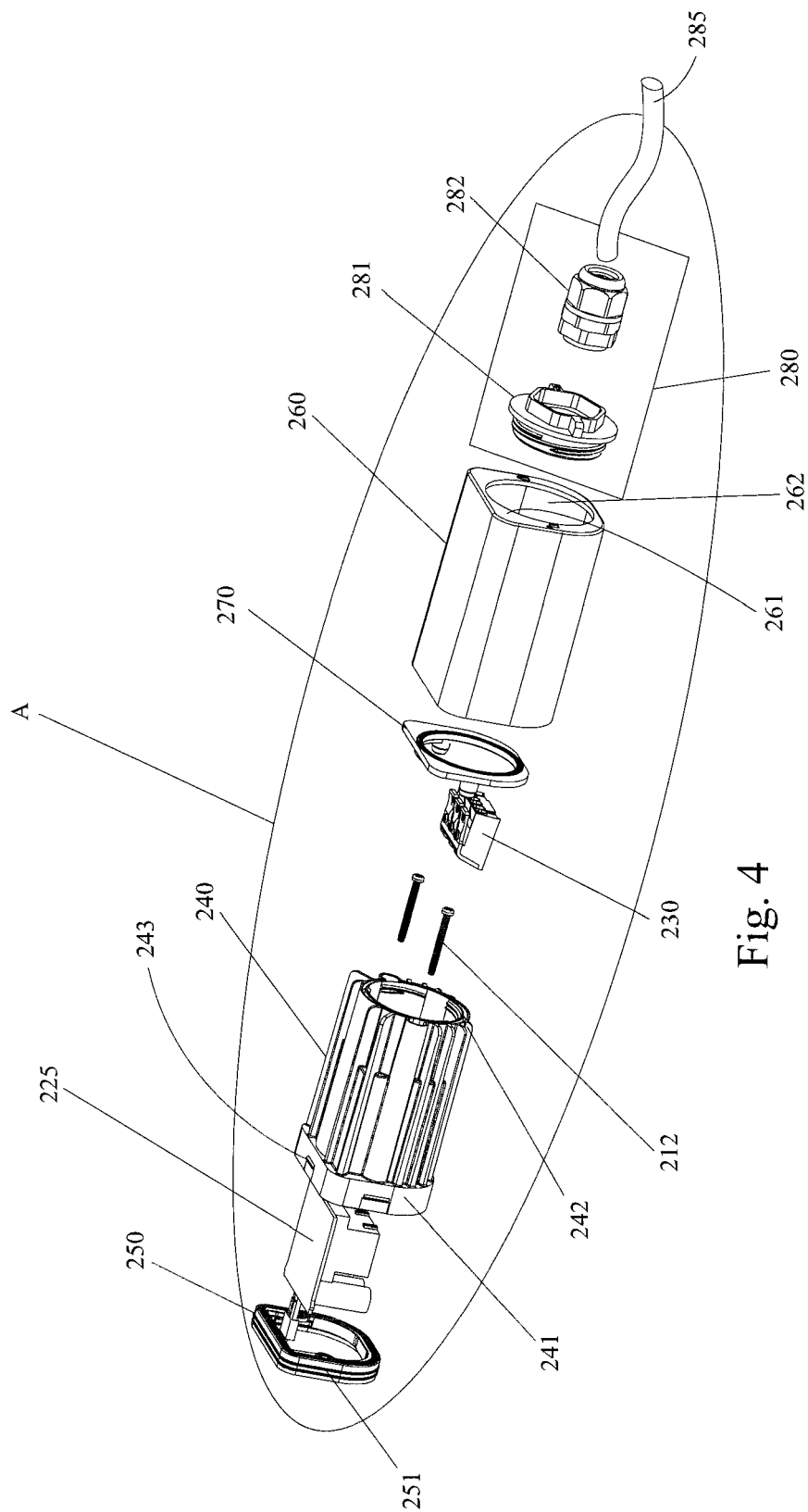


Fig. 4

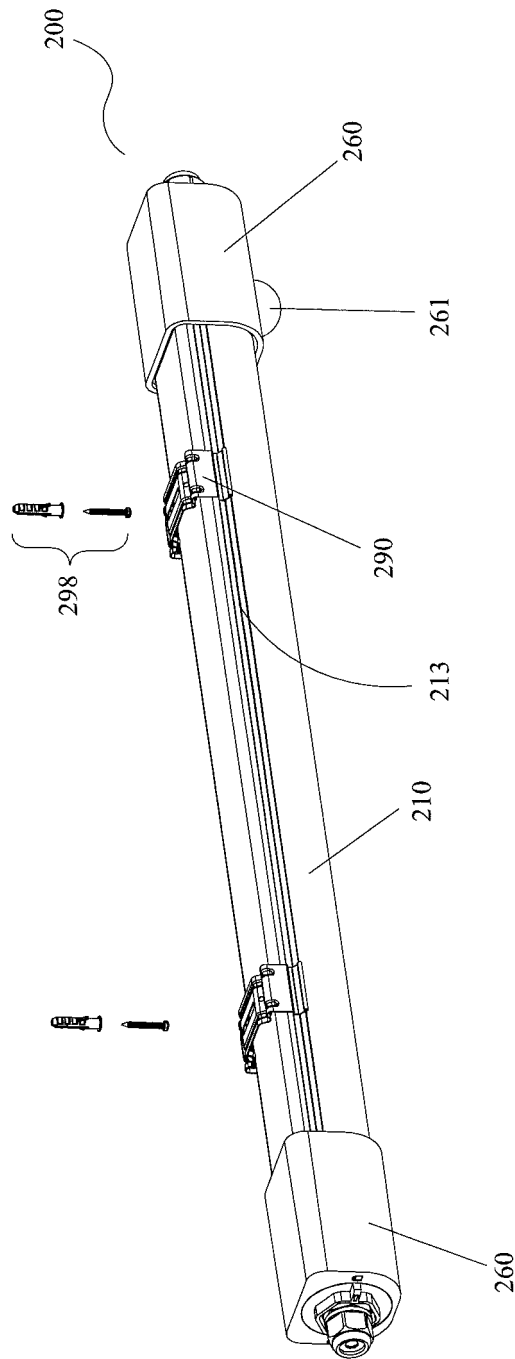


Fig. 5

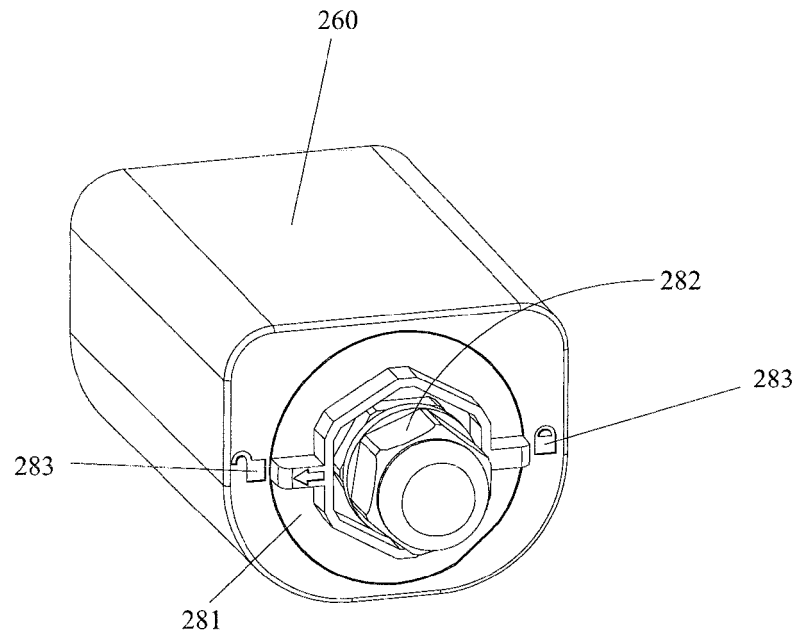


Fig. 6

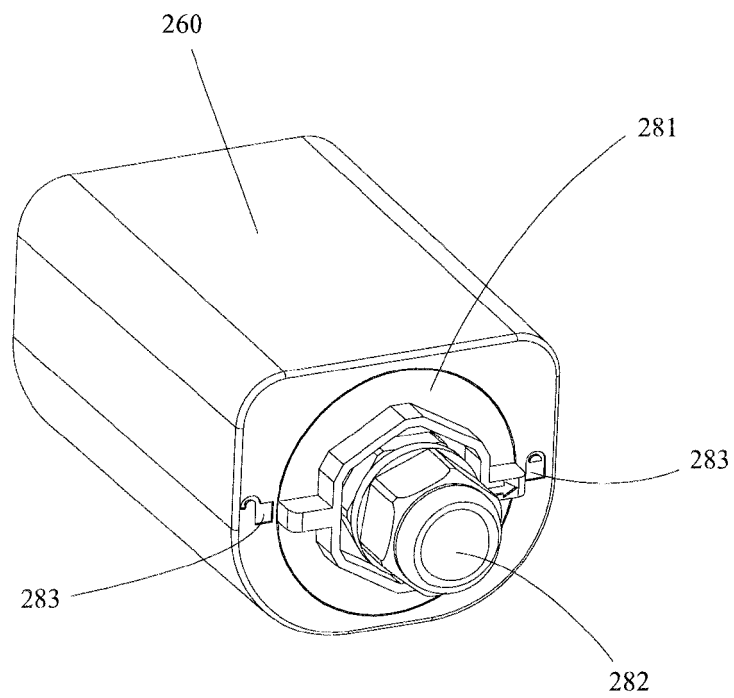


Fig. 7

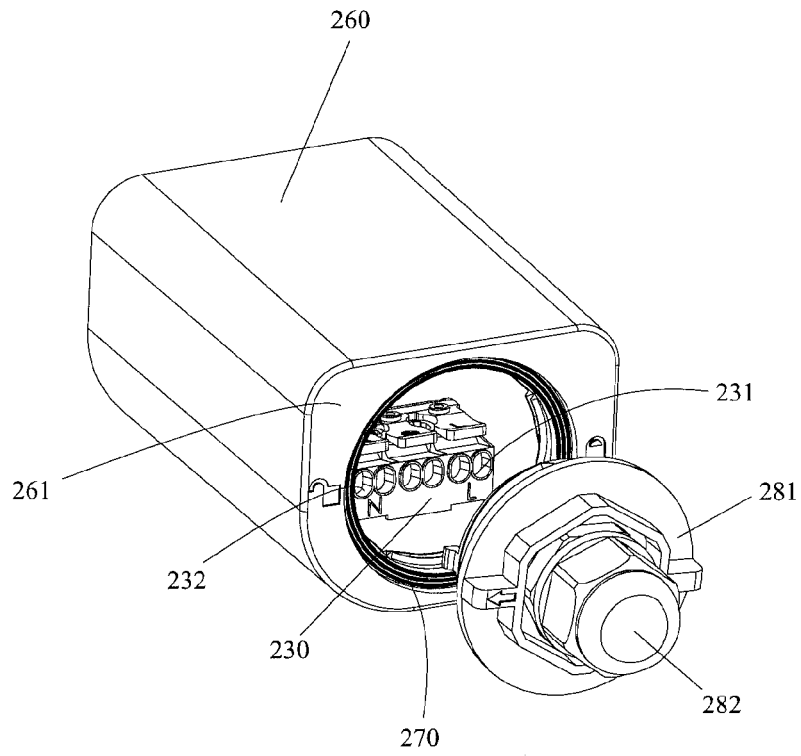


Fig. 8

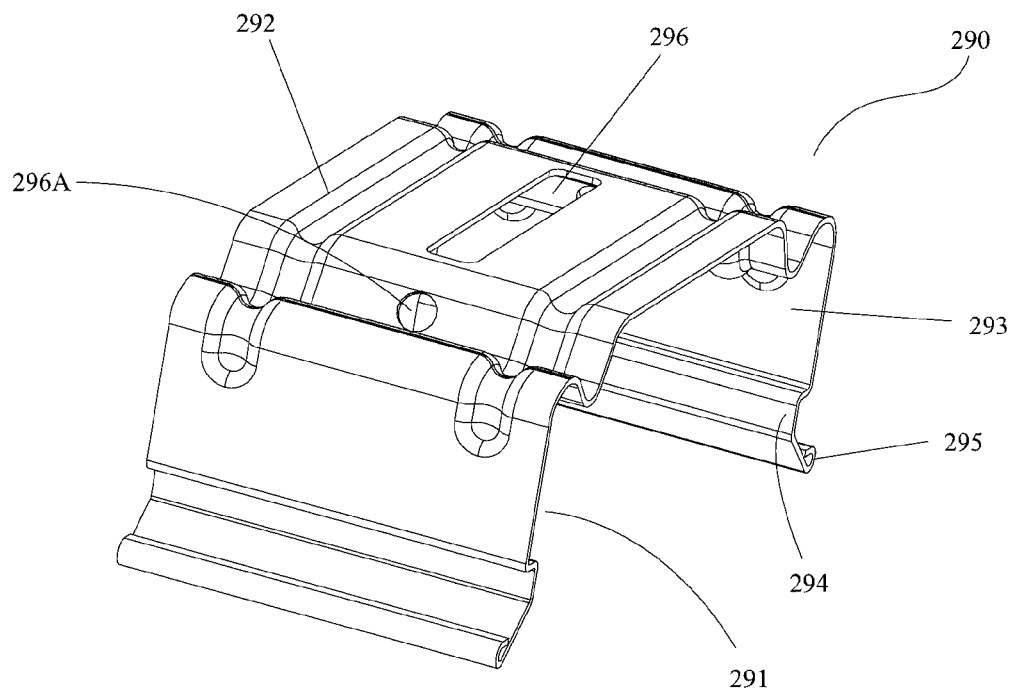


Fig. 9



EUROPEAN SEARCH REPORT

Application Number
EP 16 27 5041

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 2015/010408 A1 (GINKGO ELECTRIC ZHEJIANG LTD [CN]) 29 January 2015 (2015-01-29) * figures 1-12 * * the whole document *	1-4,6,7, 10,12,14	INV. F21V31/00 F21K99/00 F21V21/02
Y	JP 3 198996 U (-) 30 July 2015 (2015-07-30) * figure 1 *	1-4,6,7, 10,12,14	
			TECHNICAL FIELDS SEARCHED (IPC)
			F21V F21K F21Y
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 7 April 2016	Examiner Sacepe, Nicolas
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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The members are as contained in the European Patent Office EDP file on
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07-04-2016

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		TW M487989 U	11-10-2014
		US 2015377423 A1	31-12-2015

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82