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(54) **Housing for a LED light source**

(57) A housing for a LED light source (8), which housing comprises an outer tube portion having a longitudinal axis and being closed at one end by a translucent outer cover (4), wherein said housing comprises an inner tube portion manufactured from a thermal conducting material and arranged inside said outer tube portion in such a manner that said inner tube portion can rotate around said axis with respect to said outer tube portion, said

inner tube portion comprising two parts of which a first part (9) is rotateably arranged to said outer tube, said second part (10) comprising said LED light source (8), said first part (9) extending substantially around said axis, said second part (10) extends around a further longitudinal axis, said first (9) and second part (10) being cooperatively engaged so that said further axis is inclinable with respect to said axis while thermal conduction between first (9) and second part (10) is maintained.

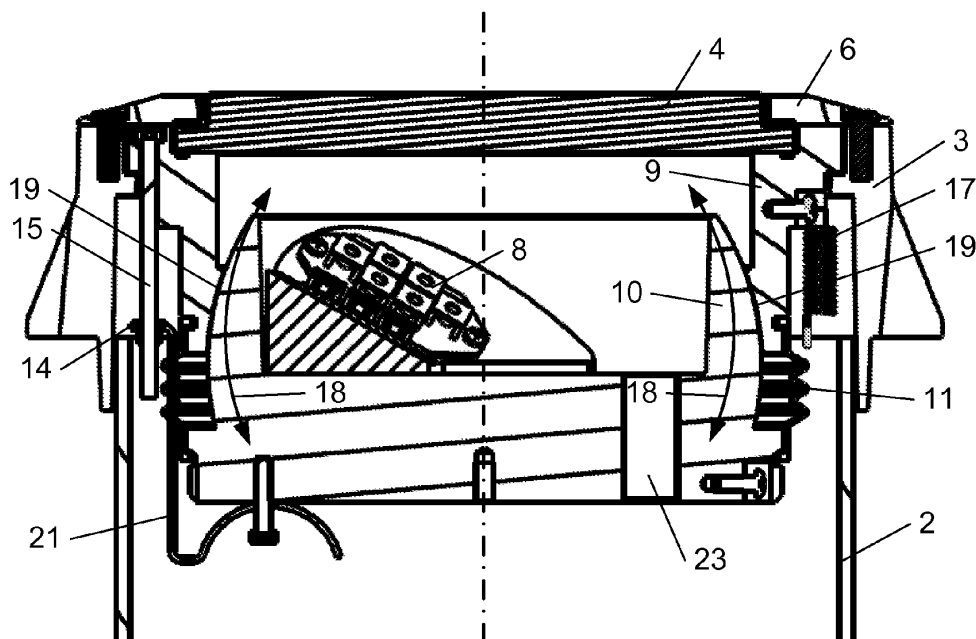


Fig. 3

Description

[0001] The invention relates to a housing for a LED light source, which housing comprises an outer tube portion having a longitudinal axis and being closed at one end by a translucent outer cover.

[0002] Such housings are well-known and used to build a LED light sources into a structure such as a floor surface. The housing and the cover thereby protect the LED light source from moisture and dust. Furthermore, the housing is provided so that heat can be transferred away from the LED light source. To this end, the LED light source is mounted firmly to the housing via a thermal conducting contacting surface that is large enough to ensure that heat can be transferred away from the LED light source to the housing via this thermal conducting contacting surface.

[0003] The problem with such housings is that, since such housings have a preferred position with respect to the structure in which it is to be built in, the direction of the LED light bundle can not be amended. Since the LED light source is firmly mounted in the housing via the thermal conducting contacting surface, the LED light source can at least not easily be repositioned and can certainly not be repositioned on site.

[0004] It is an object of the present invention to provide a housing for a LED light source in which the direction of the light bundle can be amended depending on particular circumstances on site.

[0005] To this end, the housing according to the invention is characterised in that said housing comprises an inner tube portion manufactured from a thermal conducting material and arranged inside said outer tube portion in such a manner that said inner tube portion can rotate around said axis with respect to said outer tube portion, said inner tube portion comprising two parts of which a first part is rotateably arranged to said outer tube, said second part comprising said LED light source, said first part extending substantially around said axis, said second part extends around a further longitudinal axis, said first and second part being cooperatively engaged so that said further axis is inclinable with respect to said axis while thermal conduction between first and second part is maintained. The differentiation between the outer tube and the inner tube allows the LED light source to rotate with respect to the outer part of the housing. Thereby, the LED light source can be rotated while the housing is already positioned and/or fixed within the structure. Furthermore, since the inner tube comprises two parts which can be inclined the one with respect to the other, the LED light bundle can be inclined into a preferred inclination. The combination of on the one hand the rotating of the inner tube with respect to the outer tube and on the other hand the inclining of the second part of the inner tube with respect to the first part thereof, results in that the LED light bundle emitted by the LED light source can be freely directed into substantially all directions without that the position of the outer tube should be amended with

respect to the structure.

[0006] Preferably, said first and second part each comprise a cooperative contacting surface in such a manner that said thermal conduction is achieved by said first part lying with said contacting surface against said second part. Thermal heat can easily be transferred from one to another mechanical part if there is a physical contacting surface between these mechanical parts. Thereby, cooperative contacting surfaces provide a thermal conduction between the first part and the second part.

[0007] Preferably, said contacting surface is formed by a segment of a sphere surface. The first part of the inner tube is provided with one of the inner or outer surface of a segment of a sphere while the second part of the inner tube is provided with the other of the inner or outer surface of the segment of the sphere. In this manner, the inner surface can engage into the outer surface, which results in a contacting surface between the first part and the second part that allows an inclination of the one with respect to the other part.

[0008] Preferably, said first and second part are interconnected via an inclination axis that is arranged substantially perpendicular to said longitudinal axis, and are provided with an inclination mechanism via which the inclination between the axis and the further axis is amendable. Furthermore preferably, said inclination mechanism comprises a driveable element by which the inclination mechanism is operateable, which driveable element is arranged adjacent to said cover. In mounting such housings, the cover can be temporary removed from the housing thereby exposing the inner tube, which can be rotated. Because the driveable element is located adjacent the cover, also the inclination between first part and second part of the inner tube can be amended since the driveable element is easily reachable when the cover is removed. Thereby, the rotational position between outer tube and inner tube as well as the inclination angle between first part and second part of the inner tube can be amended after the housing has been mounted in the structure. Furthermore, amending the rotational position and/or the inclination angle does not affect the transfer of heat away from the LED light source.

[0009] The invention will now be described in more details with respect to the drawings illustrating some preferred embodiments of the invention. In the drawings:

figure 1 shows an exploded view of a housing according to the present invention;
figure 2 shows an upper view of a housing according to the present invention;
figure 3 shows cross section A-A of a housing according to the present invention; and
figure 4 shows cross section B-B of a housing according to the present invention.

[0010] In the drawings a same reference number has been allocated to a same or analogous element.

[0011] Figure 1 shows the different mechanical parts

that form the housing according to a preferred embodiment of the invention. The outer tube portion 1 comprises a tube part 2 and a top part 3 extending around an axis 12. The top part 3 is provided to be placed on the tube part 2 and is provided so that the translucent outer cover can be mounted thereon and is provided so that the inner tube can be mounted therein. The length of the tube part 2 in such configuration is determining for the height of the housing. The outer height of the housing can thus be changed by using a tube part 2 of a different length.

[0012] Figure 1 furthermore shows a translucent outer cover 4. This translucent outer cover can be a plastic or preferably glass plate that fits the outer tube 1. The translucent outer cover can be mounted onto the housing by any suitable mounting means, for example by a decorative ring 6 and a protective joint 4.

[0013] Figure 1 furthermore shows an inner tube 7. The LED light source 8 is mounted in the inner tube 7. The inner tube comprises a first part 9 and a second part 10 which together form the essential parts of the inner tube 7. The first part 9 extends around said axis 12 while said second part 10 extends around a further axis which can be inclined with respect to said axis 12. The LED light source 8 is mounted to the second part 10 of the inner tube 7. Preferably, a connection joint 11 is comprised by the inner tube which joint is provided to fluid tightly seal a connection between the first part 9 and the second part 10 of the inner tube 7.

[0014] The first part 9 and second part 10 are cooperatively engaged so that a rotation of one with respect to another part around an inclination axis, which is substantially perpendicular to the axis 12, is enabled. Such rotation results in that said further axis can be inclined with respect to said axis 12. The first part 9 and second part 10 are so engaged as to maintain, in a plurality of different positions with respect to each other, a thermal conductivity between each other that allows heat, coming from the LED light source 8, to be transported from the second part 10 to the first part 9. To this end, the first and second part are manufactured from a thermal conducting material, preferably a good thermal conducting material such as metal. A thermal conductivity between the first and second part can be obtained by providing each of the first part 9 and second part 10 with cooperative contacting surfaces which are formed so that a substantial surface of the first part is in direct mechanical contact with a substantial surface of the second part in said plurality of different positions.

[0015] To this end, these surfaces in the first and second part are preferably formed as a segment of a surface of a solid of revolution around said inclination axis. More preferably, the first and second part are formed as a segment of a surface of a sphere, to form at least partly a ball and socket joint. Preferably, the first part comprises a cavity wherein the second part is provided to engage so that the first part fulfils the socket function and the second part fulfils the ball function. Thereby, the surface defining at least that part of the cavity that is in contact

with the socket, and at least that part of the socket that is in contact with the cavity, is formed as a segment of a surface of a solid of revolution, preferably of a ball. During the whole of the rotational movement over a predetermined angle, there is a constant mechanical contact between the first part 9 and the second part 10 thereby ensuring the heat transfer from the second to the first part.

[0016] The angle over which the second part 10 can be inclined with respect to the first part 9 is larger than 10 degrees, preferably larger than 20 degrees, more preferably larger than 30 degrees, most preferably larger than 40 degrees. Since the first and second part are preferably symmetrical, an angle of 40 degrees of inclination between the first part 9 and the second part 10 would allow a light bundle to be directed 20 degrees to one side and 20 degrees to the opposite site.

[0017] Preferably, the first part 9 and second part 10 are interconnected, for example by screws which, in the connected position, extend along said inclination axis. The inner tube 7 is preferably provided with an inclination mechanism 13 which enables to rotate the first part 9 with respect to the second part 10. The inclination mechanism is preferably formed by a nut-bolt mechanism where the nut 14 is connected to the second part 10 and the bolt 15 is connected to the first part 9 or visa versa. Preferably, the bolt 15 extends substantially perpendicular to the axis 12 from a first end adjacent to said second part to a second end adjacent to the translucent cover. The bolt 15 comprises a driving mechanism that enables the bolt to be driven, such as a slit for engaging a screwdriver. The slit is preferably arranged adjacent said translucent cover so that when said cover is removed, the inclination mechanism is operateable. This enables a re-directing of light bundle on site after the housing has been fixed and when the cover is removed.

[0018] The inclination mechanism preferably further comprises, opposite to the nut-bolt mechanism, a spring 17 which tends to urge the second part 10 in a first extreme inclination with respect to the first part 9. In this manner, the nut-bolt mechanism should only be provided to apply a unidirectional counterforce to the force applied by the spring 17 to move the first part 9 with respect to the second part 10 in two rotational direction.

[0019] Figure 2 shows a top view of the housing according to the invention. The figure shows the outer tube 1 mounted onto a base element 16. The base element 16 can be provided as a protection for electrical cables that are lying in the surface where the housing is to be built in. The base element 16 creates a space wherein the electrical connections can be established from the LED light source in the housing with the electrical cables. Depending on the dept where the electrical cables are arranged, the tube part 2 of the outer tube is provided with a height so that the translucent cover can be mounted at surface level.

[0020] Figure 2 furthermore shows the decorative ring 6 which holds the translucent cover 4. In the figure 2, also the second part of the inner tube is shown.

[0021] Figure 3 shows cross section A-A, see figure 2, of a preferred embodiment of the invention. The cross section is oriented with respect to the first part and the second part of the inner tube that the inclination axis is perpendicular to the cross sectional view.

[0022] Figure 3 shows the outer tube portion comprising the tube part 2 and the top part 3. To the top part 3, the translucent outer cover 4 is mounted using a decorative ring 6. Furthermore, the inner tube is mounted to the top part 3. The inner tube comprises a first part 9 and a second part 10. The first part 9 is mounted to the outer tube, and is preferably arranged shorter to the translucent cover than the second part 10. Preferably the first part is arranged adjacent the translucent cover so that by removing the translucent cover, the first part is directly reachable.

[0023] The second part 10 is provided with the LED light source 8. Preferably, the LED light source 8 is mounted onto the second part 10 via a substantially wedge like element. Thereby, the wedge like element directs the LED light source 8 roughly into a particular direction. The inclination mechanism can, in a further stage, be used to fine-tune the direction of the light beam. In this manner, the inclination of the light beam is obtained by a combination of a wedge for the rough direction, and the inclining of the second part with respect to the first part for the fine direction of the light beam. Preferably, in mounting the housing, there are several wedge shaped elements available each with a different inclination angle, so that on site also a rough amendment of the light beam direction can be amended.

[0024] The first part 9 and the second part 10 are interconnected in such a manner that the second part 10 can be inclined with respect to the first part 9. The second part 10 can rotate around the inclination axis as shown by arrows 18 in figure 3. The connecting surfaces 19 ensure that in a plurality of inclined positions, there is a close mechanical contact between the first and the second part so that heat can be transferred from the LED light sources to the second part 10 and to the first part 9 and to the environment, as is shown in figure 4 by the arrows 20.

[0025] Figure 3 furthermore shows the inclination mechanism 13 with the nut 14 and the bolt 15. The nut 14 is coupled to the second part 10 preferably via a connection element 21. The bolt 15 extends from adjacent the translucent cover 4, where it is connected to the first part 9, towards adjacent the second part 10 where it is connected to the connection element 21. The inclination mechanism 13 preferably comprises a spring 17 mounted opposite to the nut-bolt mechanism.

[0026] The inner tube furthermore comprises a connection joint 11 which is preferably a flexible rubber element connected with one end to the first part and connected with the other end to the second part so that a fluid tight seal is established between the first and the second part.

[0027] Figure 4 shows the screws which extend around

the inclination axis 22. Figure 4 further illustrates the heat transfer through the housing. The LED light source produces a certain amount of heat which is to be transferred away from the LED light source to prevent over heating of the LED light source. The heat is, because the LED light source is firmly mounted to the second part preferably via a wedge like element, transferred to the second part. The second part is provided to transfer the heat to the first part through the cooperating contacting surface 19. The first part is preferably arranged adjacent the cover and/or decorative ring 6 so that the heat can be transferred from the first part 9, through the cover 4 and/or decorative ring 6 to the environment.

[0028] The advantage of the particular setup of the preferred embodiment of the housing of the invention is that it is possible to:

- roughly direct the light beam by mounting the LED light source onto the wedge like element;
- fine-tune the direction of the light beam by inclining the second part with respect to the first part;
- amend the height of the housing simply by providing a tube part of the outer tube portion with an amended length;
- amend the direction of the light beam on site by removing the cover, and then rotating the inner tube with respect to the outer tube and operating the driving element of the inclination mechanism;

[0029] During these actions, the heat transfer 20 away from the LED light sources 8 is ensured because of the cooperating surfaces 19 between first 9 and second part 10 of the inner tube 7.

Claims

1. A housing for a LED light source (8), which housing comprises an outer tube portion 1 having a longitudinal axis (12) and being closed at one end by a translucent outer cover (4), **characterised in that** said housing comprises an inner tube portion (7) manufactured from a thermal conducting material and arranged inside said outer tube portion (1) in such a manner that said inner tube portion (7) can rotate around said axis (12) with respect to said outer tube portion (1), said inner tube portion (7) comprising two parts of which a first part (9) is rotateably arranged to said outer tube (1), said second part (10) comprises said LED light source (8), said first part (9) extending substantially around said axis (12), said second part (10) extending around a further longitudinal axis, said first (9) and second part (10) being cooperatively engaged so that said further axis is inclinable with respect to said axis (12) while thermal conduction (20) between first (9) and second part (10) is maintained.

2. The housing according to claim 1, wherein said first (9) and second part (10) each comprise a cooperative contacting surface (19) in such a manner that said thermal conduction (20) is achieved by said first part (9) lying with said contacting surface (19) against said second part (10). 5
3. The housing according to claim 2, wherein said contacting surface (19) is formed by a segment of a surface of a sphere. 10
4. The housing according to any of the previous claims, wherein said first (9) and second part (10) are interconnected via an inclination axis (22) that is arranged substantially perpendicular to said longitudinal axis (12), and are provided with an inclination mechanism (13) via which the inclination between the axis (12) and the further axis around the inclination axis (22) is amendable. 15
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5. The housing according to claim 4, wherein said inclination mechanism (13) comprises a driveable element (15) by which the inclination mechanism (13) is operateable, which driveable element (15) is arranged adjacent said cover (4). 25

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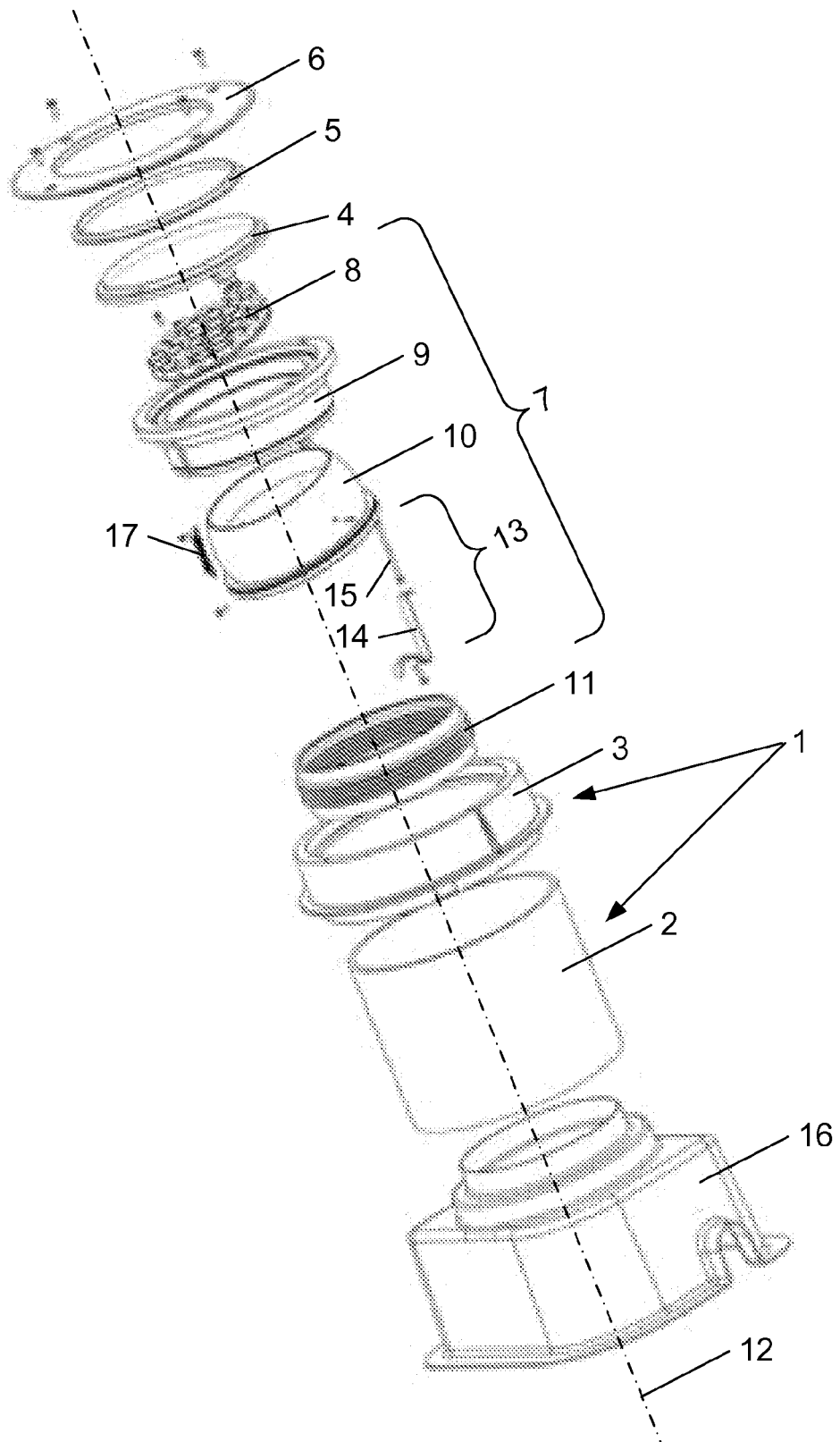


Fig. 1

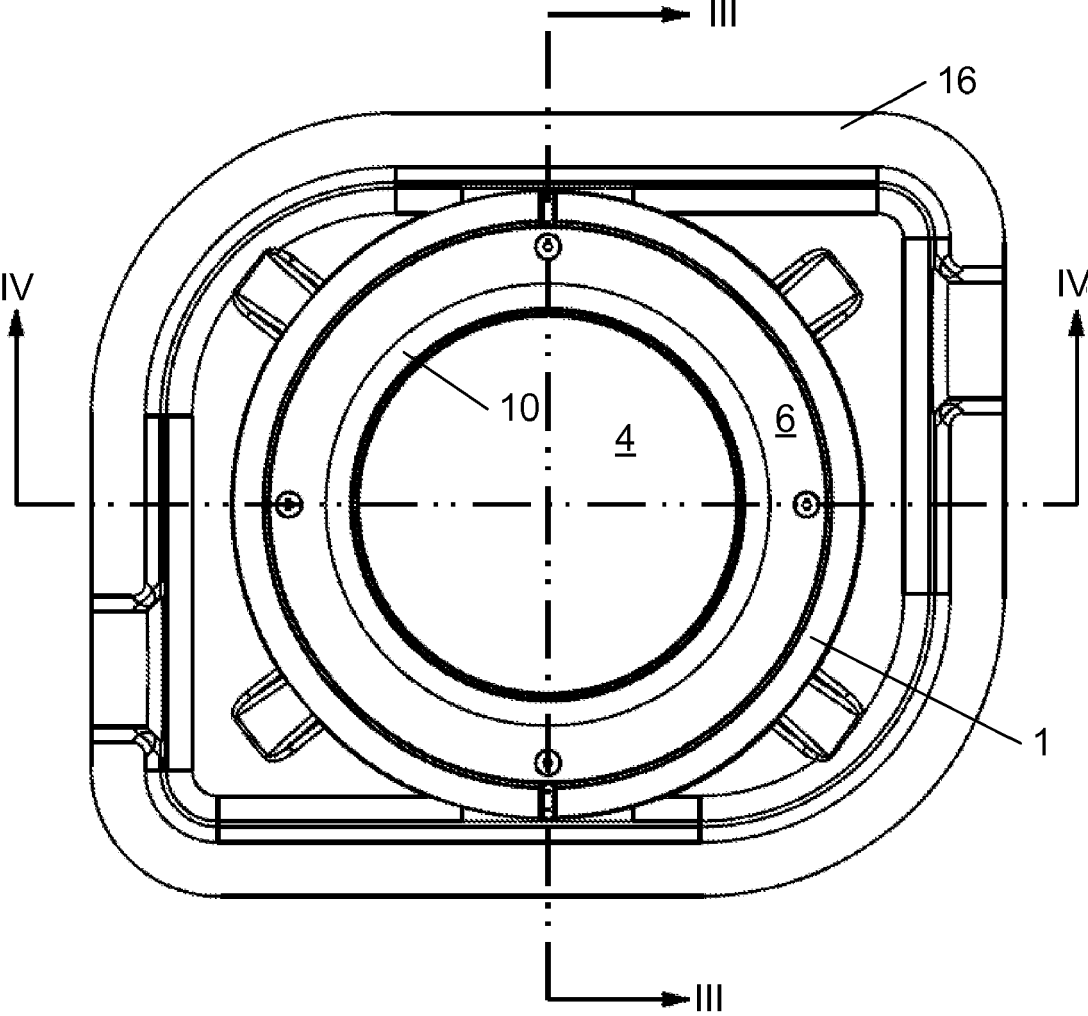


Fig. 2

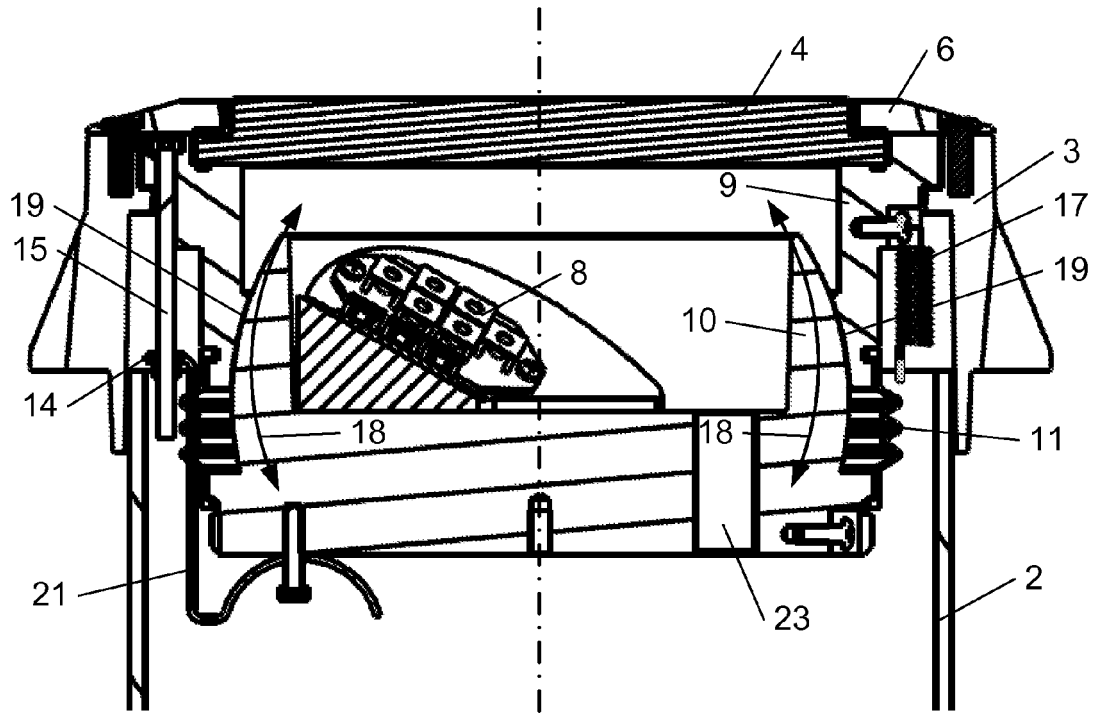


Fig. 3

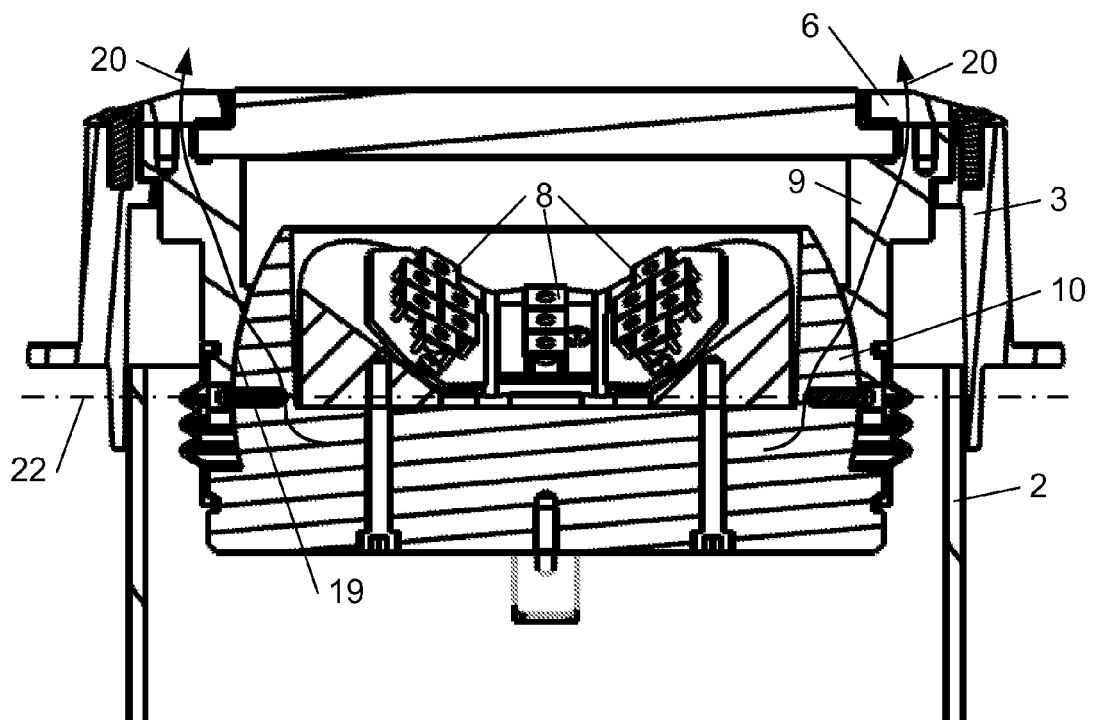


Fig. 4