



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.10.2019 Bulletin 2019/43

(51) Int Cl.:
F21S 6/00 ^(2006.01) **F21V 1/00** ^(2006.01)
F21V 19/00 ^(2006.01) **F21Y 115/10** ^(2016.01)

(21) Application number: **19168999.1**

(22) Date of filing: **12.04.2019**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **G. Luce S.r.l.**
20823 Lentate sul Seveso (MB) (IT)

(72) Inventor: **GIORGETTI, Antonio**
20823 Lentate sul Seveso (MB) (IT)

(74) Representative: **Tana, Maria Gabriella**
Praxi Intellectual Property S.p.A.
Via Mario Pagano, 69/A
20145 Milano (IT)

(30) Priority: **17.04.2018 IT 201800004598**

(54) **LED LAMP WITH INTERCHANGEABLE MODULES**

(57) LED lamp (1, 1', 101, 101') and apparatus (100) for the lighting of interiors comprising said LED lamp (1, 1', 101, 101'), said LED lamp (1, 1', 101, 101') comprising: a load-bearing structure (2, 2') provided with a first (22) and with a second end (22', 42'); and at least one first and one second LED module (3, 3'), each module (3, 3') comprising a printed circuit board and at least one LED (6, 6', 7, 7', 8, 8') mounted on the printed circuit board; said at least one first and one second LED modules (3, 3') being, moreover, attached in a reversible manner on said load-bearing structure (2, 2') by means of mechanical attachment means (10, 10', 11, 11'') and said at least one first and one second LED modules (3, 3') each comprising at least one connector (9, 9', 19, 19') in order to receive electrical current from the outside.

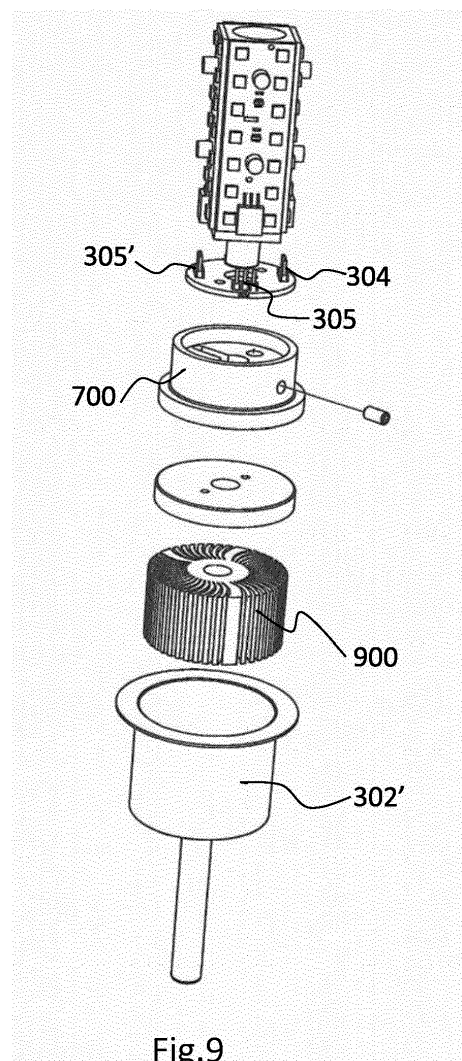


Fig.9

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a lamp, of the LED lamp type, provided with a plurality of interchangeable LED modules. The expression "LED lamp", for the purposes of the present description, is understood to refer to a lamp which uses at least one light-emitting diode (hereinafter denoted by the acronym "LED"). The expression "LED module" instead is understood to refer to a printed circuit board on which one or more LED chips are mounted, preferably yet not exclusively by means of the surface mount technique. The "LED module" of the present invention is moreover a so-called low-voltage (< 24V) LED module. The present invention relates, moreover, to a lighting apparatus, commonly known as table lamp, or floor lamp, comprising this LED lamp. An object of the present application is also a kit comprising: at least one LED module which can be used to replace a module of the LED lamp, in case said module breaks down, an assembly of connection of the lamp with the stem of a light on which to mount the lamp, means for the removal of the broken LED module (e.g. Allen key), attachment means (e.g. screws) of the module functioning on the lamp and, optionally, the aforementioned LED lamp.

STATE OF THE ART

[0002] In the current state of the art, LED lamps for the lighting of interiors, and more particularly the lamp whose LEDs are installed by means of the surface mount technique (SMD LED), are substantially made up of a substrate whereon a printed circuit board is attached whereon, in turn, a plurality of LEDs are mounted. The known LED lamps comprise, moreover, at least one component or connector, apt to receive electrical current from the outside for the supply of the printed circuit and, therefore, of the LEDs themselves. In recent years LED lamps have become increasingly commonly used in that they have various advantages, including greater energy efficiency and longer duration. LED lamps, if compared to halogen or fluorescent lamps, allow a reduction in the annual energy consumption, with consequent reduction in the emissions of CO₂. Nonetheless, it is sufficient for one single LED to break down for the entire lamp to become no longer usable and to be therefore discarded. LED lamps being composed primarily of electronic components such as, in fact, printed circuit boards, diodes and, therefore, semiconductor metals, they have to be collected and disposed of as "electronic" waste or waste in the WEEE (waste of electrical and electronic equipment) class. The main problems linked to the disposal of this type of waste are linked to the presence, in the component materials of the equipment, of substances hazardous to health and/or to the environment such as copper, iron, aluminium, glass, silver, gold, lead and mercury. Considering that, already for some years now, the annual

production of electronic waste has reached 49 million tonnes of waste of electrical and electronic equipment (WEEE), it is clear how it is becoming increasingly urgent to find solutions which allow a reduction in the quantity of this waste, taking into account that, at the same time, the use of electronic components is practically now necessary in every field of the art. In the specific case of LED lamps, considering that they often comprise a number of LEDs of the order of tens, it is easy to see which is the waste generated by throwing away tens of LEDs which could still be useful, together with the components associated therewith, due to the breakdown of one single LED.

OBJECTS AND SUMMARY OF THE INVENTION

[0003] The object of the present invention is, therefore, that of providing a LED lamp which allows the disadvantages of the prior art described above to be overcome, and that is, in particular, that allows a reduction in the production of electronic waste derived from the discarding of non-functioning LED lamps.

[0004] This object is achieved by a LED lamp wherein the LED modules which compose it are independent one from the other and can be replaced singly. In this way, when a single LED of a single module has a fault, it will be sufficient to replace the single module with all the LEDs mounted thereon, but not the entire lamp and the other LEDs mounted on the other modules. To this end, the lamp that forms the object of the present invention comprises:

- a load-bearing structure provided with a first and with a second end; and
- at least one first and one second LED module, each of which comprising:
 - a printed circuit board; and
 - at least one LED mounted on the printed circuit board.

[0005] The LED modules are attached in a reversible manner on the load-bearing structure by mechanical attachment means and each LED module comprises at least one connector in order to receive electrical current from the outside. The connectors of each LED module and, in particular, the at least one connector of the first LED module and the at least one connector of the second LED module are placed in proximity of the same end of the load-bearing structure.

[0006] The mechanical attachment elements comprise at least one screw, preferably two screws, for each of the at least two LED modules. Each LED module comprises at least one hole internally threaded and configured to accommodate a screw. The load-bearing structure, in turn, also comprises at least two holes (at least one per module) threaded internally and configured to each accommodate at least one screw.

[0007] The load-bearing structure, moreover, can have

two different geometric configurations. In a first configuration the load-bearing structure is given by the difference between a solid parallelepiped and a hollow cylinder, which projects outside of said parallelepiped, at the second end of said structure. In the second configuration, instead, the load-bearing structure is given by a hollow parallelepiped, the base surface of said parallelepiped being formed by the surface comprised between two concentric squares.

[0008] The object of the present invention is also an apparatus for the lighting of interiors, comprising:

- a LED lamp having the features described above;
- a base for resting on the floor or on a table;
- a lampshade blocking element configured in order to cover the LED lamp and for the attachment of a lampshade; and
- a stem provided with a first end configured in order to be connected to the base and with a second end configured in order to be connected to the LED lamp and to the lampshade blocking element.

[0009] According to the geometric configuration of the load-bearing structure of the LED lamp, the second end of the stem of the apparatus can in turn take on two different configurations. More particularly, when the load-bearing structure has the configuration indicated above as first configuration, the second end of the stem comprises:

- a circular hole configured for the insertion of the hollow cylinder; and
- at least one connector for each LED module of the lamp.

[0010] Each connector of the second end of the stem is configured in order to be coupled with the connector of each of the LED modules, allowing the supply thereof.

[0011] When instead the load-bearing structure has the configuration indicated above as second configuration, the second end of the stem comprises an element in the shape of a parallelepiped configured for the insertion in the load-bearing structure and at least one connector for each LED module of the lamp. In this case too, each connector of the second end of the stem is configured in order to be coupled with the connector of each of the LED modules, allowing the supply thereof. Finally, the object of the present application is also a kit, comprising:

- at least one LED module configured in order to be attached to said lamp, said at least one LED module being other than the LED modules comprised in the lamp;
- an assembly of connection of the lamp with the stem of a lamp on which to mount the lamp; and
- mechanical attachment means of said at least one LED module configured in order to be attached to

said lamp.

[0012] The kit of the present invention can, moreover, also comprise a lamp according to the present invention.

[0013] The mechanical attachment means can be made up of:

- at least two socket head screws and an Allen key; or
- at least two thumb screws which can be unscrewed by hand.

[0014] These and other objects of the present invention will be made clearer by the following detailed description of some preferred embodiments of the present invention, to be understood by way of a non-limiting example of the more general concepts claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The following description refers to the accompanying drawings, in which:

- Figure 1a is a blown-up view of a LED lamp according to the present invention;
- Figure 1b is a three-dimensional view of the load-bearing structure of a LED lamp of the present invention;
- Figure 2a is an anterior frontal view of the LED module of a LED lamp according to the present invention;
- Figure 2b is a rear frontal view of the LED module of a LED lamp according to the present invention;
- Figure 3a is a frontal view of a first embodiment of the LED lamp according to the present invention;
- Figure 3b is a frontal view of a second embodiment of the LED lamp according to the present invention;
- Figure 4a is a frontal view of a third embodiment of the LED lamp according to the present invention;
- Figure 4b is a frontal view of a fourth embodiment of the LED lamp according to the present invention;
- Figure 5a is a frontal view of a detail of a first embodiment of the LED lamp of the present invention, relating to the second end of said lamp;
- Figure 5b is a frontal view of a detail of a second embodiment of the LED lamp of the present invention, relating to the second end of said lamp;
- Figure 6a is a view from below of a detail of a first embodiment of the LED lamp of the present invention, relating to the second end of said lamp;
- Figure 6b is a view from below of a detail of a second embodiment of the LED lamp of the present invention, relating to the second end of said lamp;
- Figure 7a is a three-dimensional view of a detail of a first embodiment of the apparatus of the present invention, relating to the second end of the stem of the apparatus;
- Figure 7b is a three-dimensional view of a detail of a second embodiment of the apparatus of the present invention, relating to the second end of the

stem of the apparatus;

- Figure 8a is a three-dimensional view of a first embodiment of an apparatus according to the present invention;
- Figure 8b is a three-dimensional view of a detail of a first embodiment of an apparatus according to the present invention, relating to the subassembly of the apparatus comprising base, stem, lampshade blocking element and lamp;
- Figure 8c is a three-dimensional view of a first embodiment of an apparatus according to the present invention, relating to the subassembly of the apparatus comprising base, stem and lamp;
- Figure 9 is a blown-up view of the assembly made up of the second embodiment of the lamp of the present invention, an assembly of connection between said lamp and the stem of the first embodiment of the apparatus according to the present invention;
- Figure 10 is a blown-up view of the assembly of connection between a third or fourth embodiment of the present invention and the stem of the second embodiment of the apparatus of the present invention;
- Figure 11a is a three-dimensional view of a second embodiment of an apparatus according to the present invention, relating to the subassembly of the apparatus comprising base, stem and lamp; and
- Figure 11b is a three-dimensional view of a third embodiment of an apparatus according to the present invention, relating to the subassembly of the apparatus comprising base, stem and lamp;

DETAILED DESCRIPTION OF THE INVENTION

[0016] Referring to Figures 1a, 1b, 2a, 2b, 3a, 5a and 6a, a first embodiment of the LED lamp (1) of the present invention comprises:

- a load-bearing structure (2) provided with a first (22) and with a second end (42'); and
- four LED modules (3, 3'), each comprising:
 - a printed circuit board;
 - fourteen LEDs (6, 6', 7, 7', 8, 8') mounted on the printed circuit board.

[0017] The fourteen LEDs (6, 6', 7, 7', 8, 8') are organised into two independent circuits, each of said circuits comprising seven LEDs (6, 6', 7, 7', 8, 8'). In this way a possible breakdown of one single LED does not jeopardise the functioning of the entire board but only of half thereof.

[0018] Each of the LED modules (3, 3') is attached in a reversible manner on the load-bearing structure (2) by means of two socket head screws (10, 10'). Each LED (3, 3') comprises, moreover, a connector (9, 9') in order to receive electrical current from the outside. The LED modules (3, 3') are positioned on the load-bearing structure (2) in such a way that the connectors (9, 9') of each

LED module (3, 3') are placed in proximity of the same end (42') of the load-bearing structure (2). Each LED module (3, 3') comprises two internally threaded holes (13, 13'), each of said holes (13, 13') being configured to each accommodate a screw (10, 10'). The load-bearing structure (2) comprises, in turn, two holes for each LED module, for a total of eight holes (12, 12'). These holes (12, 12') are also internally threaded and are configured to each accommodate a screw (10, 10'). Superimposing each LED module (3, 3') on the load-bearing structure (2), in such a way that the holes (13, 13') of the LED module (3, 3') correspond to the holes (12, 12') of the load-bearing structure (2) and screwing a socket head screw (10, 10') in said holes (12, 12', 13, 13'), in such a way that the latter traverses with continuity the holes (13, 13') of the LED module (3, 3') first and the holes (12, 12') of the load-bearing structure (2) later, the single LED module (3, 3') is attached reversibly onto the load-bearing structure (2). In the first embodiment of the present invention, the load-bearing structure (2) of the LED lamp (1) is given by the difference between a solid parallelepiped and a hollow cylinder (20'), said hollow cylinder (20') projecting outside of said parallelepiped, at the second end (42').

[0019] Referring to Figures 1a, 1b, 2a, 2b, 3b, 5a and 6a, a second embodiment of the LED lamp (1') of the present invention comprises:

- a load-bearing structure (2) provided with a first (22) and with a second end (42'); and
- four LED modules (3, 3'), each comprising:
 - a printed circuit board;
 - fourteen LEDs (6, 6', 7, 7', 8, 8') mounted on the printed circuit board.

[0020] The fourteen LEDs (6, 6', 7, 7', 8, 8') are organised into two independent circuits, each of said circuits comprising seven LEDs (6, 6', 7, 7', 8, 8').

[0021] Each of the LED modules (3, 3') is attached in a reversible manner on the load-bearing structure (2) by means of two thumb screws (11, 11'), which can be unscrewed by hand. Each LED (3, 3') comprises, moreover, a connector (9, 9') in order to receive electrical current from the outside. The LED modules (3, 3') are positioned on the load-bearing structure (2) in such a way that the connectors (9, 9') of each LED module (3, 3') are placed in proximity of the same end (42') of the load-bearing structure (2). Each module (3, 3') comprises two internally threaded holes (13, 13'), each of said holes (13, 13') being configured to each accommodate a screw (11, 11'). The load-bearing structure (2) comprises, in turn, two holes for each LED module, for a total of eight holes (12, 12'). These holes (12, 12') are also internally threaded and are configured to each accommodate a screw (11, 11'). Superimposing each LED module (3, 3') on the load-bearing structure (2), in such a way that the holes (13, 13') of the LED module (3, 3') correspond to the

holes (12, 12') of the load-bearing structure (2) and screwing manually a thumb screw (11, 11') in said holes (12, 12', 13, 13'), in such a way that the latter traverses with continuity the holes (13, 13') of the LED module (3, 3') first and the holes (12, 12') of the load-bearing structure (2) later, the single LED module (3, 3') is attached reversibly onto the load-bearing structure (2). In the second embodiment of the present invention, the load-bearing structure (2) of the LED lamp (1') is given by the difference between a solid parallelepiped and a hollow cylinder (20'), said hollow cylinder (20') projecting outside of said parallelepiped, at the second end (42').

[0022] Referring to Figures 1a, 1b, 2a, 2b, 4a, 5b and 6b, a third embodiment of the LED lamp (101) of the present invention comprises:

- a load-bearing structure (2') provided with a first (22) and with a second end (22'); and
- four LED modules (3, 3'), each comprising:
 - a printed circuit board;
 - fourteen LEDs (6, 6', 7, 7', 8, 8') mounted on the printed circuit board.

[0023] The fourteen LEDs (6, 6', 7, 7', 8, 8') are organised into two independent circuits, each of said circuits comprising seven LEDs (6, 6', 7, 7', 8, 8').

[0024] Each of the LED modules (3, 3') is attached in a reversible manner on the load-bearing structure (2') by means of two socket head screws (10, 10'). Each LED module (3, 3') comprises, moreover, a connector (9, 9', 19, 19') in order to receive electrical current from the outside. The LED modules (3, 3') are positioned on the load-bearing structure (2') in such a way that the connectors (9, 9', 19, 19') of each LED module (3, 3') are placed in proximity of the same end (22') of the load-bearing structure (2'). Each LED module (3, 3') comprises two internally threaded holes (13, 13'), each of said holes (13, 13') being configured to each accommodate a screw (10, 10'). The load-bearing structure (2') comprises, in turn, two holes for each LED module, for a total of eight holes (12, 12'). These holes (12, 12') are also internally threaded and are configured to each accommodate a screw (10, 10'). Superimposing each LED module (3, 3') on the load-bearing structure (2'), in such a way that the holes (13, 13') of the LED module (3, 3') correspond to the holes (12, 12') of the load-bearing structure (2') and screwing a socket head screw (10, 10') in said holes (12, 12', 13, 13'), in such a way that the latter traverses with continuity the holes (13, 13') of the LED module (3, 3') first and the holes (12, 12') of the load-bearing structure (2') later, the single LED module (3, 3') is attached reversibly onto the load-bearing structure (2). In the third embodiment of the present invention, the load-bearing structure (2') of the LED lamp (101) is a hollow parallelepiped, the base surface of said parallelepiped being formed by the surface comprised between two concentric squares.

[0025] Referring to Figures 1a, 1b, 2a, 2b, 4b, 5b and 6b, a fourth embodiment of the LED lamp (101') of the present invention comprises:

- a load-bearing structure (2') provided with a first (22) and with a second end (22'); and
- four LED modules (3, 3'), each comprising:
 - a printed circuit board;
 - fourteen LEDs (6, 6', 7, 7', 8, 8') mounted on the printed circuit board.

[0026] The fourteen LEDs (6, 6', 7, 7', 8, 8') are organised into two independent circuits, each of said circuits comprising seven LEDs (6, 6', 7, 7', 8, 8').

[0027] Each of the LED modules (3, 3') is attached in a reversible manner on the load-bearing structure (2') by means of two thumb screws (11, 11'), which can be unscrewed by hand. Each LED module (3, 3') comprises, moreover, a connector (9, 9', 19, 19') in order to receive electrical current from the outside. The LED modules (3, 3') are positioned on the load-bearing structure (2') in such a way that the connectors (9, 9', 19, 19') of each LED module (3, 3') are placed in proximity of the same end (22') of the load-bearing structure (2'). Each LED module (3, 3') comprises two internally threaded holes (13, 13'), each of said holes (13, 13') being configured to each accommodate a screw (11, 11'). The load-bearing structure (2') comprises, in turn, two holes for each LED module, for a total of eight holes (12, 12'). These holes (12, 12') are also internally threaded and are configured to each accommodate a screw (11, 11'). Superimposing each LED module (3, 3') on the load-bearing structure (2'), in such a way that the holes (13, 13') of the LED module (3, 3') correspond to the holes (12, 12') of the load-bearing structure (2') and screwing manually a thumb screw (11, 11') in said holes (12, 12', 13, 13'), in such a way that the latter traverses with continuity the holes (13, 13') of the LED module (3, 3') first and the holes (12, 12') of the load-bearing structure (2') later, the single LED module (3, 3') is attached reversibly onto the load-bearing structure (2'). In the fourth embodiment of the present invention, the load-bearing structure (2') of the LED lamp (101') is a hollow parallelepiped, the base surface of said parallelepiped being formed by the surface comprised between two concentric squares.

[0028] Referring to Figures 1a, 1b, 2a, 2b, 3a, 3b, 5a, 6a, 7a, 8a, 8b, 8c and 9, a first embodiment of the apparatus (100) for the lighting of rooms of the present invention comprises:

- a LED lamp (1, 1') in its first or second embodiment;
- a base (301) for resting on the floor or on a table;
- preferably, a lampshade blocking element (600) configured in order to cover said LED lamp (1, 1') and for the attachment of a lampshade (500); and
- a stem (302) provided with a first end (302') configured in order to be connected to the base (301) and

with a second end (302'') configured in order to be connected to the LED lamp (1, 1') and to the lampshade blocking element (600); and

- a heat sink (900) contained in the second end of the stem (302).

[0029] The lampshade blocking element (600) is provided with a threaded ring nut to which to screw the lampshade (500). The second end (302'') of the stem (302) is connected structurally and electrically to said lamp (1, 1', 101, 101') by means of a connection assembly (700), said assembly (700) comprising: a circular hole (303) configured for the insertion of the hollow cylinder (20') and four connectors (304, 304', 305, 305'), one for each LED module (3, 3') of the lamp (1, 1'), said connectors being configured in order to be coupled with the connectors (9, 9', 19, 19') of the LED modules (3, 3') allowing the supply thereof. Referring to 8c and 9, the connection assembly (700) is mounted on the heat sink (900) contained on the second end (302'') of the stem. Referring to Figures 1a, 1b, 2a, 2b, 4a, 4b, 5b, 6b, 7b, 8a, 8b, 8c and 10, a second embodiment of the apparatus (100) for the lighting of rooms of the present invention comprises:

- a LED lamp (101, 101') in its third or fourth embodiment;
- a base (301) for resting on the floor or on a table;
- preferably, a lampshade blocking element (600) configured in order to cover said LED lamp (101, 101') and for the attachment of a lampshade (500); and
- a stem (302) provided with a first end (302') configured in order to be connected to the base (301) and with a second end (302'') configured in order to be connected to the LED lamp (101, 101') and to the lampshade blocking element (600);
- a heat sink (900) contained in the second end of the stem (302).

[0030] The lampshade blocking element (600) is provided with a threaded ring nut to which to screw the lampshade (500). The second end (302'') of the stem (302) is connected structurally and electrically to said lamp (1, 1', 101, 101') by means of a connection assembly (700'), said assembly (700') comprising: a parallelepiped-shaped element (303') configured for the insertion in the load-bearing structure (2') and four connectors (404, 404', 405') for each LED module (3, 3') of the lamp (101, 101'), said connectors being configured in order to be coupled with the connectors (9, 9') of each of the LED modules (3, 3') allowing the supply thereof.

[0031] Referring to 8c and 9, the connection assembly (700') is mounted on the heat sink (900) contained on the second end (302'') of the stem.

[0032] Referring to Figure 11a, a third embodiment of the apparatus (200) of the present invention comprises:

- a LED lamp (1, 1', 101, 101') according to any one of the preceding claims;

- a base (801) configured in order to be mounted on the ceiling;
- preferably, a lampshade blocking element (600) configured in order to cover said LED lamp (1, 1', 101, 101') and for the attachment of a lampshade (500);
- a stem (302) provided with a first end (302') configured in order to be connected to the base (301) and with a second end (302'') configured in order to be connected to the LED lamp (1) and to the lampshade blocking element (600);
- a heat sink (900) contained in the second end of the stem (302).

[0033] The lampshade blocking element (600) is provided with a threaded ring nut to which to screw the lampshade (500). The second end (302'') of the stem (302) is connected structurally and electrically to said lamp (1, 1', 101, 101') by means of a connection assembly (700), said assembly (700) comprising: a circular hole (303) configured for the insertion of the hollow cylinder (20') and at least one connector (304, 304', 305, 305') for each LED module (3, 3') of the lamp (1, 1'), said connectors being configured in order to be coupled with the connectors (9, 9', 19, 19') of the LED modules (3, 3') allowing the supply thereof. Referring to 8c and 9, the connection assembly (700) is mounted on the heat sink (900).

[0034] Referring to Figure 11b, a fourth embodiment of the apparatus (200) of the present invention comprises:

- a LED lamp (1, 1', 101, 101') according to any one of the preceding claims;
- a base (801) configured in order to be mounted on the ceiling;
- preferably, a lampshade blocking element (600) configured in order to cover said LED lamp (1, 1', 101, 101') and for the attachment of a lampshade (500);
- a stem (302) provided with a first end (302') configured in order to be connected to the base (301) and with a second end (302'') configured in order to be connected to the LED lamp (1) and to the lampshade blocking element (600); and
- a heat sink (900) contained in the second end of the stem (302).

[0035] The lampshade blocking element (600) is provided with a threaded ring nut to which to screw the lampshade (500). The second end (302'') of the stem (302) is connected structurally and electrically to said lamp (1, 1', 101, 101') by means of a connection assembly (700'), said assembly (700') comprising: a parallelepiped-shaped element (303') configured for the insertion in the load-bearing structure (2') and four connectors (404, 404', 405') for each LED module (3, 3') of the lamp (101, 101'), said connectors being configured in order to be coupled with the connectors (9, 9') of each of the LED modules (3, 3') allowing the supply thereof. Referring to 8c and 9, the connection assembly (700') is mounted on

the heat sink (900).

[0036] In all the embodiments of the apparatus described above, the connection assembly (700') is mounted on the heat sink (900) contained on the second end (302') of the stem.

[0037] Considering what is described above, for the purposes of the present description, the term "stem" is intended to be used in its more general meaning, valid both for so-called "table lamps" and for "floor lamps" and, finally, for the so-called "suspension lamps". In the case of "table lamps" and "floor lamps", the term "stem" is understood to be that element which allows the lamp to be connected with a base configured for the resting on a horizontal plane such as the floor or a table. In the case of "suspension lamps", the term "stem" is understood to be, instead, that element which allows the lamp to be connected with a base configured in order to be attached to or hanging from a ceiling.

[0038] Referring to Figures 1a, 1b, 2a, 2b, 3a, 7a, a first embodiment of the kit that is the object of the present invention comprises:

- at least one LED module configured in order to be attached to said lamp (1, 101), said at least one LED module being other than the LED modules (3, 3') comprised in the lamp (1, 101);
- a connection assembly (700) of the lamp (1), in its first embodiment, with a stem (302) of a lighting apparatus in its first embodiment; and
- two socket head screws (10, 10'); and
- an Allen key.

[0039] The first embodiment of the kit can, also, comprise:

- a lamp (1) in its first embodiment.

[0040] Referring to Figures 1a, 1b, 2a, 2b, 3b, 7a, a second embodiment of the kit that is the object of the present invention comprises:

- at least one LED module configured in order to be attached to said lamp (1'), said at least one LED module being other than the LED modules (3, 3') comprised in the lamp (1);
- a connection assembly (700) of the lamp (1'), in its second embodiment, with a stem (302) of a lighting apparatus in its first embodiment; and
- at least two thumb screws (11, 11') which can be unscrewed by hand.

[0041] The second embodiment of the kit can, also, comprise:

- a lamp (1') in its second embodiment.

[0042] Referring to Figures 1a, 1b, 2a, 2b, 4a, 7b, a third embodiment of the kit that is the object of the present

invention comprises:

- at least one LED module configured in order to be attached to said lamp (101), said at least one LED module being other than the LED modules (3, 3') comprised in the lamp (101);
- a connection assembly (700) of the lamp (101), in its third embodiment, with a stem (302) of a lighting apparatus in its second embodiment; and
- two socket head screws (10, 10'); and
- an Allen key.

[0043] The third embodiment of the kit can, also, comprise:

- a lamp (101) in its third embodiment.

[0044] Referring to Figures 1a, 1b, 2a, 2b, 4b, 7b, a fourth embodiment of the kit that is the object of the present invention comprises:

- at least one LED module configured in order to be attached to said lamp (101'), said at least one LED module being other than the LED modules (3, 3') comprised in the lamp (101');
- a connection assembly (700) of the lamp (101'), in its fourth embodiment, with a stem (302) of a lighting apparatus in its second embodiment; and
- at least two thumb screws (11, 11') which can be unscrewed by hand.

[0045] The fourth embodiment of the kit can, also, comprise:

- a lamp (101') in its fourth embodiment.

[0046] All the embodiments of the kit of the present invention can also comprise a heat sink (900) configured in order to be contained in the second end of the stem (302').

Claims

1. LED lamp (1, 1', 101, 101') comprising:

- a load-bearing structure (2, 2') provided with a first (22) and with a second end (22', 42'); and
- at least one first and one second LED module (3, 3'), attached in a reversible manner on said load-bearing structure (2, 2') by means of mechanical attachment means (10, 10', 11, 11"), said at least one first and one second LED module each comprising:

- a printed circuit board;
- at least one LED (6, 6', 7, 7, 8, 8') mounted on the printed circuit board; and

- at least one connector (9, 9', 19, 19') in order to receive electrical current from the outside.

said LED lamp (1, 1', 101, 101') being **characterised in that** it is configured to be connected to a stem (302) of a lighting apparatus by means of a connection assembly (700, 700') comprising:

- a circular hole (303) configured for the insertion of the hollow cylinder (20') and at least one connector (304, 304', 305, 305') for each LED module (3, 3') of the lamp (1, 1'), said at least one connector being configured in order to be coupled with the connector (9, 9', 19, 19') of each of the LED modules (3, 3') allowing the supply thereof; or

a parallelepiped-shaped element (303') configured for the insertion in the load-bearing structure (2') and at least one connector (404, 404', 405) for each LED module (3, 3') of the lamp (101, 101'), said at least one connector being configured in order to be coupled with the connector (9, 9') of each of the LED modules (3, 3') allowing the supply thereof.

- LED lamp according to claim 1, wherein the connection assembly (700, 700') is mounted on a heat sink (900) configured to be contained in the second end of the stem (302').
- LED lamp (1, 1', 101, 101') according to claim 1 or 2, wherein said at least one first and one second LED modules (3, 3') are positioned on said load-bearing structure (2, 2') in such a way that the at least one connector (9, 9', 19, 19') of the first LED module (3, 3') and the at least one connector (9, 9', 19, 19') of the second LED module (3, 3') are placed in proximity of the same end (22', 42') of the load-bearing structure (2, 2').
- LED lamp (1, 1', 101, 101') according to any one of the preceding claims, wherein the mechanical attachment elements (10, 10', 11, 11') comprise at least one screw (10, 10', 11, 11') for each of the at least two LED modules (3, 3').
- LED lamp (1, 1', 101, 101') according to claim 4, wherein said load-bearing structure (2, 2') comprises at least one first (12) and one second (12') internally threaded holes, said first (12) and second (12') holes being configured in order to accommodate each said at least one screw (10, 10', 11, 11').
- LED lamp (1, 1', 101, 101') according to claim 5, wherein each of said first and second LED modules (3, 3') comprises at least one internally threaded hole (13, 13'), said at least one hole being configured to

accommodate said at least one screw (10, 10', 11, 11').

- LED lamp (1, 1', 101, 101') according to any one of claims 1 to 6, wherein said load-bearing structure (2) is given by the difference between a solid parallelepiped and a hollow cylinder (20'), said hollow cylinder (20') projecting outside of said parallelepiped, at the second end (42') of the structure (2).
- LED lamp (1, 1', 101, 101') according to any one of claims 1 to 6, wherein said load-bearing structure (2') is a hollow parallelepiped, the base surface of said parallelepiped being formed by the surface comprised between two concentric squares.
- LED lamp (1, 1', 101, 101') according to any one of the preceding claims, wherein said at least one first and one second LED module (3, 3') comprise a plurality of LEDs divided into two independent circuits.
- Apparatus (100) for the lighting of rooms, comprising:

- a LED lamp (1, 1', 101, 101') according to any one of the preceding claims;
- a base (301) for resting on the floor or on a table;
- a lampshade blocking element (600) configured in order to cover said LED lamp (1, 1', 101, 101') and for the attachment of a lampshade (500);
- a stem (302) provided with a first end (302') configured in order to be connected to the base (301) and with a second end (302'') configured in order to be connected to the LED lamp (1) and to the lampshade blocking element (600);
- a heat sink (900) contained in the second end of the stem (302);

said apparatus (100) **characterised in that** it comprises:

- a connection assembly (700, 700') mounted on the heat sink (900), said connection assembly (700, 700') comprising:
 - a circular hole (303) configured for the insertion of the hollow cylinder (20') and at least one connector (304, 304', 305, 305') for each LED module (3, 3') of the lamp (1, 1'), said at least one connector being configured in order to be coupled with the connector (9, 9', 19, 19') of each of the LED modules (3, 3') allowing the supply thereof; or
 - a parallelepiped-shaped element (303') configured for the insertion in the load-bearing

ing structure (2') and at least one connector (404, 404', 405) for each LED module (3, 3') of the lamp (101, 101'), said at least one connector being configured in order to be coupled with the connector (9, 9') of each of the LED modules (3, 3') allowing the supply thereof.

11. Apparatus (200) for the lighting of rooms, comprising:

- a LED lamp (1, 1', 101, 101') according to any one of the preceding claims;
- a base (801) configured in order to be mounted on the ceiling;
- a stem (302) provided with a first end (302') configured in order to be connected to the base (301) and with a second end (302'') configured in order to be connected to the LED lamp (1); and
- a heat sink (900) contained in the second end of the stem (302).

said apparatus (200) **characterised in that** it comprises:

- a connection assembly (700, 700') mounted on the heat sink (900), said connection assembly (700, 700') comprising:

- a circular hole (303) configured for the insertion of the hollow cylinder (20') and at least one connector (304, 304', 305, 305') for each LED module (3, 3') of the lamp (1, 1'), said at least one connector being configured in order to be coupled with the connector (9, 9', 19, 19') of each of the LED modules (3, 3') allowing the supply thereof;
- or
- a parallelepiped-shaped element (303') configured for the insertion in the load-bearing structure (2') and at least one connector (404, 404', 405) for each LED module (3, 3') of the lamp (101, 101'), said at least one connector being configured in order to be coupled with the connector (9, 9') of each of the LED modules (3, 3') allowing the supply thereof.

12. Apparatus (100, 200) according to claim 10 or 11, wherein the connection assembly (700, 700') is mounted on a heat sink (900) configured to be contained in the second end of the stem (302').

13. Kit comprising:

- at least one LED module configured in order to be attached to said lamp (1, 1', 101, 101'), said at least one LED module being other than

the LED modules (3, 3') comprised in the lamp (1, 1', 101, 101');

- a connection assembly (700, 700') of the lamp (1, 1', 101, 101') according to any one of claims 1 to 7, with a stem (302) of a lighting apparatus according to any one of claims 10 to 12; and
- means of mechanical attachment (10, 10', 11, 11') of said at least one LED module configured in order to be attached to said lamp (1, 100), said mechanical attachment means (10, 10', 11, 11') being constituted by:

- at least two socket head screws (10, 10') and an Allen key; or
- at least two thumb screws (11, 11') which can be unscrewed by hand.

14. Kit according to the preceding claim, comprising:

- a lamp according to any one of claims 1 to 9.

15. Kit according to any one of the preceding claims comprising:

- a heat sink (900) configured in order to be contained in the second end of the stem (302').

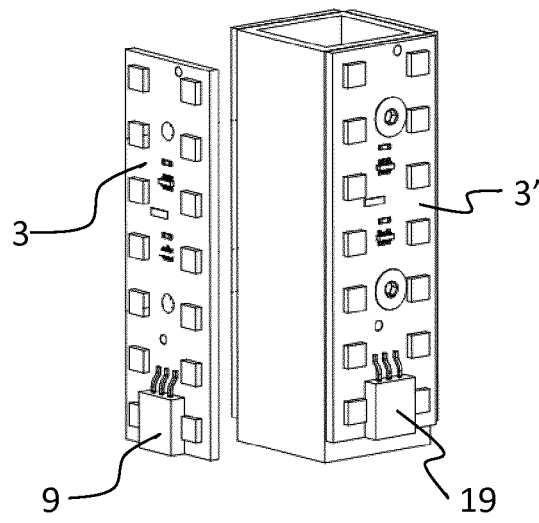


Fig.1a

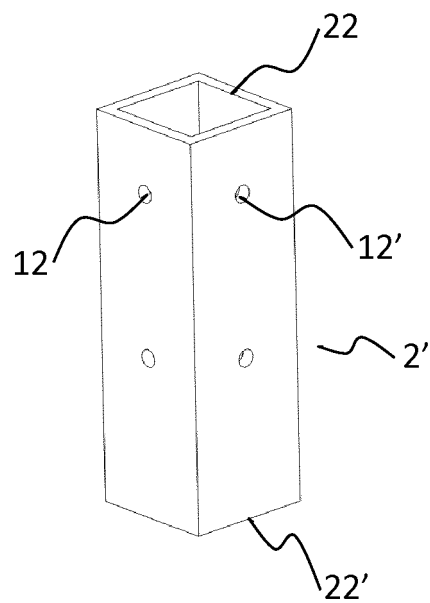
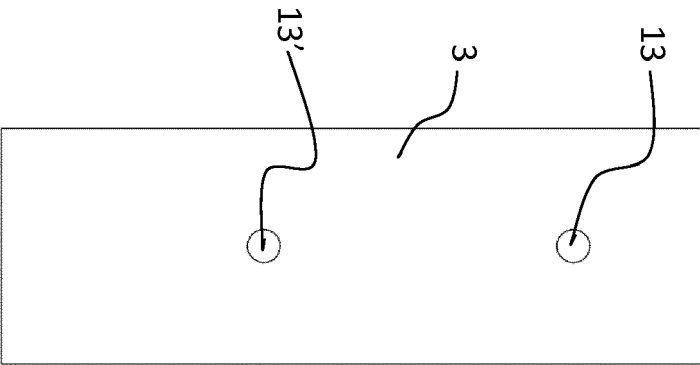
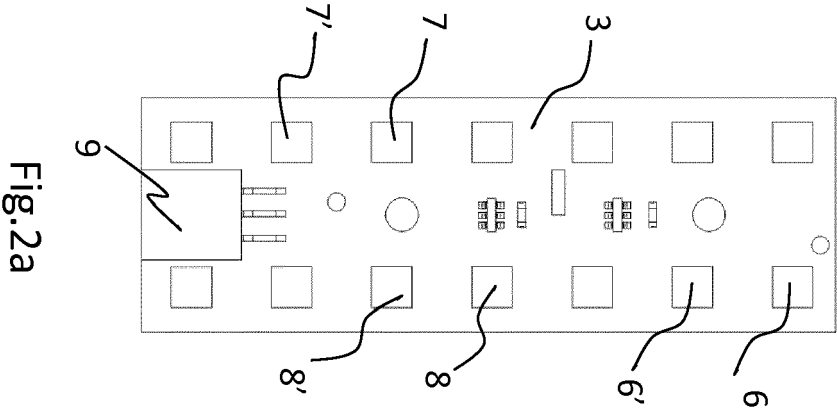


Fig.1b



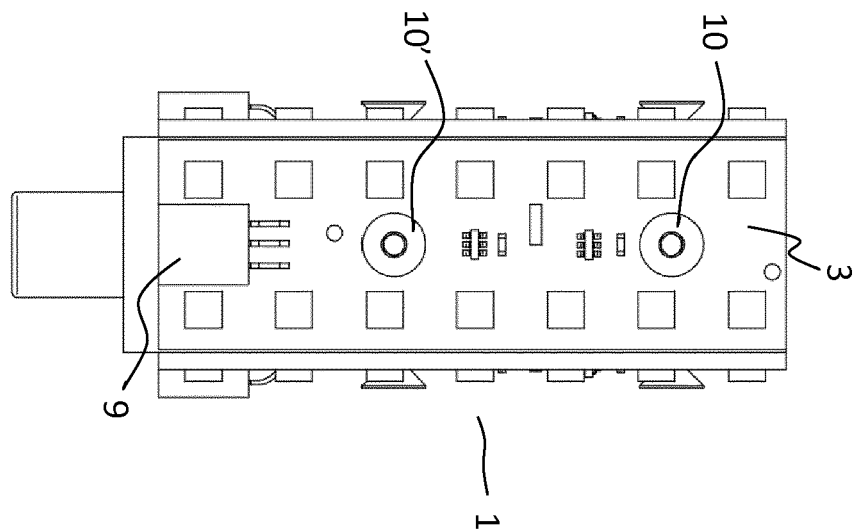


Fig. 3a

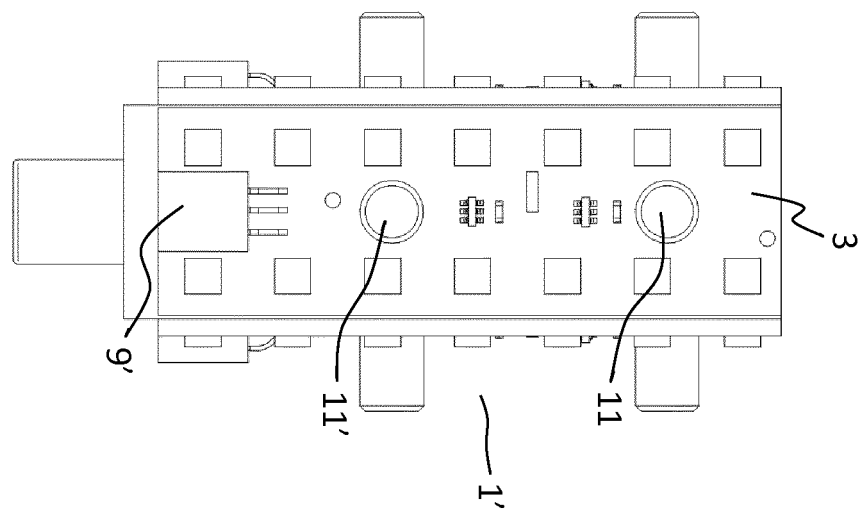
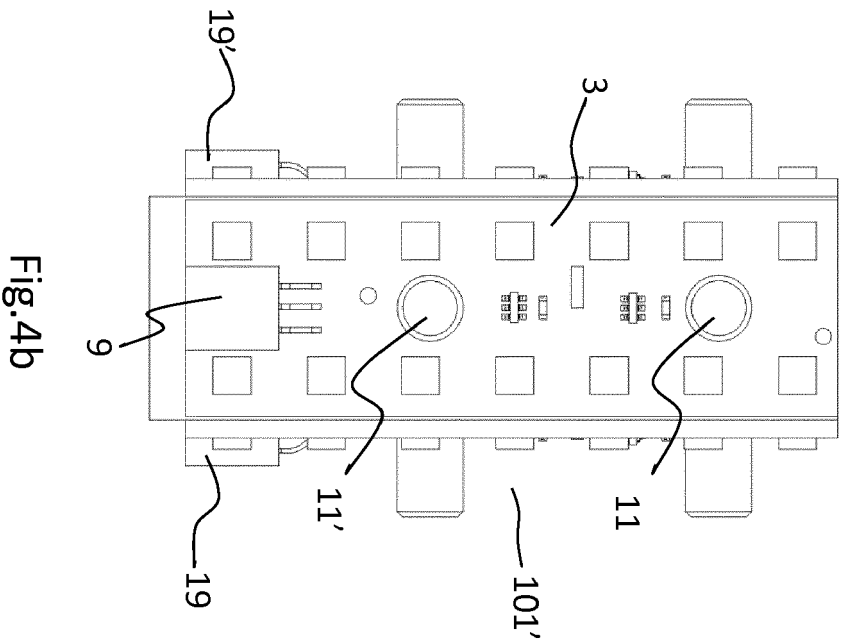
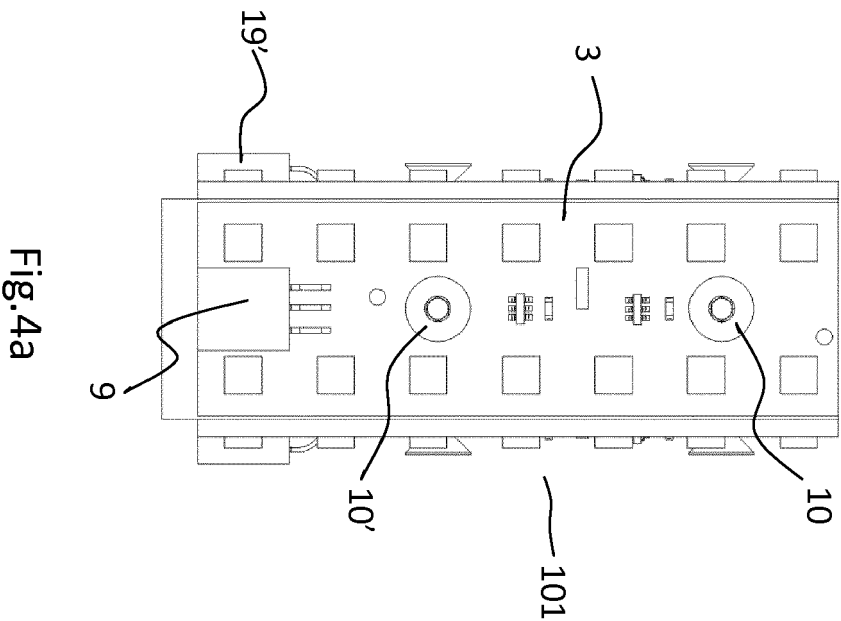


Fig. 3b



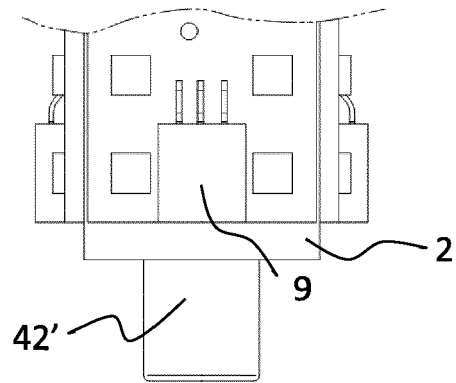


Fig.5a

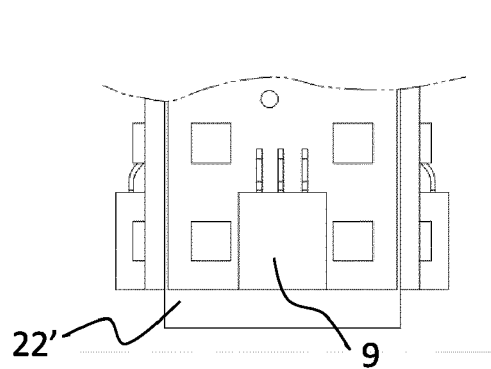


Fig.5b

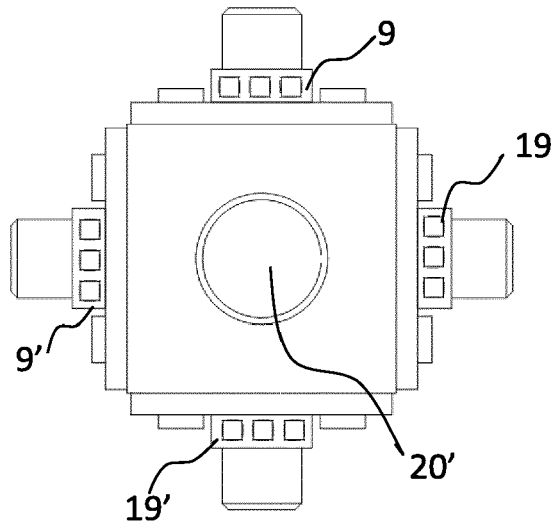


Fig. 6a

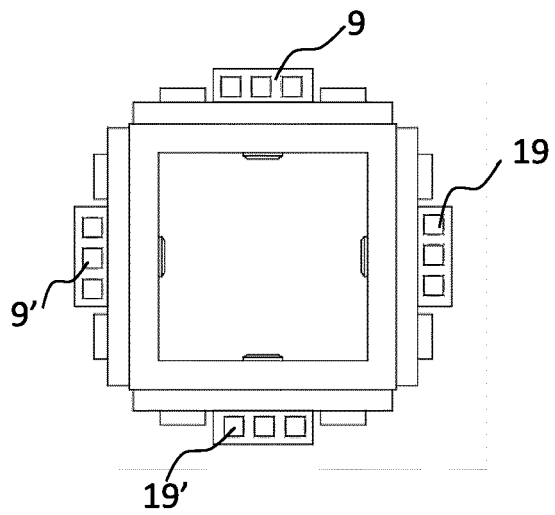


Fig. 6b

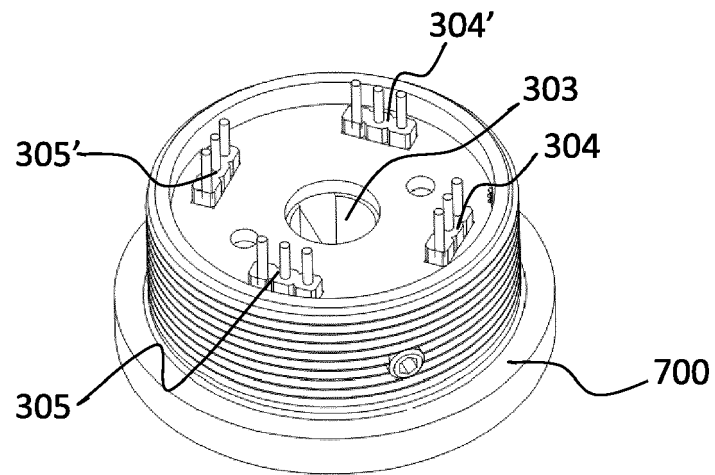


Fig. 7a

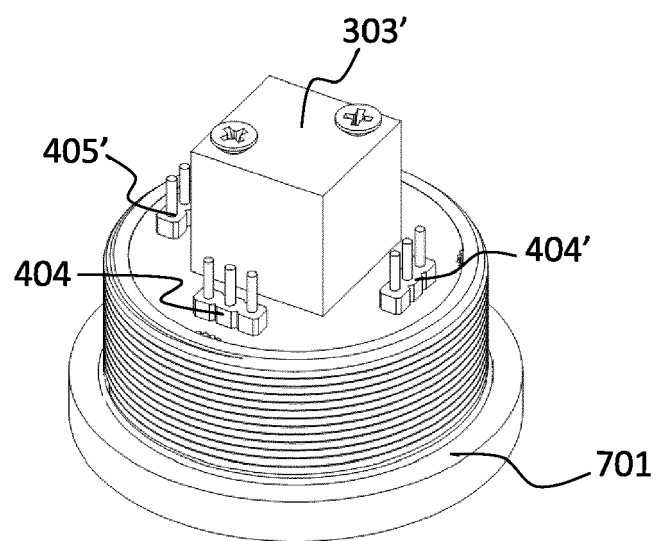


Fig. 7b

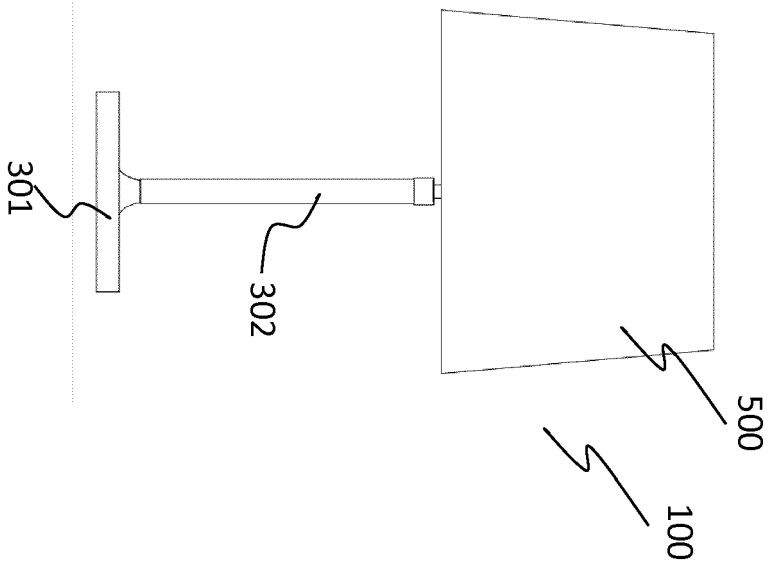


Fig. 8a

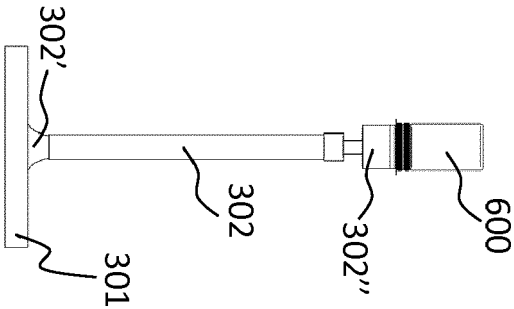


Fig. 8b

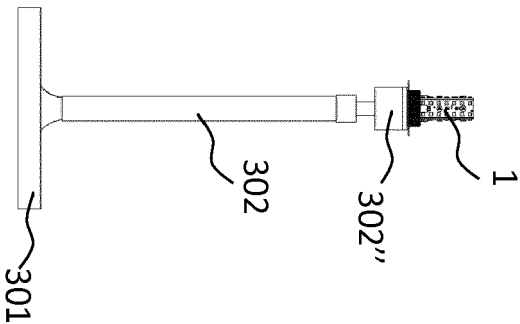
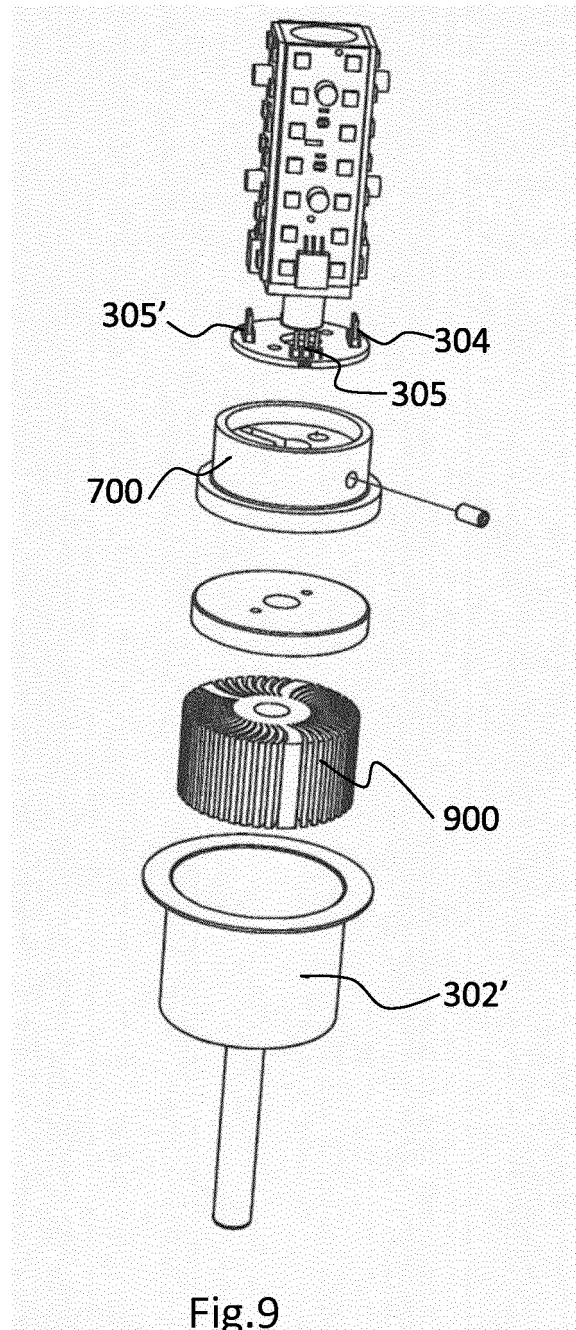


Fig. 8c



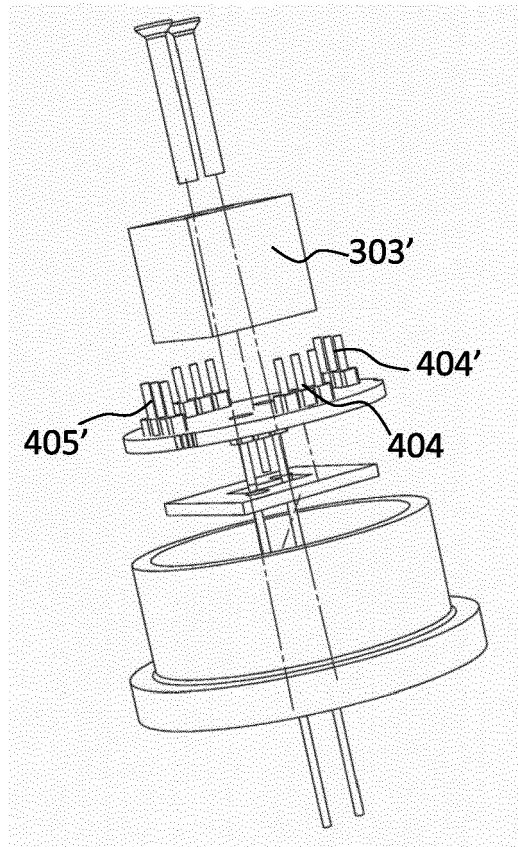


Fig.10

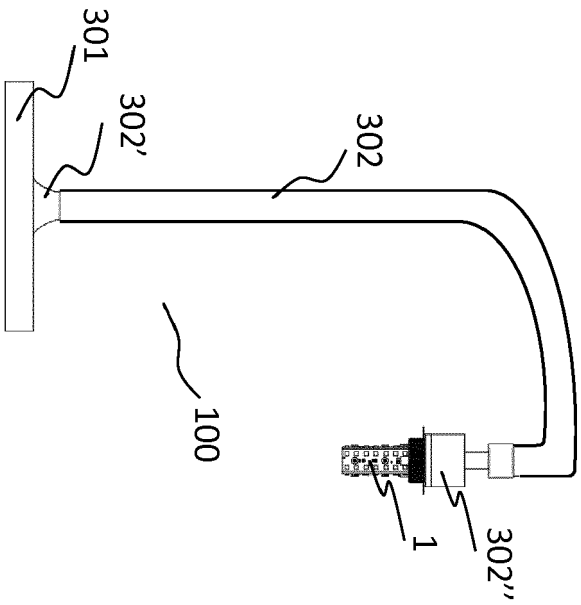


Fig. 11a

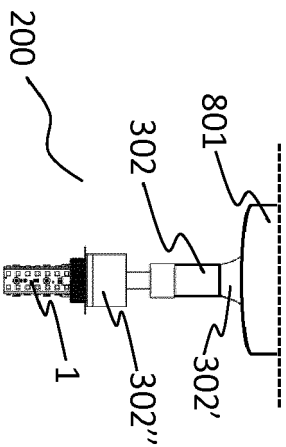


Fig. 11b



EUROPEAN SEARCH REPORT

Application Number
EP 19 16 8999

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2008/291663 A1 (WEDELL MARK TAYLOR [US] ET AL) 27 November 2008 (2008-11-27) * figures 1-4, 7 * * paragraphs [0017] - [0027] *	1-15	INV. F21S6/00 F21V1/00 F21V19/00
Y	CN 101 551 092 A (XUCAI OPTOELECTRIC CO LTD [CN]) 7 October 2009 (2009-10-07) * figures 1, 2 * * example 1 *	1-15	ADD. F21Y115/10
A	DE 10 2009 019881 A1 (LIBAL ULRICH [DE]; REITZENSTEIN HUBERTUS VON [DE]) 11 November 2010 (2010-11-11) * figures 2-4, 7, 8 * * paragraphs [0041] - [0053] *	1-15	
A	US 2015/124444 A1 (CHEN CHI-LIN [TW]) 7 May 2015 (2015-05-07) * figures 2-6 * * paragraph [0018] *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			F21S F21V F21Y
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 25 June 2019	Examiner Vida, Gyorgy
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			

EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 16 8999

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

25-06-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008291663 A1	27-11-2008	NONE	

CN 101551092 A	07-10-2009	NONE	

DE 102009019881 A1	11-11-2010	NONE	

US 2015124444 A1	07-05-2015	CN 204187523 U	04-03-2015
		TW M478103 U	11-05-2014
		US 2015124444 A1	07-05-2015
