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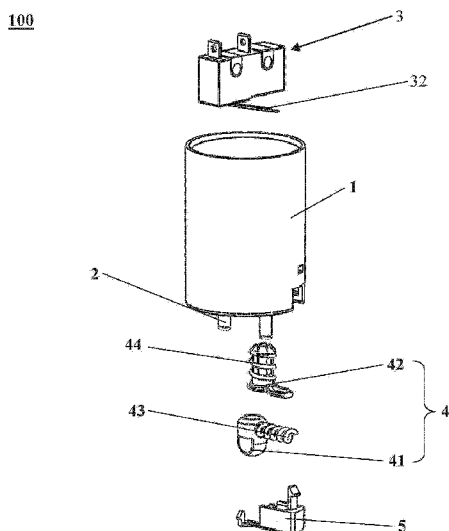


Figure 1

(57) Abstract: The present invention relates to an end cap (100) for an illumination apparatus and to an illumination apparatus, the end cap (100) comprises a housing (1); an electrical conductor (2) provided on an outer end surface (S) of the housing (1), wherein the electrical conductor (2) can be inserted into a socket that supplies power; a switching unit (3) accommodated in the housing (1), wherein the switching unit (3) is used for switching on or switching off electrical connection between the electrical conductor (2) and other power consumption components of the illumination apparatus; and a drive unit (4) for controlling the switching unit (3), wherein the drive unit (4) is designed such that, during connecting the electrical conductor (2) to the socket, the socket applies a force moving the drive unit (4) so as to automatically switch on the switching unit (3), and during disconnecting the electrical conductor (2) from the socket, the drive unit (4) returns to an initial position with the action of a restoring force, so as to automatically switch off the switching unit (3).

Description

End Cap for an Illumination Apparatus, and Illumination Apparatus

5

Technical Field

The present invention relates to an end cap for an illumination apparatus and to an illumination apparatus.

Background Art

10 End caps for connection with a power supply are usually provided at both ends of a generally used tubular light emitting device, and in order to improve the safety of the light emitting device, the end caps are usually designed to have two-step safe operation function. After manually connecting and
15 fixing a lamp tube with an end cap mounted to a socket having a power supply, additional manual operation on the end cap is required, so as to switch on the electrical connection between the power supply and the lamp tube. In the prior art, e.g. a mechanical, electrical, magnetic, or thermal switching
20 device is usually applied to an end cap for a light emitting device, so as to switch the electrical connection between the power supply and the lamp tube. In a solution in the prior art, e.g. a mechanical switching device is used, which can switch on or switch off the electrical connection between a
25 power supply and a lamp tube when an end cap is rotated relative to the lamp tube. Moreover, in another solution in the prior art, e.g. a mechanical switching device is further provided, wherein a push-button switch is provided on the outer surface of an end cap, and the switching device is configured
30 to an "ON" or "OFF" mode by pressing this push-button switch, so as to switch on or switch off the electrical connection between a power supply and a lamp tube. The above end caps provided in the prior art both require configurations for the

end caps through additional manual operation after that the end caps are completely mounted and fixed to the socket, so as to switch on or switch off the light emitting device.

Summary of the Invention

- 5 An object of the present invention is to provide an end cap for an illumination apparatus and an illumination apparatus comprising this end cap. This end cap has an improved switching manner, wherein the end cap automatically switches on the electrical connection between a power supply or a adapter and
10 a light emitting unit when being connected to the adapter, so as to implement a two-step safe operation, while manually switching on the electrical connection is not required after that the end cap is completely mounted and fixed to the adapter. Moreover, this end cap has a simple mechanical
15 structure and user friendly configuration, and is suitable for the action of an operator when mounting and connecting a light emitting device to an adapter under normal conditions, such that an electrical connection is automatically switched on during mounting by means of the action.
- 20 The first object of the present invention is solved by an end cap for an illumination apparatus, that is, an end cap for an illumination apparatus, which comprises a housing; an electrical conductor provided at an outer end surface of the housing, wherein the electrical conductor can be inserted in-
25 to an adapter that supplies power; a switching unit accommodated in the housing, wherein the switching unit is used for switching on or switching off an electrical connection between the electrical conductor and other power consumption components of the illumination apparatus; and a drive unit
30 for controlling the switching unit, wherein the drive unit is designed such that, during connecting the electrical conductor to the adapter, the adapter applies a force moving the

drive unit so as to automatically switch on the switching unit, and during disconnecting the electrical conductor from the adapter, the drive unit returns to an initial position with the action of a restoring force, so as to automatically switch off the switching unit.

The end cap according to the present invention has a simple mechanical structure, wherein the switching unit in the end cap can be turned on just by means of the force applied on the end cap by the adapter during connecting the end cap to the adapter, so as to automatically switch on the electrical connection between the adapter and a light emitting unit in connection with the end cap. Such an operation process does not require additional manual operation to switch on the switching unit in the end cap, that is to say, the switching unit in the end cap is already turned on when the end cap is completely connected and fixed to the adapter, and the electricity from the power supply can directly flow to the light emitting unit, such as a lamp tube, in connection with the end cap.

According to a preferred example of the present invention, the drive unit is arranged to be partially exposed through the outer end surface, and to transfer the force applied on the drive unit to the switching unit in a direction towards the switching unit, so as to switch on the switching unit.

The adapter can control the switching unit provided in the interior of the housing through operation on the portion of the drive unit that is exposed through the outer end surface of the housing. The force applied on the adapter through the end cap while the end cap is connecting to the adapter can be directly used to perform action on the portion of the drive unit which is exposed through the housing, such that the adapter can hereby exert a counter force on the drive unit of

the end force.

Preferably, the drive unit includes a first operation part which can extend out from an opening provided on the outer end surface and a second operation part provided in the housing, wherein the first operation part can move towards the second operation part by means of the force applied by the adapter, and force the second operation part to move, so as to switch on the switching unit. The first operation part can transfer the force applied thereon to the second operation part, so as to force the second operation part to move, such that the force applied from outside of the end cap is transferred to the switching unit provided inside the end cap.

Preferably, the opening is configured to allow the first operation part to move in a first moving direction parallel with the outer end surface. The extending direction and length of the opening also define the moving direction and moving range for the first operation part in the housing.

Preferably, a first cavity for accommodating the first operation part and a second cavity for accommodating the second operation part are formed in the housing, wherein the first cavity is configured to be respectively in connection with the opening and the second cavity, wherein the first operation part moves to a junction between the first cavity and the second cavity by means of the force applied by the adapter, and enters the second cavity with an action of a component force of the force and forces the second operation part to move along with the first operation part. When no operation is performed on the first operation part, the first operation part and the second operation part are held respectively in the first cavity and in the second cavity, and when operation is performed on the first operation part, the first

operation part can move from the first cavity into the second cavity, and then perform operation on the second operation part.

Preferably, the switching unit comprises a third operation
5 part for switching the on-off state of the switching unit and
a fourth operation part for driving the third operation part,
wherein the fourth operation part can transfer a force which
is applied on the fourth operation part by the second opera-
tion part to the third operation part, so as to switch the
10 on-off state of the third operation part. The fourth opera-
tion part can transfer the force applied on the drive unit
from outside of the end cap to the switching unit provided
inside the housing, so as to perform operation on the switch-
ing unit.

15 Preferably, the fourth operation part transfers the force
which is applied on the fourth operation part by the second
operation part to the third operation part in a manner of
elastic deformation. The control mode of elastic deformation
can enable the volume of the operation parts, which are pro-
20 vided for the purpose of controlling the switching unit, to
be as small as possible. In addition, the fourth operation
part can perform inverse operation on the second operation
part and the third operation part in a situation where the
reset force brought by the elastic deformation can be used,
25 that is to say, the second operation part is made to move in
an opposite direction and the third operation part is made to
reset.

Preferably, the third operation part is configured as a but-
ton type switching part, and the fourth operation part is
30 configured as a lever-type leaf spring.

Preferably, the moving direction of the first operation part defined by the opening passes through the centre of the outer end surface and forms an angle of 45 degrees with respect to a connecting line between the electrical conductors. Through
5 such an arrangement, the end cap according to the present invention is suitable for both vertical installing and horizontal installing to the adapter.

Preferably, the end cap further comprises a stopper provided on the outer end surface, the stopper and the housing together
10 defining the first cavity, wherein the stopper is configured to stop the first operation part in a direction after that the first operation part moves for a predetermined distance in the direction.

Preferably, the first operation part is configured as a first
15 button, and the end cap further comprises a first spring, wherein the first spring is accommodated in the first cavity, and abuts against the first button with one end and abuts against the stopper with the other end. When the end cap is disconnected from the adapter, the first button can have an
20 automatic reset by means of the first spring, that is, return to the initial position in relation to the opening.

Preferably, the second operation part is configured as a second button, and the end cap further comprises a second spring, wherein the second spring is accommodated in the second
25 cavity and at least partially surrounds the second button. When the end cap is disconnected from the adapter, the second button can move the first button by means of the restoring force of the second spring, such that the first button moves from the second cavity back to the first cavity.

30 Preferably, the portion of the first operation part that is

capable of extending through the outer end surface is designed to be hemispherical. A hemispherical surface can effectively convert a force which is applied on the first operation part by the adapter into a component force which is in the moving direction of the first operation part defined by the opening.

The other object of the present invention is solved by such an illumination apparatus, that is to say, this illumination apparatus comprises an end cap as described above and a light emitting unit in connection with the end cap, wherein the light emitting unit is in electrical connection with the switching unit. After the illumination apparatus according to the present invention is connected and fixed to the adapter, the possibility of direct conduction through a power supply can be automatically achieved, without additional operations, that is to say, the switching unit in the end cap of the illumination apparatus is already switched on.

Brief Description of the Drawings

The accompanying drawings constitute a part of the present description and are used to provide further understanding of the present invention. Such accompanying drawings illustrate the embodiments of the present invention and are used to describe the principles of the present invention together with the description. In the accompanying drawings the same components are represented by the same reference numbers. As shown in the drawings:

Figure 1 shows an exploded schematic diagram of an end cap according to an embodiment of the present invention;

Figure 2 shows a top schematic diagram of an end cap according to an embodiment of the present invention;

Figure 3 shows a sectional schematic diagram of an end cap according to an embodiment of the present invention when the first operation part is at a first position;

Figure 4 shows a sectional schematic diagram of an end cap according to an embodiment of the present invention when the first operation part is at a second position;

Figure 5 shows another sectional schematic diagram of an end cap according to an embodiment of the present invention when the first operation part is at a first position; and

Figure 6 shows another sectional schematic diagram of an end cap according to an embodiment of the present invention when the first operation part is at a second position.

Detailed Description of the Embodiments

Figure 1 shows an exploded schematic diagram of an end cap 100 according to an embodiment of the present invention. The end cap 100 comprises a housing 1 and an electrical conductor 2 provided on the housing 1, wherein the housing 1 is preferably designed to have a cylindrical shape. The end cap 100 further comprises a first operation part 41 which can be partially accommodated in the housing 1 and a second operation part 42 completely accommodated in the housing 1, a switching unit 3 for switching electrical connection for a light emitting unit (not shown) connected to the end cap 100, and a stopper 5 mounted to the housing 1. The first operation part 41 is assigned with a first spring 43, and the first operation part 41 is preferably designed as a first button, while the first spring 43 is at least partially accommodated in the first button. The second operation part 42 is assigned with a second spring 44, and the second operation part 42 is preferably designed as a second button, while the second spring 44

at least partially surrounds the second button. The switching unit 3 is provided with a fourth operation part 32 with one end being fixed on the switching unit 3, wherein the fourth operation part 32 is preferably designed as a lever-type leaf spring.

Figure 2 shows a top schematic diagram of an end cap 100 according to an embodiment of the present invention. An opening O is opened on an outer end surface S of the housing 1, and an electrical conductor 2 is connected to the outer end surface S. The first operation part 41 partially extends through the opening O, wherein the extended portion is preferably designed to be hemispherical. According to a preferred embodiment of the present invention, the opening O can partially extend into the stopper 5. The opening O defines the movement of the first operation part 41 in a direction parallel with the outer end surface S. Preferably, the extending of this opening O can pass through the middle point of a connecting line between two electrical conductors 2, wherein this middle point can coincide with the centre of the outer end surface S that is designed in circular. Thus, the moving direction of the first operation part 41 can preferably form an angle of 45 degrees with the connecting line between the electrical conductors 2.

Figure 3 shows a sectional schematic diagram of an end cap 100 according to an embodiment of the present invention when the first operation part 41 is at a first position. When no force is applied on the first operation part 41 from outside, the first operation part 41 is partially accommodated in the first cavity R1 and abuts against the inner wall of the first cavity R1 through the elastic force of the first spring 43. The second operation part 42 and the second spring 44 are accommodated in the second cavity R2, and the second spring 44

at least partially surrounds the second operation part 42. In addition, specifically, in the second cavity R2 is provided a separation structure T for limiting the deformation of the second spring 44 and for further at least partially accommo-

5 dating the second spring 44 and the second operation part 42, and a hook-shaped end portion 422 of the second operation part 42 extends through this separation structure T and is locked on the separation structure T in a direction away from the switching unit 3. The second operation part 42 further

10 preferably has a flat end portion 423 provided at the other end facing away from the hook-shaped end portion 422. The second spring 44 is therefore accommodated in a space defined by the flat end portion 423 and the separation structure T. In addition, the second operation part 42 further preferably

15 has an extending portion 421 which extends outwardly from this flat end portion 423. The first spring 43 connected to the first operation part 41 can be laid on this extending portion 421. The second operation part 42 can only move towards the switching unit 3 under action of an external force.

20 In the state as shown in figure 3, the lever-type leaf spring, i.e. the fourth operation part 32, with one end being fixed on the switching unit 3 is not deformed as a result of the external force. Preferably, the switching unit 3 can also be accommodated in the second cavity R2 together with the se-

25 cond operation part 42 and the second spring 44.

Figure 4 shows a sectional schematic diagram of an end cap 100 according to an embodiment of the present invention when the first operation part 41 is in a second position. Under the action of an external force, e.g. during connecting the

30 end cap 100 to an adapter (not shown), which is preferably implemented as a socket which supplies electrical power, the first operation part 41 begins to move and can move to a junction between the first cavity R1 and the second cavity

R2, and then move to enter the second cavity R2, so as to force the second operation part 42 to move together. During the movement of the first operation part 41, the first spring 43 moves on the extending portion 421 along with the first
5 operation part 41. The first operation part 41 presses the second operation part 42 on the flat end portion 423 of the second operation part 42, then the flat end portion 423 extrudes the second spring 44, and the hook-shaped end portion 422 further moves in a direction away from the separation
10 structure T and presses the fourth operation part 32, such that the fourth operation part 32 undergoes elastic deformation so as to switch on the switching unit 3.

Figure 5 shows another sectional schematic diagram of an end cap 100 according to an embodiment of the present invention
15 when the first operation part 41 is in the first position. Figure 5 shows another sectional view with respect to figure 3. In this state, no external force is applied to the first operation part 41, and accordingly, the second operation part 42 does not yet press the fourth operation part 32. In a sit-
20 uation where the fourth operation part 32 does not undergo deformation, the third operation part 31 provided on the switching unit 3 does not have a change in position relative to the switching unit 3, wherein a first end of the third operation part 31 is inserted into the switching unit 3 and is
25 in fixed connection with the switching unit 3. In this case, the third operation part 31 is preferably arranged to be a push-button switching part, and further can preferably have the shape of a pin.

Figure 6 shows another sectional schematic diagram of an end
30 cap 100 according to an embodiment of the present invention when the first operation part 41 is in the second position. Figure 6 shows another sectional view with respect to figure

4. In figure 6, the first operation part 41, under the action of an external force, prompts the second operation part 42 to move towards the switching unit 3, and hereby, the fourth operation part 32 undergoes deformation and extrudes the third operation part 31 in a situation where one end is position-fixed. Accordingly, the third operation part 31 undergoes a change in position so as to switch the on-off state of the switching unit 3, that is, to switch on the switching unit 3.

The above is merely preferred embodiments of the present invention but not to limit the present invention. For a person skilled in the art, the present invention may have various alterations and changes. Any alterations, equivalent substitutions, improvements, within the spirit and principle of the present invention, should be covered in the protection scope of the present invention.

List of reference signs

	1	housing
	2	electrical conductor
	3	switching unit
5	4	drive unit
	5	stopper
	31	third operation part
	32	fourth operation part
	41	first operation part
10	42	second operation part
	421	extending portion
	422	hook-shaped end portion
	423	flat end portion
	43	first spring
15	44	second spring
	100	end cap
	S	outer end surface
	O	opening
	T	separation structure
20	R1	first cavity
	R2	second cavity

Patent claims

1. An end cap (100) for an illumination apparatus, comprising:
 - 5 a housing (1);
 - an electrical conductor (2) provided at an outer end surface (S) of the housing (1), wherein the electrical conductor (2) can be inserted into an adapter that supplies power;
 - 10 a switching unit (3) accommodated in the housing (1), wherein the switching unit (3) is used for switching on or switching off an electrical connection between the electrical conductor (2) and other power consumption components of the illumination apparatus; and
 - 15 a drive unit (4) for controlling the switching unit (3), characterized in that the drive unit (4) is configured such that, during connecting the electrical conductor (2) to the adapter, the adapter applies a force moving the drive unit so as to automatically switch on the
 - 20 switching unit (3), and during disconnecting the electrical conductors (2) from the adapter, the drive unit (4) returns to an initial position with the action of a restoring force, so as to automatically switch off the switching unit (3).
- 25 2. The end cap (100) as claimed in claim 1, characterized in that the drive unit (4) is arranged to be partially exposed through the outer end surface (S), and to transfer the force applied on the drive unit (4) to the switching unit (3) in a direction towards the switching
- 30 unit (3), so as to switch on the switching unit (3).
3. The end cap (100) as claimed in claim 2, characterized in that the drive unit (4) includes a first operation

part (41) which can extend out from an opening (O) provided on the outer end surface (S) and a second operation part (42) provided in the housing (1), wherein the first operation part (41) can move towards the second operation part (42) by means of the force applied by the adapter, and force the second operation part (42) to move, so as to switch on the switching unit (3).

4. The end cap (100) as claimed in claim 3, characterized in that the opening (O) is configured to allow the first operation part (41) to move in a first moving direction parallel with the outer end surface.

5. The end cap (100) as claimed in claim 4, characterized in that a first cavity (R1) for accommodating the first operation part (41) and a second cavity (R2) for accommodating the second operation part (42) are formed in the housing (1), wherein the first cavity (R1) is configured to be respectively in connection with the opening (O) and the second cavity (R2), wherein the first operation part (41) moves to a junction between the first cavity (R1) and the second cavity (R2) by means of the force applied by the adapter, and enters the second cavity (R2) with an action of a component force of the force and forces the second operation part (42) to move along with the first operation part (41).

6. The end cap (100) as claimed in claim 3, characterized in that the switching unit (3) comprises a third operation part (31) for switching the on-off state of the switching unit (3) and a fourth operation part (32) for driving the third operation part (31), wherein the fourth operation part (32) can transfer a force which is applied on the fourth operation part (32) by the second

operation part (42) to the third operation part (31), so as to switch the on-off state of the third operation part (31).

- 5 7. The end cap (100) as claimed in claim 6, characterized in that the fourth operation part (32) transfers the force which is applied on the fourth operation part (32) by the second operation part (42) to the third operation part (31) in a manner of elastic deformation.
- 10 8. The end cap (100) as claimed in claim 6, characterized in that the third operation part (31) is configured as a button type switching part, and the fourth operation part (32) is configured as a lever-type leaf spring.
- 15 9. The end cap (100) as claimed in claim 3, characterized in that the moving direction of the first operation part (41) defined by the opening (0) passes through the centre of the outer end face (S) and forms an angle of 45 degrees with respect to a connecting line between the electrical conductors (2).
- 20 10. The end cap (100) as claimed in claim 5, characterized in that the end cap (100) further comprises a stopper (5) provided on the outer end surface (S), the stopper and the housing together defining the first cavity, wherein the stopper (5) is configured to stop the first operation part (41) in a direction after that the first operation part (41) moves for a predetermined distance
25 in the direction.
11. The end cap (100) as claimed in claim 10, characterized in that the first operation part (41) is configured as a first button, and the end cap (100) further comprises a

first spring (43), wherein the first spring (43) is accommodated in the first cavity (R1), and abuts against the first button with one end and abuts against the stopper with the other end.

- 5 12. The end cap (100) as claimed in claim 5, characterized in that the second operation part (42) is configured as a second button, and the end cap (100) further comprises a second spring (44), wherein the second spring (44) is
10 accommodated in the second cavity (R2) and at least partially surrounds the second button.
13. The end cap (100) as claimed in claim 3, characterized in that the portion of the first operation part (41) which can extend out from the outer end face (S) is configured to be hemispherical.
- 15 14. An illumination apparatus, characterized by comprising an end cap (100) as claimed in any one of claims 1-13 and a light emitting unit in connection with the end cap (100), wherein the light emitting unit is in electrical connection with the switching unit (3).

FIG. 1

100

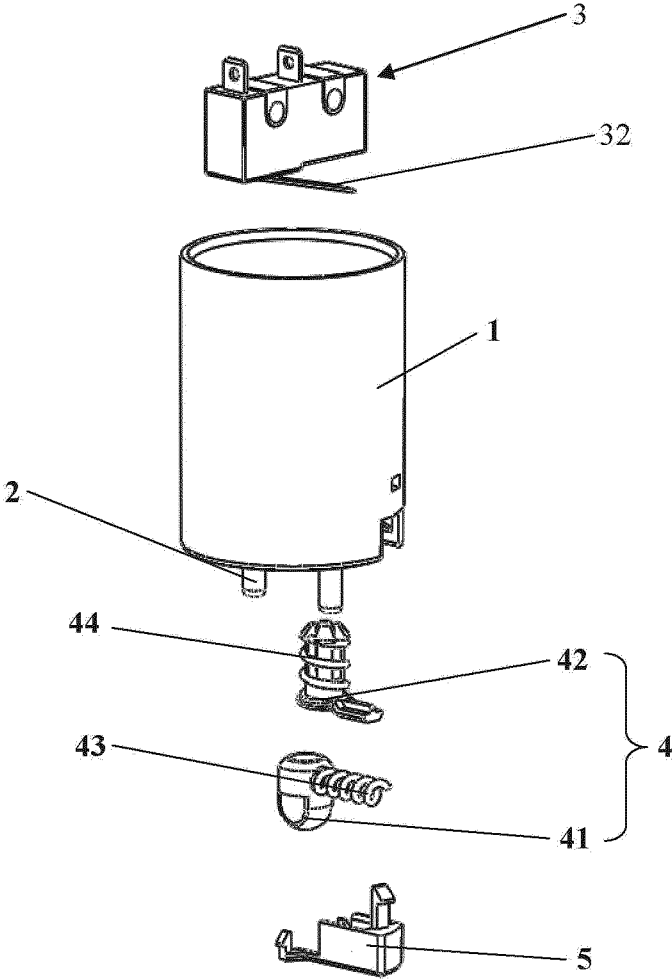


Figure 1

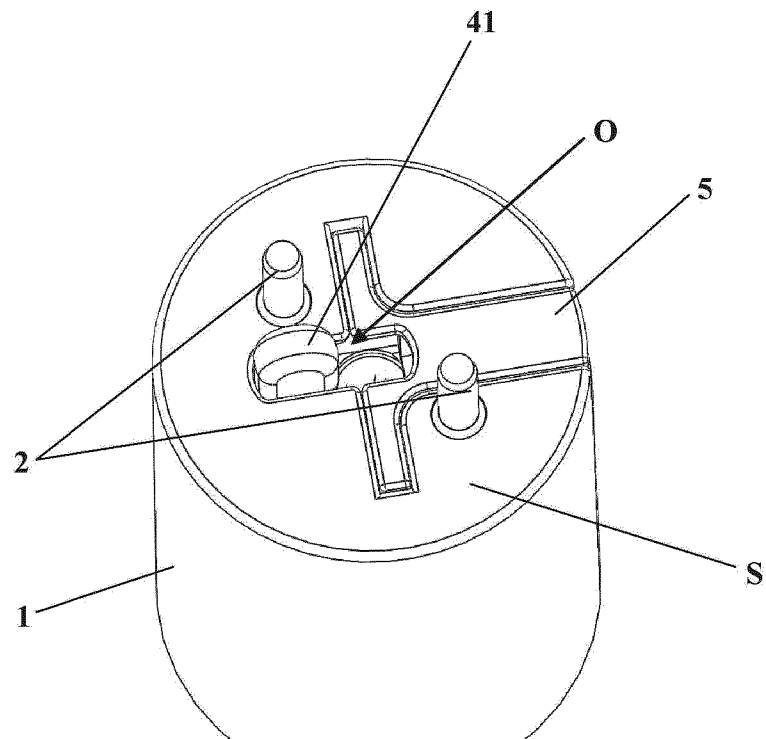


Figure 2

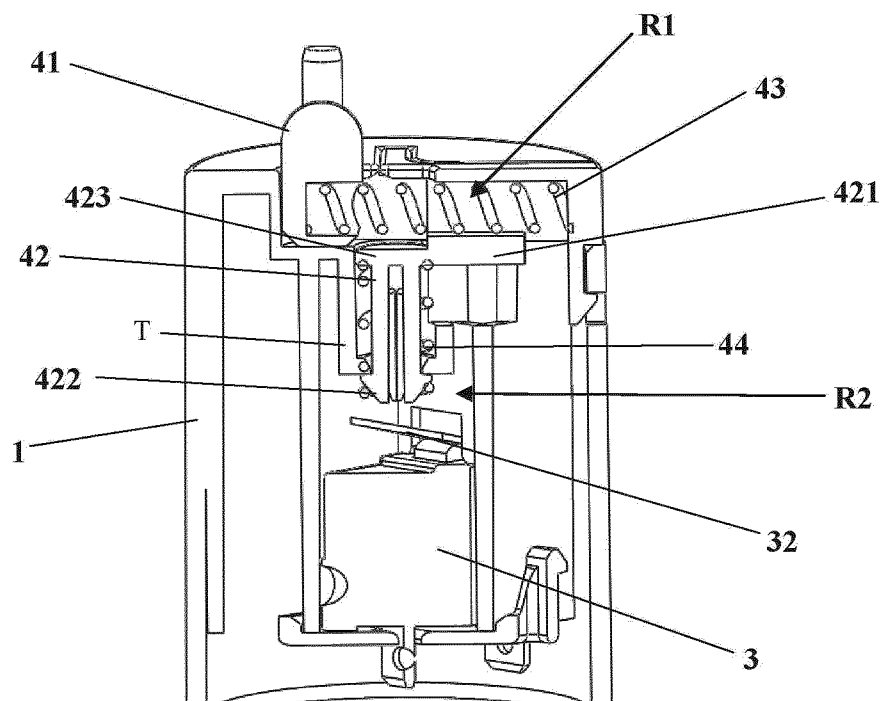


Figure 3

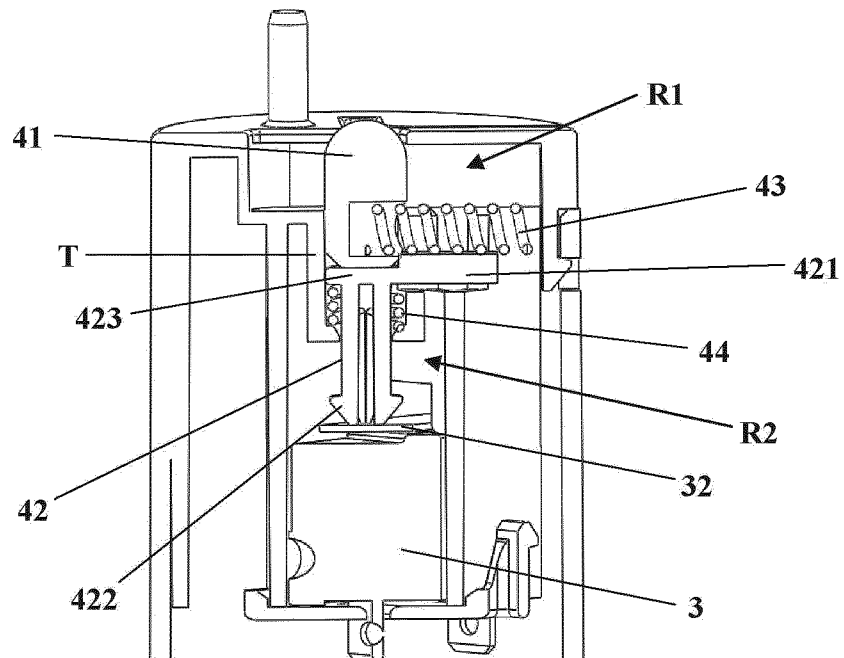


Figure 4

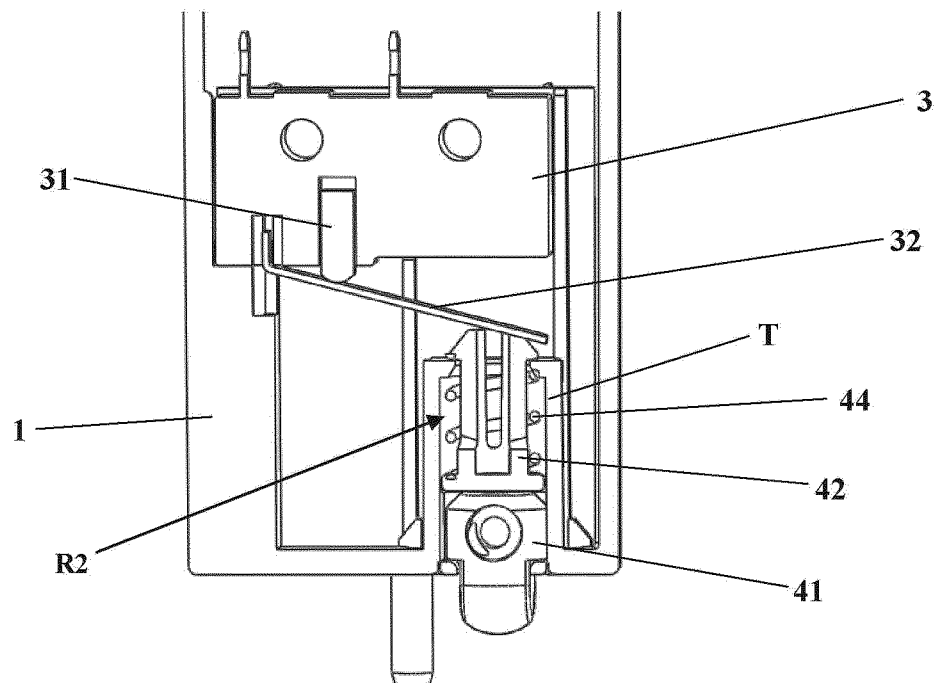


Figure 5

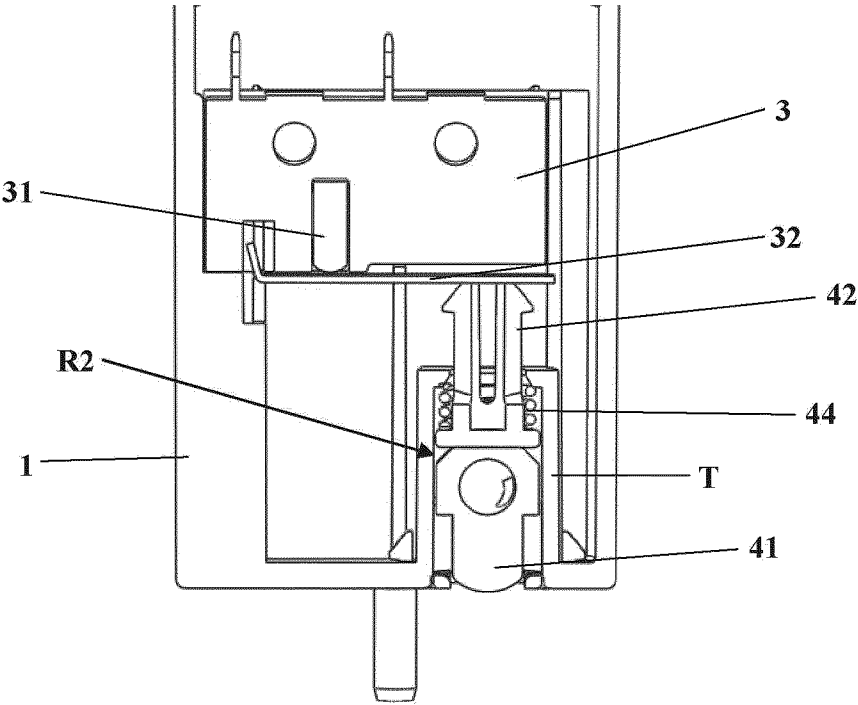


Figure 6

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

INV. F21V25/04 F21K99/00 F21V23/04 F21V23/06
ADD. F21Y101/02 F21Y103/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F21K F21V H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013/127327 A1 (HEIL VOLKER [DE] ET AL) 23 May 2013 (2013-05-23) paragraphs [0115], [0121] figures 5,6,7 -----	1-3,6-8, 13,14
X	DE 20 2012 100373 U1 (PLASTIMAT GMBH [DE]) 6 May 2013 (2013-05-06) paragraph [0025] - paragraph [0035] paragraph [0039] figures 1-5 -----	1-4,13, 14
X	WO 2013/191377 A1 (TEKLUX CO LTD [KR]) 27 December 2013 (2013-12-27) figures 2,3,10,11 ----- -/-	1-3,13, 14



Further documents are listed in the continuation of Box C.



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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 466 701 A1 (ALPS ELECTRIC CO LTD [JP]) 20 June 2012 (2012-06-20) paragraph [0162] - paragraph [0171] figures 1,19,27 -----	1-3,6,7, 13,14
A	DE 10 2012 206188 A1 (OSRAM GMBH [DE]) 17 October 2013 (2013-10-17) figure 1 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/059470

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2013127327 A1	23-05-2013	CN 103003629 A EP 2567149 A2 US 2013127327 A1 WO 2011138141 A2	27-03-2013 13-03-2013 23-05-2013 10-11-2011
DE 202012100373 U1	06-05-2013	NONE	
WO 2013191377 A1	27-12-2013	NONE	
EP 2466701 A1	20-06-2012	CN 102543546 A EP 2466701 A1 JP 4976579 B1 JP 2012142261 A KR 20120068727 A TW 201237312 A US 2012153873 A1	04-07-2012 20-06-2012 18-07-2012 26-07-2012 27-06-2012 16-09-2012 21-06-2012
DE 102012206188 A1	17-10-2013	NONE	