(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 April 2014 (17.04.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/056984 A1

(51) International Patent Classification:
F21K 99/00 (2010.01) *F21V 23/00* (2006.01)
F21V 17/00 (2006.01) *F21V 23/06* (2006.01)
F21V 17/12 (2006.01) *F21Y 101/02* (2006.01)
F21V 17/14 (2006.01)

(21) International Application Number:
PCT/EP2013/071057

(22) International Filing Date:
9 October 2013 (09.10.2013)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
201210382109.7 10 October 2012 (10.10.2012) CN

(71) Applicant: **OSRAM GMBH** [DE/DE]; Marcel-Breuer-Straße 6, 80807 München (DE).

(72) Inventors: **ZHANG, Qihui**; 5F, Hantang Building, OCT (Overseas Chinese Town), Shenzhen, Guangdong 518053 (CN). **ZHANG, HongWei**; 5F, Hantang Building, OCT (Overseas Chinese Town), Shenzhen, Guangdong 518053 (CN). **CHEN, Xiaoyu**; 5F, Hantang Building, OCT (Overseas Chinese Town), Shenzhen, Guangdong 518053 (CN). **MING, Yusheng**; 5F, Hantang Building, OCT (Overseas Chinese Town), Shenzhen, Guangdong 518053 (CN).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,

[Continued on next page]

(54) Title: ILLUMINATING DEVICE

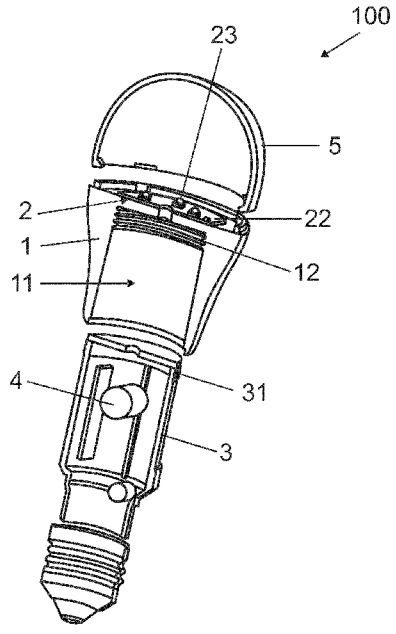

Figure 1

(57) Abstract: The present invention relates to an illuminating device (100), comprising a heat sink (1), a light engine (2) arranged at one side of the heat sink (1), a driver housing (3), and a driver (4) arranged in the driver housing (3), the heat sink (1) forms an accommodation cavity (11) at the other side, and the driver housing (3) is inserted in the accommodation cavity (11), wherein a first rotational locking structure (12) is formed in the accommodation cavity (11), and a second rotational locking structure (31) is formed on the driver housing (3), wherein the first rotational locking structure (12) and the second rotational locking structure (31) are locked together by rotating the driver housing (3) and/or the heat sink (1) after the driver housing (3) is inserted in the accommodation cavity (11).

WO 2014/056984 A1

TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Description

Illuminating Device

Technical Field

The present invention relates to an illuminating device.

Background Art

As everyone knows, LED illumination has irreplaceable advantages, such as energy saving, low power consumption, and electrical-to-optical conversion efficiency near to 100%. It can save no less than 80% energy and has a longer service lifetime compared with the traditional light source with the same illuminating efficiency. In view of the above advantages, the LED is used more and more as a light source such as a lot of LED retrofit lamps in the market. Such LED retrofit lamps have the same appearance and profile as the traditional light source such as incandescent lamp, thus they can be more applicable to the existing illuminating systems as a light source.

The prior LED retrofit lamp usually has a heat sink, a light engine arranged at one side of the heat sink, a driver housing and a driver arranged in the driver housing. The heat sink forms an accommodation cavity at the other side, and the driver housing is inserted in the accommodation cavity. In order to fix the driver housing on the heat sink in the accommodation cavity, connection modes such as glue bonding, hook or screw joint are usually used in the prior art. In the modes of the glue bonding and hook joint, it is hard to break up the driver housing and the heat sink without breaking the illuminating device itself. Especially for the LED retrofit

lamp, the service lifetime of the driver is shorter than that of the LED engine, and the driver should be replaced after the driver fails, for this reason the LED retrofit lamp needs to be disconnected. For instance, in the mode of the hook joint, in order to release the connection, a bulb firstly should be removed. But sometimes, the bulb itself is also connected to the heat sink through hook joint or glue bonding, and then the bulb should be broken to contact the hook connection between the driver housing and the heat sink.

The screw connection between the driver housing and the heat sink obviously increases the number of parts of the LED retrofit lamp, which reduces the assembling efficiency.

Summary of the Invention

In order to solve the above technical problems, the present invention provides an illuminating device. The illuminating device according to the present invention can be simply dissembled without breaking the illuminating device itself, and also has a low cost and a simple structure.

The object of the present invention is accomplished via an illuminating device. The illuminating device comprises a heat sink, a light engine arranged at one side of the heat sink, a driver housing, and a driver arranged in the driver housing, the heat sink forms an accommodation cavity at the other side, and the driver housing is inserted in the accommodation cavity, wherein a first rotational locking structure is formed in the accommodation cavity, and a second rotational locking structure is formed on the driver housing, wherein the first rotational locking structure and the second rotational locking structure are locked together by rotating the driver housing and/or the heat sink after the driver housing

is inserted in the accommodation cavity. The illuminating device according to the present invention uses a special connection structure between the driver housing and the heat sink, and the two can be simply and reliably connected and locked together, or unlocked and disconnected, just by rotating the driver housing and/or the heat sink. Such connection mode avoids the dissembling manner of breaking the illuminating device itself for removing the driver housing.

According to the present invention, the first rotational locking structure and the second rotational locking structure are configured as structures capable of being locked or unlocked through rotation. Since the driver housing is inserted in the accommodation cavity, an operator can lock and connect the driver housing with the heat sink just by rotating the driver housing or the heat sink in one direction, and can release the locked connection between the driver housing and the heat sink just by rotating the driver housing or the heat sink in the opposite direction, which greatly simplifies the assembling process.

Preferably, the first rotational locking structure is configured as internal thread formed in an inner wall defining the accommodation cavity, the second rotational locking structure is configured as external thread formed on an outer peripheral surface of the driver housing and capable of being screwed in the internal thread. The internal thread and the external thread can be formed just through a simple process, and the threaded connection can assure more reliable connection between parts. Besides, such threaded connection structure does not increase the number of parts of the illuminating device, reducing the manufacturing cost and improving the assembling efficiency.

Optionally, the first rotational locking structure is configured as an L-shape groove formed in the inner wall of the accommodation cavity, wherein the L-shape groove comprises a first section extending from an opening end of the accommodation cavity to interior of the accommodation cavity and a second section extending perpendicular to the first section, and the second rotational locking structure is configured as a protrusion formed on an outer peripheral surface of the driver housing, and the protrusion can be inserted in the accommodation cavity along the first section and slide into the second section through rotational movement. Such type of locked connection manner further simplifies the connection process between the driver housing and the heat sink. In practical assembling process, the locked connection between the driver housing and the heat sink can be realized just by aligning the protrusion of the driver housing with the first section of the L-shape groove to be inserted in the heat sink along the first section, and then to rotationally slide into the second section, and the locked connection between the driver housing and the heat sink can be released by executing a reverse procedure. This further simplifies the assembling complexity.

According to one preferred solution of the present invention, the illuminating device further comprises a electrical cable, through which the driver is in electrical connection with the light engine. Prior to lockedly connecting the driver housing with the heat sink, the electrical cable can be welded in advance to the driver and the light engine. The electrical cable can be relatively long for facilitating welding in a situation that the driver housing and the heat sink are separated. The electrical cable can be rolled in the driver housing after the driver housing and the heat sink have been locked and connected together.

According to another preferred solution of the present invention, the light engine and the driver realize electrical connection by connecting the driver housing to the heat sink through rotational movement. Advantageously, the driver housing is provided with a first electrical connector in electrical connection with a first output of the driver, and the light engine is provided with a second electrical connector in electrical connection with a first input of the light engine and passing through the heat sink to protrude into the accommodation cavity, and the first electrical connector and the second electrical connector are in electrical connection after the driver housing and the heat sink have been locked and connected by rotational movement. In addition, the first rotational locking structure is configured as a third electrical connector in electrical connection with a second input of the light engine, the second rotational locking structure is configured as a fourth electrical connector in electrical connection with a second output of the driver, and the third electrical connector and the fourth electrical connector are in electrical connection after the driver housing and the heat sink have been locked and connected by rotational movement. Besides, the third electrical connector and the fourth electrical connector are electrically insulated from the first electrical connector and the second electrical connector, respectively. Such structure further reduces the number of parts of the illuminating device, avoids electrical connection manner by means of electrical cable welding, improves the electrical connection reliability between parts of the illuminating device, and also decreases the assembling complexity.

Further according to the present invention, the illuminating device further comprises a bulb or a lens arranged on the one side of the heat sink. The bulb or the lens can protect an

LED lighting engine accommodated therein against external invasion, and also can perform secondary treatment on light emitted from the LED lighting engine to achieve expected optical effect.

Preferably, the light engine comprises a circuit board and at least one LED chip (23) arranged on the circuit board. The LED chip has the advantages of long service lifetime, high lighting efficiency and environmental friendliness.

It is to be understood that the features of the various exemplary embodiments described herein may be combined with each other, unless specifically noted otherwise.

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:

Fig. 1 is an exploded schematic diagram of a first embodiment of an illuminating device according to the present invention;

Fig. 2 is a cross section diagram of the illuminating device shown in Fig. 1 in an assembled state;

Fig. 3 is an exploded schematic diagram of a second embodiment of the illuminating device according to the present invention; and

Fig. 4 is a cross section diagram of the illuminating device shown in Fig. 3 in an assembled state.

Detailed Description of the Embodiments

In the following detailed description, reference is made to the accompanying drawings, which form a part hereof, and in which is shown by way of illustration specific embodiments in which the invention may be practiced. In this regard, directional terminology, such as "upper", "lower", "one side", "the other side", is used in reference to the orientation of the figures being described. Because components of embodiments of the present invention can be positioned in a number of different orientations, the directional terminology is used for purposes of illustration and is in no way limiting. It is to be understood that other embodiments may be utilized and structural or logical changes may made without departing from the scope of the present invention. The following detailed description, therefore, is not to be taken in a limiting sense, and the scope of the present invention is defined by the appended claims.

Fig. 1 is an exploded schematic diagram of a first embodiment of an illuminating device 100 according to the present invention. It can be seen from the figure that the illuminating device 100 comprises a heat sink 1, a light engine 2 arranged at one side of the heat sink 1, a driver housing 3, and a driver 4 arranged in the driver housing 3, wherein the heat sink 1 forms an accommodation cavity 11 at the other side, and the driver housing 3 is inserted in the accommodation cavity 11, wherein a first rotational locking structure 12 is formed in the accommodation cavity 11, and a second rotational locking structure 31 is formed on the driver housing 3, and wherein the first rotational locking structure 12 and

the second rotational locking structure 31 are locked together by rotating the driver housing 3 and/or the heat sink 1 after the driver housing 3 is inserted in the accommodation cavity 11. The first rotational locking structure 12 and the second rotational locking structure 31 are configured as structures that can be locked or unlocked through rotation.

In the present embodiment, the first rotational locking structure 12 is configured as internal thread formed in an inner wall defining the accommodation cavity, the second rotational locking structure 31 is configured as external thread formed on an outer peripheral surface of the driver housing 3 and capable of being screwed in the internal thread. Since the driver housing 3 is inserted in the accommodation cavity 11, an operator can lock and connect the driver housing 3 with the heat sink 1 just by rotating the driver housing 3 or the heat sink 1 in one direction, and can release the locked connection between the driver housing 3 and the heat sink 1 just by rotating the driver housing 3 or the heat sink 1 in the opposite direction, which greatly simplifies the assembling process. Fig. 2 is a cross section diagram of the illuminating device shown in Fig. 1 in an assembled state. It can be seen from the figure that the driver housing 3 and the heat sink have been locked and connected together by screwing the external thread in the internal thread.

Besides, it can be seen further from Fig. 1 that the illuminating device 100 further comprises a bulb 5—of course, it also can be other optical parts such as lens—arranged at the one side of the heat sink 1. In addition, in one solution of the present invention, the light engine 2 comprises a circuit board 22 and at least one LED chip 23 arranged on the circuit board 22.

Furthermore, in the present embodiment, a electrical cable (not shown in the figures) is provided in order to realize electrical connection between the driver 4 and the light engine 2. Prior to lockedly connecting the driver housing 3 with the heat sink 1, the electrical cable can be welded in advance to the driver 4 and the light engine 2. The electrical cable can be relatively long for facilitating welding in a situation that the driver housing 3 and the heat sink 1 are separated. The electrical cable can be rolled in the driver housing 3 after the driver housing 3 and the heat sink 1 have been locked and connected together.

In another possible embodiment of the present invention, the first rotational locking structure 12 is configured as an L-shape groove (not shown in the figures) formed in the inner wall of the accommodation cavity 11, wherein the L-shape groove comprises a first section extending from an opening end of the accommodation cavity 11 to interior of the accommodation cavity 11 and a second section extending perpendicular to the first section, and the second rotational locking structure 31 is configured as a protrusion (not shown in the figures) formed on the outer peripheral surface of the driver housing 3, wherein the protrusion can be inserted in the accommodation cavity 11 along the first section, and slides into the second section through rotational movement. Such type of locked connection manner further simplifies the connection process between the driver housing 3 and the heat sink 1. In practical assembling process, the locked connection between the driver housing 3 and the heat sink 1 can be realized just by aligning the protrusion of the driver housing 3 with the first section of the L-shape groove to be inserted in the heat sink 1 along the first section, and then to rotationally slide into the second section, and the locked connection between the driver housing 3 and the heat sink 1

can be released by executing a reverse procedure. This further simplifies the assembling complexity.

Fig. 3 is an exploded schematic diagram of a second embodiment of the illuminating device 100 according to the present invention. The illuminating device 100 shown in Fig. 3 has no essential difference in structure from the first embodiment shown in Fig. 1. The slight difference lies in that the electrical connection through electrical cable is eliminated from the illuminating device 100 shown in Fig. 3, and a special manner is used. In the illuminating device 100 shown in Fig. 3, the driver housing 3 is provided with a first electrical connector 32 in electrical connection with a first output of the driver 4, and the light engine 2 is provided with a second electrical connector 21 in electrical connection with a first input of the light engine 2 and passing through the heat sink 1 to protrude into the accommodation cavity 11. In addition, the first rotational locking structure 12 (internal thread) is configured as a third electrical connector in electrical connection with a second input of the light engine 2, the second rotational locking structure 31 (external thread) is configured as a fourth electrical connector in electrical connection with a second output of the driver 4, and the third electrical connector and the fourth electrical connector are electrically insulated from the first electrical connector 33 and the second electrical connector 21, respectively.

Fig. 4 is a cross section diagram of the illuminating device 100 shown in Fig. 3 in an assembled state. It can be seen from the figure that the third electrical connector (internal thread) and the fourth electrical connector (external thread) are engaged with each other and form the electrical connection. The first electrical connector 32 and the second elec-

trical connector 21 are also in mutual contact to form the electrical connection. Such structure further reduces the number of parts of the illuminating device 100, avoids electrical connection manner by means of electrical cable welding, improves the electrical connection reliability between parts of the illuminating device 100, and also decreases the assembling complexity.

The above is merely preferred embodiments of the present invention but not to limit the present invention. For the 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	heat sink
11	accommodation cavity
12	first rotational locking structure
2	light engine
21	second electrical connector
22	circuit board
23	LED chip
3	driver housing
31	second rotational locking structure
32	first electrical connector
4	driver
5	bulb
100	illuminating device

Patent claims

1. An illuminating device (100), comprising a heat sink (1), a light engine (2) arranged at one side of the heat sink (1), a driver housing (3) for accommodating the driver (4) , the heat sink (1) defined an accommodation cavity (11) at the other side, and the driver housing (3) being inserted in the accommodation cavity (11), characterized in that a first rotational locking structure (12) is formed in the accommodation cavity (11), and a second rotational locking structure (31) is formed on the driver housing (3), wherein the first rotational locking structure (12) and the second rotational locking structure (31) are locked together by rotating the driver housing (3) and/or the heat sink (1) after the driver housing (3) is inserted in the accommodation cavity (11).

2. The illuminating device (100) according to Claim 1, characterized in that the first rotational locking structure (12) and the second rotational locking structure (31) are configured as structures capable of being locked or unlocked by rotation.

3. The illuminating device (100) according to Claim 1 or 2, characterized in that the first rotational locking structure (12) is configured as internal thread formed in an inner wall defining the accommodation cavity, the second rotational locking structure (31) is configured as external thread formed on an outer peripheral surface of the driver housing (3) and capable of being screwed in the internal thread.

4. The illuminating device (100) according to Claim 1 or 2,

characterized in that the first rotational locking structure (12) is configured as an L-shape groove formed in an inner wall of the accommodation cavity (11), the L-shape groove comprises a first section extending from an opening end of the accommodation cavity (11) to interior of the accommodation cavity (11) and a second section extending perpendicular to the first section, and the second rotational locking structure (31) is configured as a protrusion formed on an outer peripheral surface of the driver housing (3), and the protrusion is capable of being inserted in the accommodation cavity (11) along the first section and sliding into the second section through rotational movement.

5. The illuminating device (100) according to Claim 1 or 2, characterized in that the illuminating device (100) further comprises an electrical cable, through which the driver (4) is in electrical connection with the light engine (2).

6. The illuminating device (100) according to Claim 1 or 2, characterized in that the light engine (2) and the driver (4) realize electrical connection by connecting the driver housing (3) to the heat sink (1) through rotational movement.

7. The illuminating device (100) according to Claim 6, characterized in that the driver housing (3) is provided with a first electrical connector (32) in electrical connection with a first output of the driver (4), and the light engine (2) is provided with a second electrical connector (21) in electrical connection with a first input of the light engine (2) and passing through the heat sink (1) to protrude into the accommodation cavity

(11), and the first electrical connector (32) and the second electrical connector (21) are in electrical connection after the driver housing (3) and the heat sink (1) have been locked and connected by rotational movement.

8. The illuminating device (100) according to Claim 7, characterized in that the first rotational locking structure (12) is configured as a third electrical connector in electrical connection with a second input of the light engine (2), the second rotational locking structure (31) is configured as a fourth electrical connector in electrical connection with a second output of the driver (4), and the third electrical connector and the fourth electrical connector are in electrical connection after the driver housing (3) and the heat sink (1) have been locked and connected by rotational movement.

9. The illuminating device (100) according to Claim 8, characterized in that the third electrical connector and the fourth electrical connector are electrically insulated from the first electrical connector (33) and the second electrical connector (21), respectively.

10. The illuminating device (100) according to Claim 1 or 2, characterized in that the illuminating device (100) further comprises a bulb (5) or a lens arranged on the one side of the heat sink (1).

11. The illuminating device (100) according to Claim 1 or 2, characterized in that the light engine (2) comprises a circuit board (22) and at least one LED chip (23) arranged on the circuit board (22).

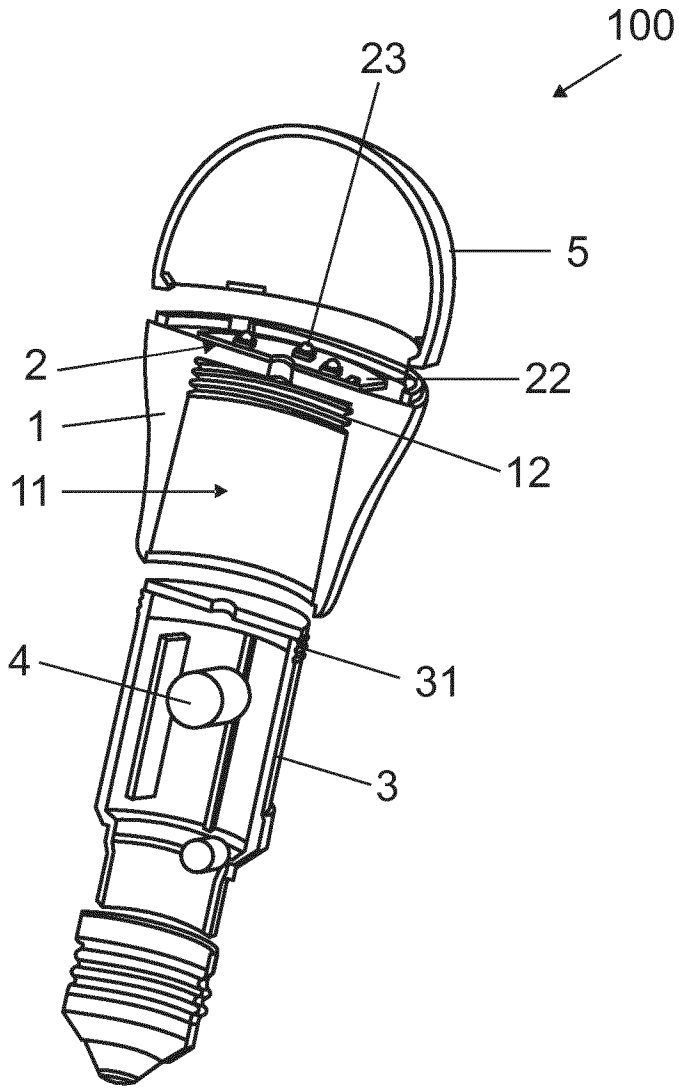

Figure 1

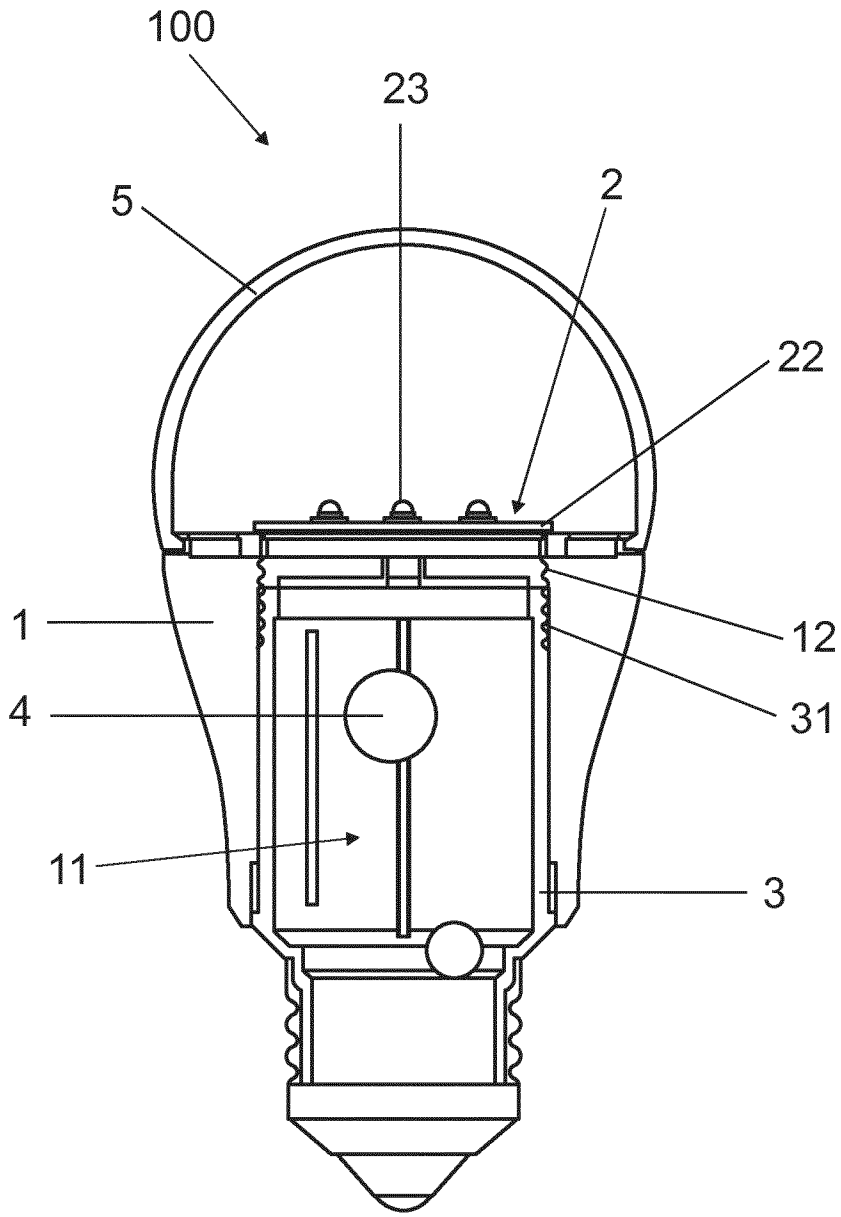

Figure 2

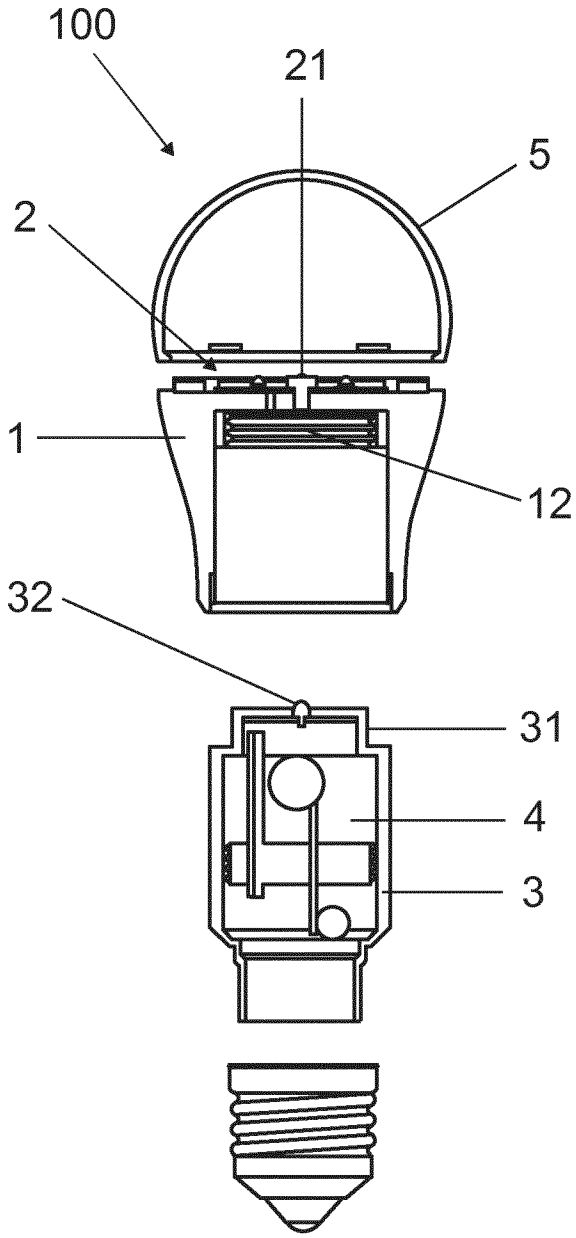

Figure 3

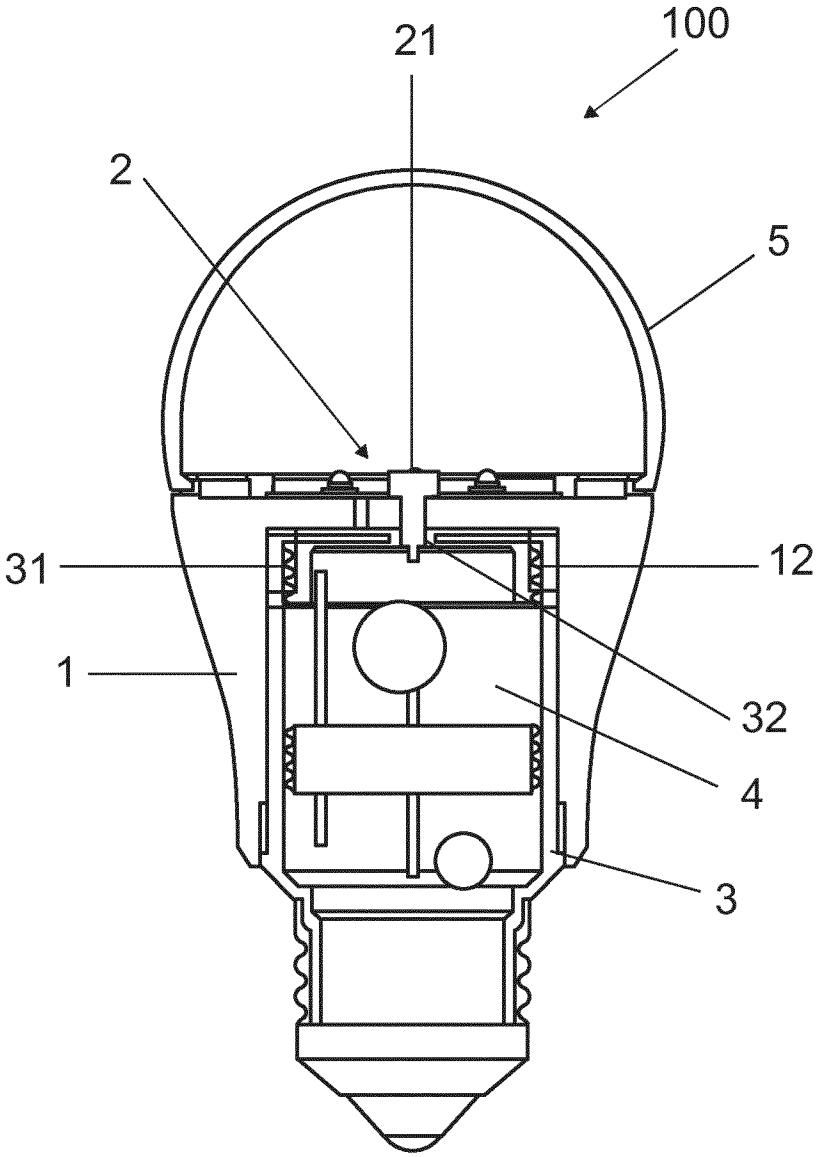

Figure 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/071057

A. CLASSIFICATION OF SUBJECT MATTER
INV. F21K99/00 F21V17/00 F21V17/12 F21V17/14 F21V23/00
F21V23/06
ADD. F21Y101/02
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 F21Y

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	KR 101 017 349 B1 (TEKLUX CO LTD [KR]) 28 February 2011 (2011-02-28) paragraph [0001] - paragraph [0095] figures 6-10	1-3,10, 11
X,P	US 2013/100682 A1 (HSIUNG TA-SUNG [TW]) 25 April 2013 (2013-04-25) paragraph [0014] - paragraph [0027] figures 1-3	1-3,6,7, 10,11
X,P	GB 2 490 880 A (COOK BERNARD [GB]) 21 November 2012 (2012-11-21) page 3, line 1 - page 8, line 25 figures 1-4	1-3,6,7, 10,11

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 January 2014	10/02/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Blokland, Russell

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2013/071057

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 101017349 B1	28-02-2011		
US 2013100682 A1	25-04-2013	CN 103062639 A	24-04-2013
		US 2013100682 A1	25-04-2013
GB 2490880 A	21-11-2012	NONE	