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(54) **MODULAR LIGHT-EMITTING DEVICE**

(57) A modular light-emitting device comprises a shell (1) internally provided with a multifunctional module (2) and a lamp panel (27) having more than one light-emitting component (26); the multifunctional module (2) comprises a module base (21) having an accommodating space (25) and the lamp panel (27) connected below the module base (21); a sensor (24) and a camera lens (23) are disposed inside the accommodating space (25), and the camera lens (23) and the light-emitting components (26) are stared through the sensor (24); and the multifunctional module (2) is suitable for being mounted inside the shells of various lamps.

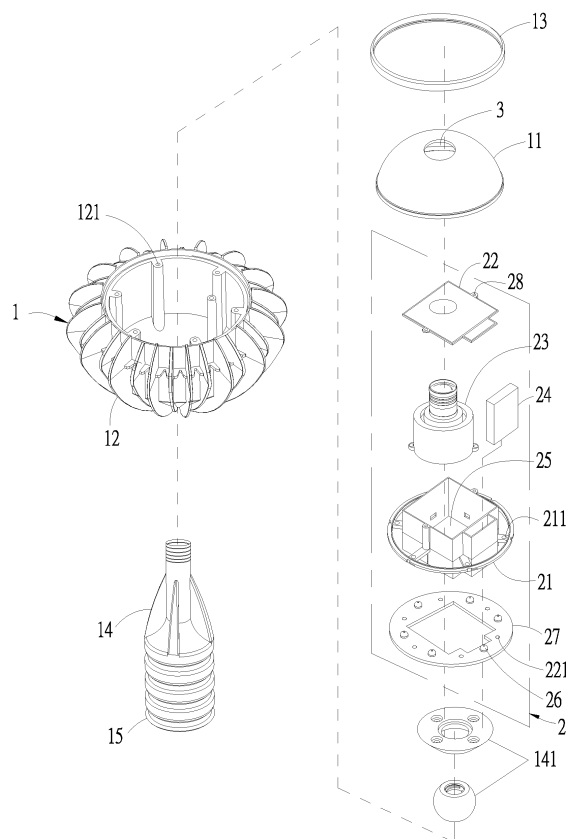


FIG. 2

Description

(a) Technical Field of the Invention

[0001] The present invention generally relates to a modular light-emitting device, and more particularly to one that comprises a multifunctional module arranged inside a shell of a variety lighting fixtures/devices to allow a user to selectively install a sensor or a camera lens so as to achieve the purpose of simple substitute and having various functions of use.

(b) Description of the Prior Art

[0002] The progress of LED (Light-Emitting Diode) technology brings an increase of the number thereof put into use. The manufacturers have devoted themselves to research and development of techniques of energy saving and illumination and also put effort in diversifying the functionality of the related products available in the market, those functions including sensing based operation, camera based surveillance, and remote control. However, those products that are of the variable functions are generally of closed type designs. In other words, to meet the needs for several types of functions, a consumer must purchase a variety of different products.

[0003] However, an example of a conventional multifunctional LED base device has an interior structure as shown in FIG 10. The exemplificative device is a lighting device (9) comprising LEDs (93) that are activated by means of result of sensing. Arranged inside the device are a variety of components mounted on a circuit board (92), including the LEDs (93) and a sensor element (94), which are housed in a casing (91) for protection of the components. The sensor element (94) can make a detection of an activation signal to power the plurality of LEDs (93) for lighting so that the period of time of continuous operation can be reduced and energy can be saved. When a user requires an image recording function, an additional device must be purchased for replacement. For a user, disassembling must be done for the original device in order to proceed with replacement. This incurs additional costs of time and money for installation.

[0004] This is surely a problem of inconvenience for users having the needs of devices of various functions and it is desired to have a novel lighting device that allows for the achievement of multiple functions and is of convenience of use in order to suit the needs of various users for various functions.

SUMMARY OF THE INVENTION

[0005] A primary object of the present invention is to provide a modular light-emitting device, which comprises a multifunctional module to be used in combination with a sensor or a camera lens selected by a user and further comprises a substrate mounted to the multifunctional module, whereby through being fixed inside a shell of a

light fixture/device, modularization can be achieved for selection of function.

[0006] A secondary object of the present invention is that for a light fixture/device that can be selected by a user from a group including a regular light bulb, a ceiling light, an embedded light, a pendant light, a light tube, and a wall light, a multifunctional module provided by the present invention can be mounted in each of the light fixtures/devices of operation therewith.

[0007] The technical solution of the present invention can be realized as follows:

A modular light-emitting device comprises:

a shell, which comprises a multifunctional module and a lamp panel comprising at least one light-emitting component mounted therein; and the multifunctional module comprising a module base that defines an accommodating space, the lamp panel being mounted under the module base, the accommodating space receiving therein a sensor and a camera lens, the sensor being operable to activate operations of the camera lens and the light-emitting component.

[0008] Preferably, in the modular light-emitting device, the accommodating space receives a single sensor therein in such a way that the sensor is operable to activate an operation of the light-emitting component.

[0009] Preferably, in the modular light-emitting device, the sensor is arranged at one side of the camera lens.

[0010] Preferably, in the modular light-emitting device, the accommodating space further receives therein a substrate that is arranged on a top of the accommodating space for retaining the camera lens or the sensor so as to prevent the camera lens or the sensor from damages caused by being exposed.

[0011] Preferably, in the modular light-emitting device, the multifunctional module is mounted in an interior of the shell so as to allow for mounting in an interior of a variety of lighting fixtures/devices.

[0012] Compared to the prior art, the present invention provides the following beneficial effects and performance:

The modular light-emitting device according to the present invention allows a user to select a desired function and to replace components of different functions through the multifunctional module and which can be directly mounted in various types of light fixtures/devices to prevent excessive economic burden of the general consumers and to allow the general consumers to make purchase of only the desired function. As such, each type of lighting devices can achieve different functions through a modularized arrangement. To further expound the technical solution and effectiveness of the present invention that achieve the above purpose and features, preferred

embodiments will be described with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

FIG 1 is a perspective view of the present invention.
FIG 2 is an exploded view of the present invention.
FIG 3 is a schematic view showing a multifunctional module according to the present invention.

FIG 4 is a cross-sectional view of a portion of the present invention illustrating mounting of a camera lens and a sensor.

FIG 5 is a cross-sectional view showing an additional first embodiment of the present invention.

FIG 6 is a cross-sectional view showing an additional second embodiment of the present invention.

FIG 7 is a cross-sectional view showing an additional third embodiment of the present invention.

FIG 8 is a perspective view showing a portion of an additional fourth embodiment of the present invention.

FIG 9 is a cross-sectional view showing an additional fifth embodiment of the present invention.

FIG 10 is a perspective view showing a prior art device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] A detailed description will be given hereinafter for a preferred feasible embodiment of the present invention with reference being had to the attached drawings in order to provide better understanding of the present invention. Referring to FIGS. 1-3, the present invention provides a modular light-emitting device, which generally comprises: a shell (1), which formed by mating and combining an upper shell member (11) to a lower shell member (12). The shell (1) can be made in the form of various lighting fixtures/devices, including a light bulb, an embedded light (31), a ceiling light (32), a pendant light (34), and a light tube (33). An LED light bulb is taken as a primary embodiment according to the present invention, which comprises a power input terminal (15) that is rotatably connected by a rotatable joint (141) to the lower shell member (12) for the purposes of adjustment of a range of detection or an angle of image taking, the rotatable joint (141) also having a function for supporting components arranged inside the lower shell member (12); and a multifunctional module (2), which is made up of a module base (21) that has an accommodating space (25) combined with a substrate (22) that has threaded holes (28) formed in opposite sides thereof to be coupled by screwing means to threaded hole formed around the accommodating space (25) and corresponding thereto so as to close a top opening of the accommodating space (25) to protect internal components.

[0015] The internal components of the present invention are a camera lens (23) and a sensor (24). The camera lens (23) has an outer circumference over which a rubber-made sleeve is fit and the camera lens (23) is received through an opening defined in the substrate (22) to have the camera lens (23) fixed in the accommodating space (25). The sensor (24) is arranged at one side of the camera lens (23) and is also located in the accommodating space (25). The arrangement of the substrate (22) protects these components from damages caused by being exposed to the outside environment. The camera lens (23) and the sensor (24) are electrically connected, at a lower end of the accommodating space (25), to a circuit board to control operations of the components inside the accommodating space (25). The shape of the accommodating space (25) can be altered to correspond to different types of arrangement and configuration of component and is not limited to what disclosed herein. The circuit board can be a regular printed circuit board (PCB), a metal-based printed circuit board, a flexible printed circuit board, a ceramic printed circuit board, and the likes. The circuit board may comprise, mounted thereon, a system-on-chip (SOC) to allow for multiple uses of the multifunctional module (2) corresponding to various components, or alternatively, to provide an arrangement for a single function. For example, in the present invention, detection and image taking are taken as an example for illustrating multiple or single use. If an arrangement is made on the basis of SOC, then a single multifunctional module (2) can be used to correspond to various functions. Or, for the purposes of cost reduction, the multifunctional module (2) can be limited to individual functions so as to provide a multifunctional module (2) for each individual function. Thus, the present invention is not limited to such an arrangement that the multifunctional module (2) can be connected for a single way or multiple ways; and the electrical connection associated therewith can be done with various forms, such as through pins in combination with socket holes or wire bonding, being not subject to any unnecessary limitations so that a user may make substitute of the sensor (24) or the camera lens (23) according to a desired function to achieve each and simple replacement thereof.

[0016] The multifunctional module (2) is arranged inside the lower shell member (12). The upper shell member (11) has an outer rim that is mounted through downward fitting with a ring (13) so as to achieve strengthened mated coupling between the upper shell member (11) and the lower shell member (12). The upper shell member (11) comprises a through hole (3) defined centrally therein for receiving, in a mated manner, the camera lens (23) and the sleeve helps securely hold the camera lens (23) in the through hole (3). The camera lens (23) shows a horizontal positional relationship with respect to the through hole (3).

[0017] Referring to FIG 4, the module base (21) comprises projects formed on an under surface thereof to mate corresponding parts of the lower shell member (12).

The module base (21) has a circumference in which a plurality of notches is formed so that through rotation of a proper angle to adjust the corresponding positions, the module base (21) and the lower shell member (12) can be fit to each other. The module base (21) further comprises therein a plurality of braces extending to the circumference. The plurality of braces comprises a plurality of mounting holes (211) formed therein. The plurality of mounting holes (211) corresponds to mounting holes (121) formed in the lower shell member (12) with an LED-included lamp panel (27) interposed therebetween. The lamp panel (27) has a central portion that is hollowed to correspond to the accommodating space (25) of the module base (21). The lamp panel (27) also comprises a plurality of the mounting holes (221) that is coupled to the module base (21) the mounting holes (211) and the mounting holes (121) of the lower shell member (12) by screwing fastening means. The lamp panel (27) is provided with at least one light-emitting component (26) and in the instant embodiment, the light-emitting component (26) is a light-emitting diode. The upper shell member (11) has a circumferential flange forming a recessed portion engageable with the module base (21) and an inverted L-shaped portion formed inside the ring (13) can be forcibly pressed down to securely fix the upper shell member (11) and the lower shell member (12) to each other so as to securely fix the multifunctional module (2) in position inside the shell (1).

[0018] Referring to FIGS. 5-9, additional first, second, third, fourth, and fifth embodiments according to the present invention are shown. In the drawings, the shells (1) are respectively made in the form of an embedded light (31), a ceiling light (32), a pendant light (34), a light tube (33), and a wall light (37). Each of the shells (1) comprises therein an LED-included circuit board (36), which is secured in position inside the shell (1) or at any other mounting position by means of screwing locking means in combination with a plurality of mounting holes (211) formed in a module base (21). In more details, in case of an embedded light (31), a multifunctional module (2) is mounted to the circuit board (36) inside a lower shell member (12) and the circuit board (36) is configured with a rotatable joint arrangement to allow for direction adjustment, in both a forward direction and a backward direction, of the multifunctional module (2) through rotation, thereby providing the multifunctional module (2) with a function of adjustment of range of use. Alternatively, mounting can be made to a circuit board (36) having no rotatable joint arrangement. In the case of a ceiling light (32), the multifunctional module is mounted to a circuit board (36) inside a shell (1). In case of a pendant light (34), the multifunctional module is also mounted to a circuit board (36) inside a shell (1). In case of a light tube (33), the multifunctional module is arranged in an enclosed space to be combined with a circuit board (36) electrically connected to the light tube (33). In case of a wall light (37), the multifunctional module (2) is also mounted to a circuit board (36) inside a shell (1). The

above described multifunctional module (2) is generally arranged to make use of a plurality of mounting holes (211) present in an existing structure to be fixed inside various lighting fixtures/devices, while the sensor (24) and the camera lens (23) that are originally provided can still be functionable to allow a user to continuously use the originally selected function, whereby the multifunctional module (2) can be disassembled and re-assembled with different lighting fixtures/devices through modularization. Further, the light-emitting component (26) of each of the lighting fixtures/devices can be selectively switched on/off through electrical connection with the multifunctional module (2). In the above-described embodiment of embedded light (31) that is provided with a rotatable joint arrangement, such an arrangement can be applied, through simple modification, to all sorts of lighting fixture/device to provide a function of use range adjustment so that such an arrangement is not limited to application in the embedded light (31). As can be easily seen from the above embodiments together with the drawings, the multifunctional module (2) of the present invention can be applied to and mounted in various lighting fixtures/devices and is arranged to be located inside the shell (1) so that the arrangement thereof is limited to be inside the shell and such a limiting manner of arrangement allows the multifunctional module (2) to be mounted inside a shell (1) of an additional variety of lighting fixtures/devices, being not limited to the lighting fixtures/devices illustrated herein, thereby making the device of the present invention more versatile and achieving the purposes of modularized replacement and use.

[0019] The above provides a detailed description to embodiments illustrated in the attached drawings for the purpose of illustration of the structure, feature, and effectiveness of the present invention. However, what are described above are only preferred embodiments and the present invention is not limited to a scope defined by the illustrated embodiment. All modifications and variations that comply with the inventive idea of the present invention are considered within the scope of the present invention as defined in the claims provided they are within the scope of equivalents.

Claims

1. A modular light-emitting device, **characterized by** comprising:

a shell (1), which comprises a multifunctional module (2) and a lamp panel (27) comprising at least one light-emitting component (26) mounted therein; and

the multifunctional module (2) comprising a module base (21) that defines an accommodating space (25), the lamp panel (27) being mounted under the module base (21), the accommodating space (25) receiving therein a sensor (24)

and a camera lens (23), the sensor (24) being operable to activate operations of the camera lens (23) and the light-emitting component (26).

2. The modular light-emitting device according to claim 1, **characterized in that** the accommodating space (25) receives a single sensor (24) therein in such a way that the sensor (24) is operable to activate an operation of the light-emitting component (26).
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3. The modular light-emitting device according to claim 1, **characterized in that** the sensor (24) is arranged at one side of the camera lens (23).
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4. The modular light-emitting device according to claim 1, **characterized in that** the accommodating space (25) further receives therein a substrate (22) that is arranged on a top of the accommodating space (25) for retaining the camera lens (23) or the sensor (24) so as to prevent the camera lens (23) or the sensor (24) from damages caused by being exposed.
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5. The modular light-emitting device according to claim 1, **characterized in that** the multifunctional module (2) is mounted in an interior of the shell (1) so as to allow for mounting in an interior of a variety of lighting fixtures/devices.
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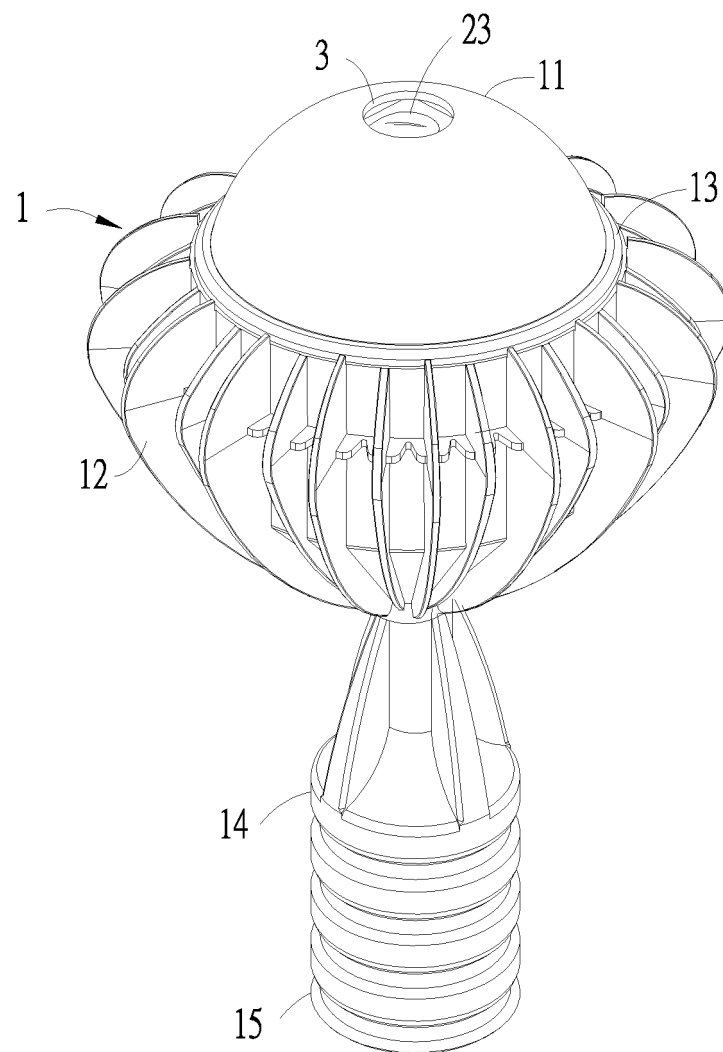


FIG. 1

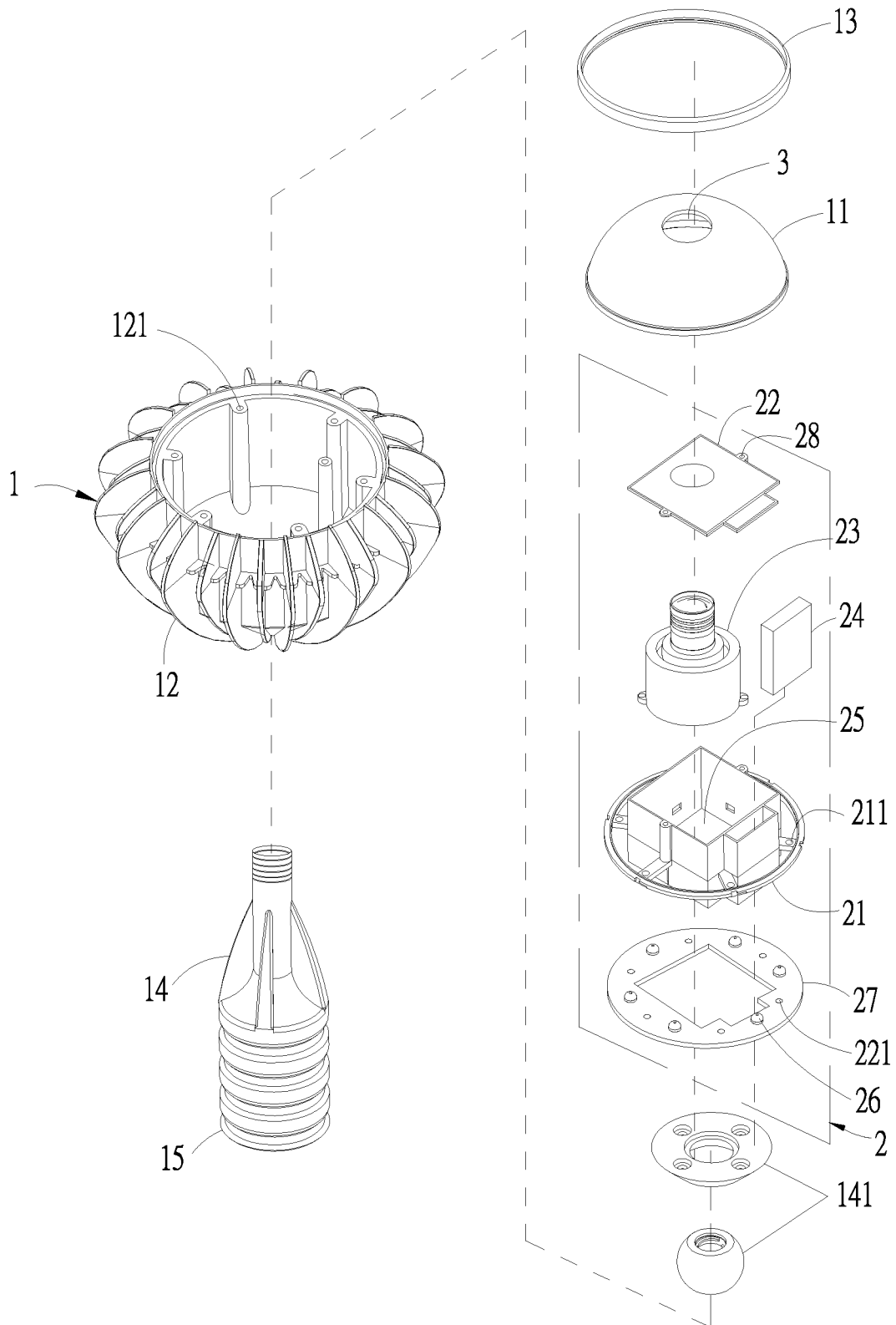


FIG. 2

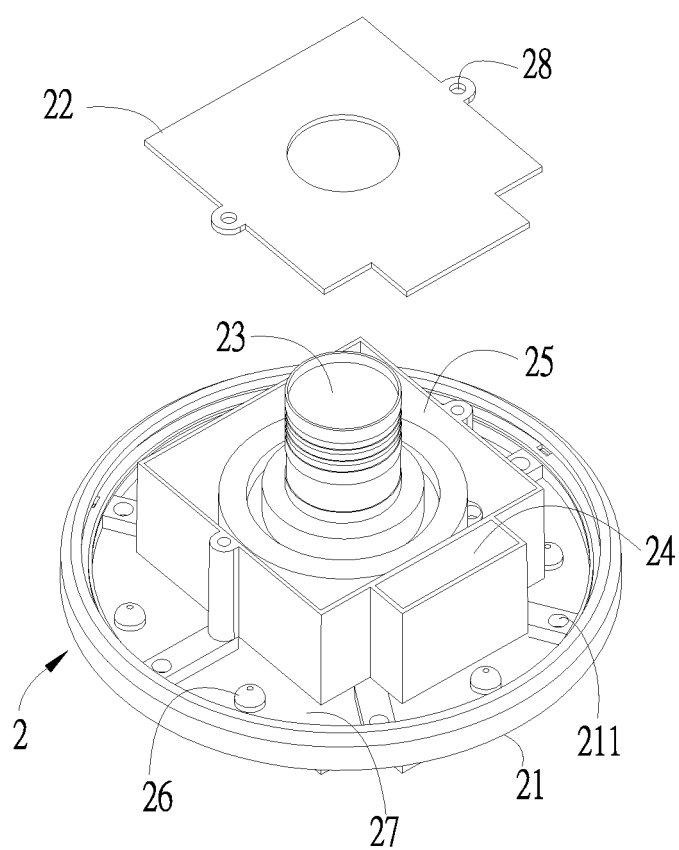


FIG. 3

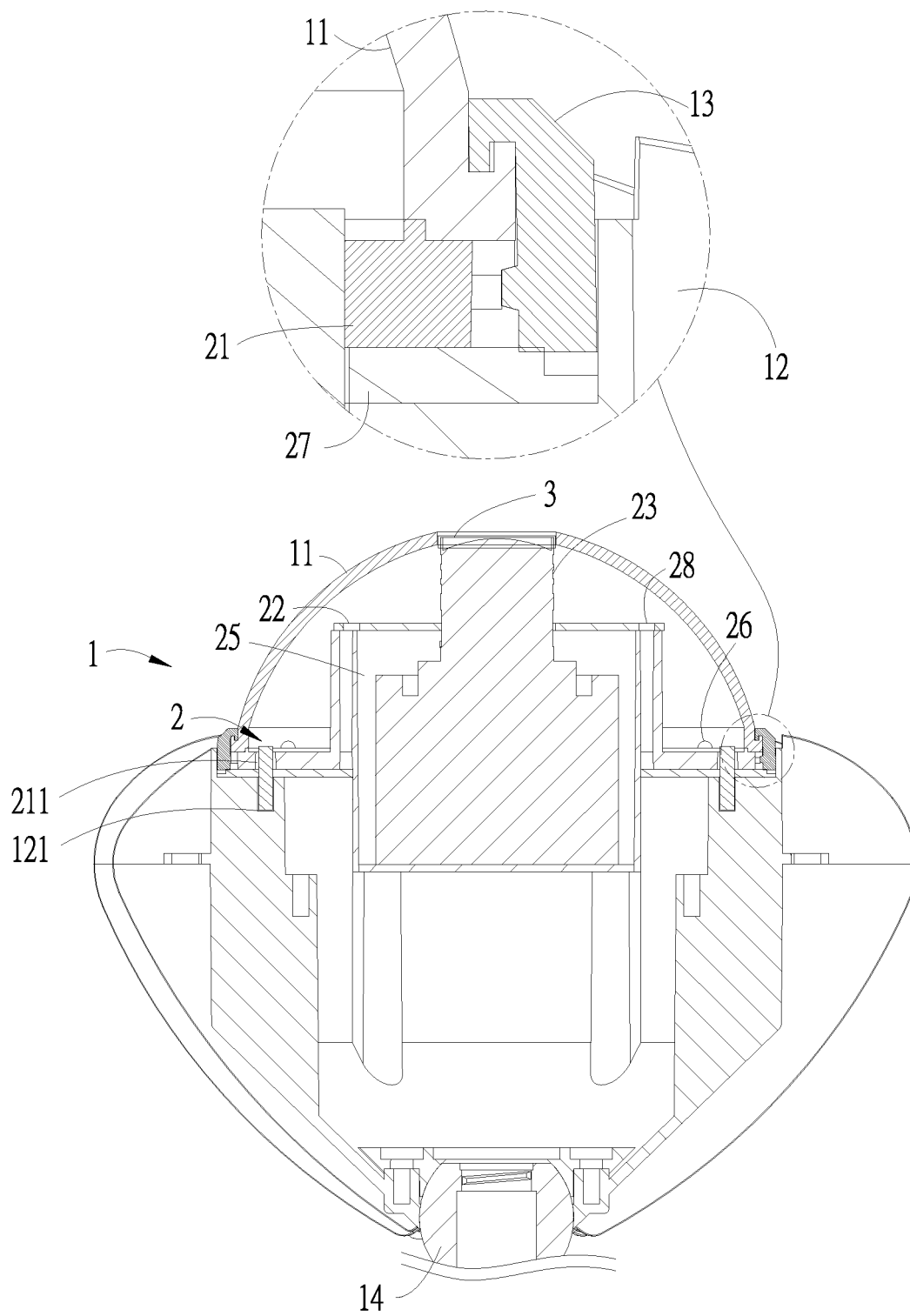


FIG. 4

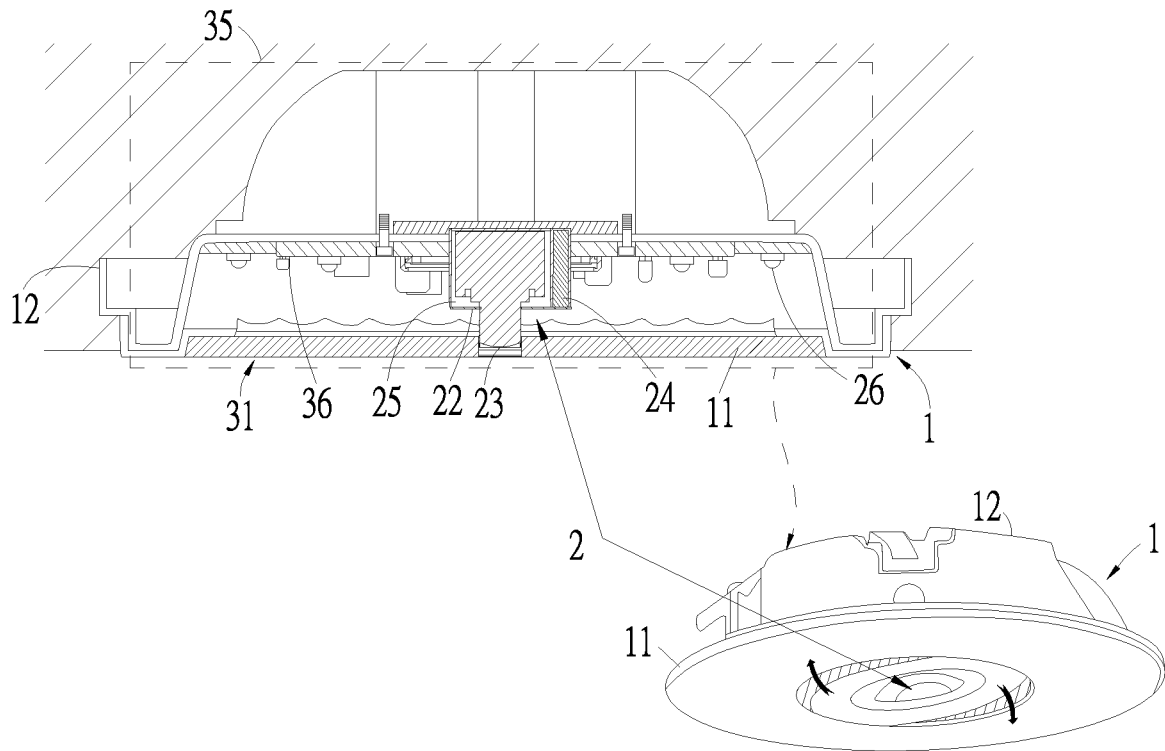


FIG. 5

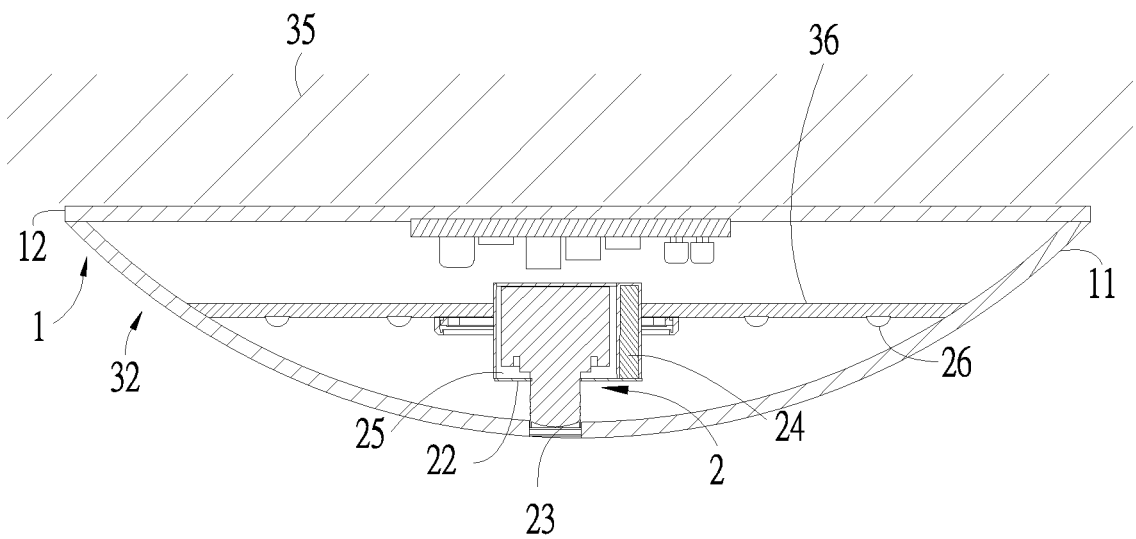


FIG. 6

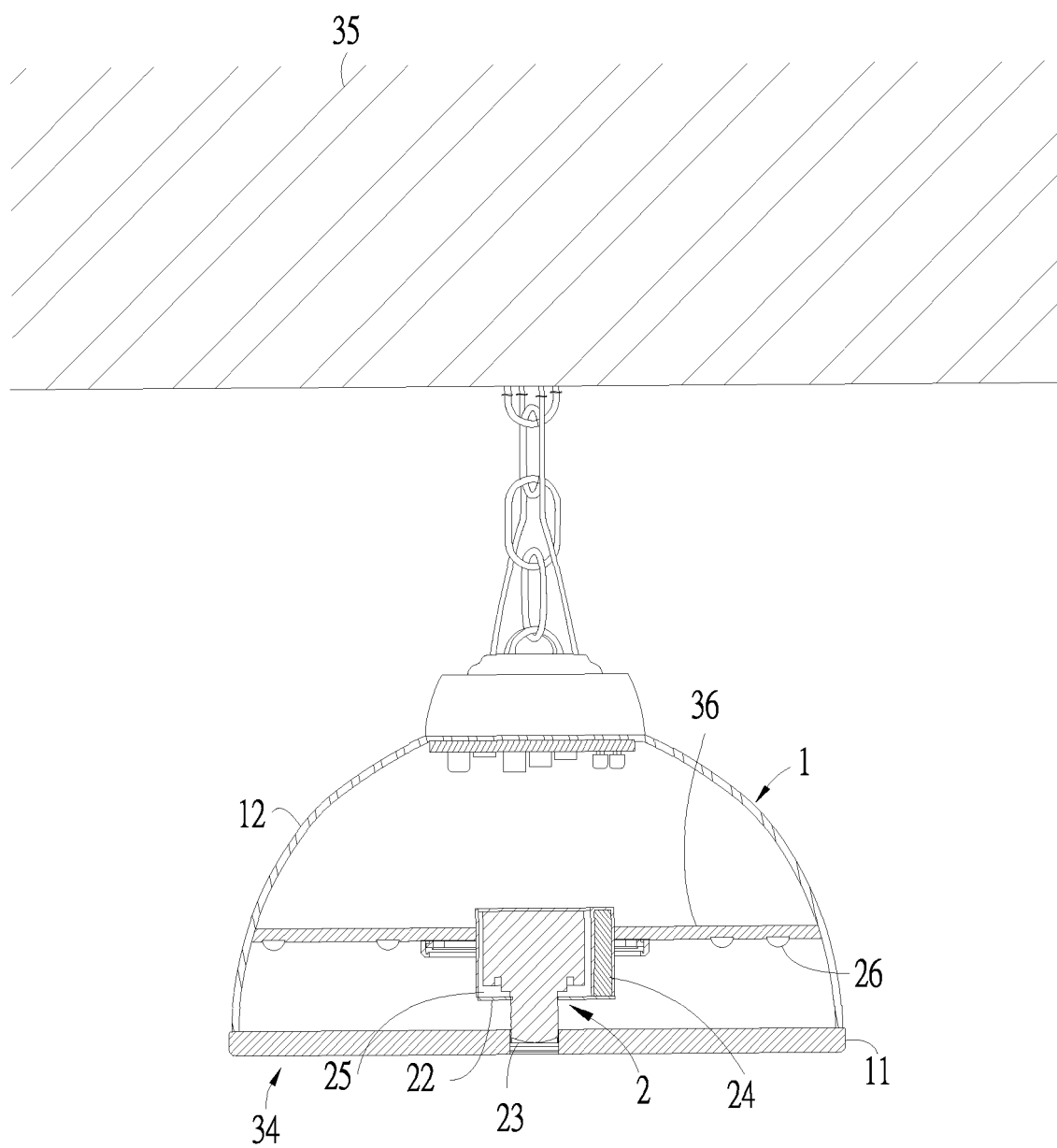


FIG. 7

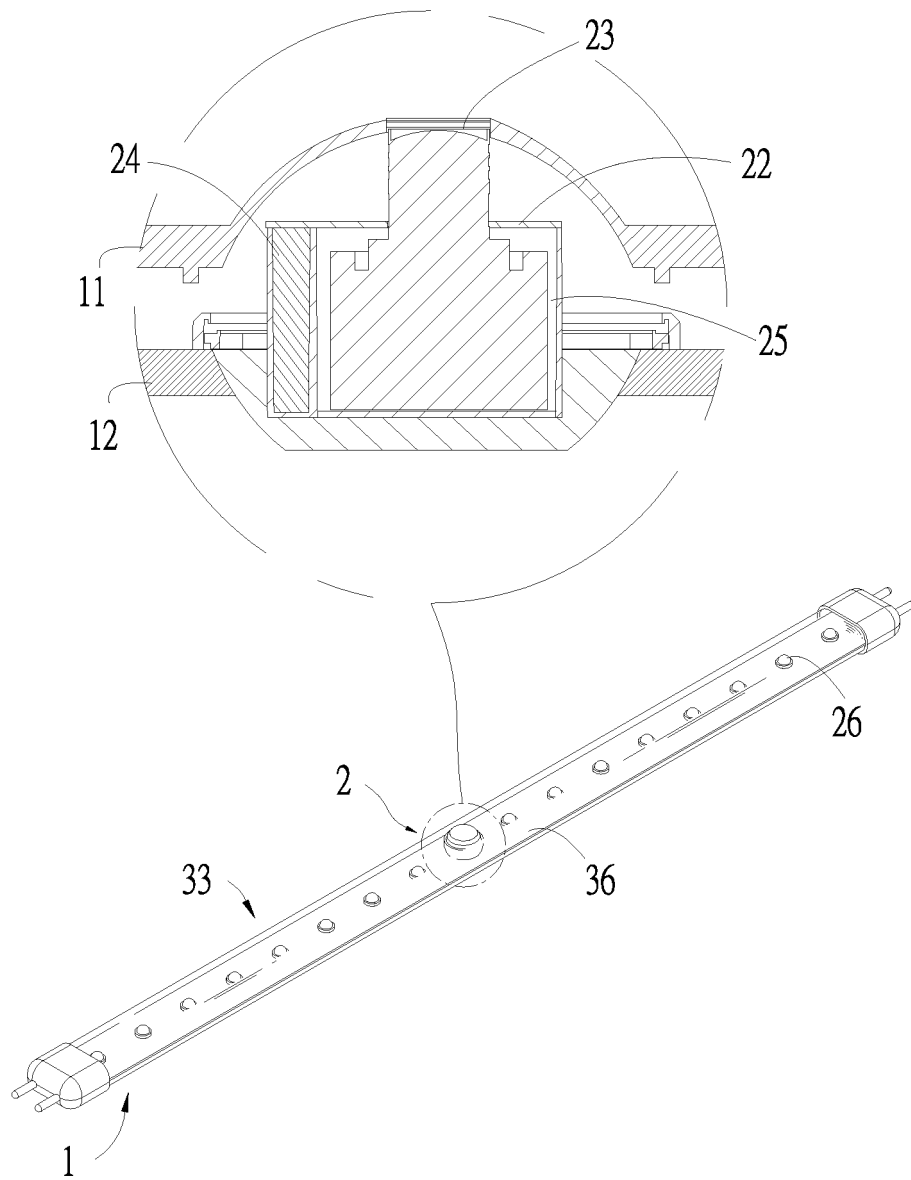


FIG. 8

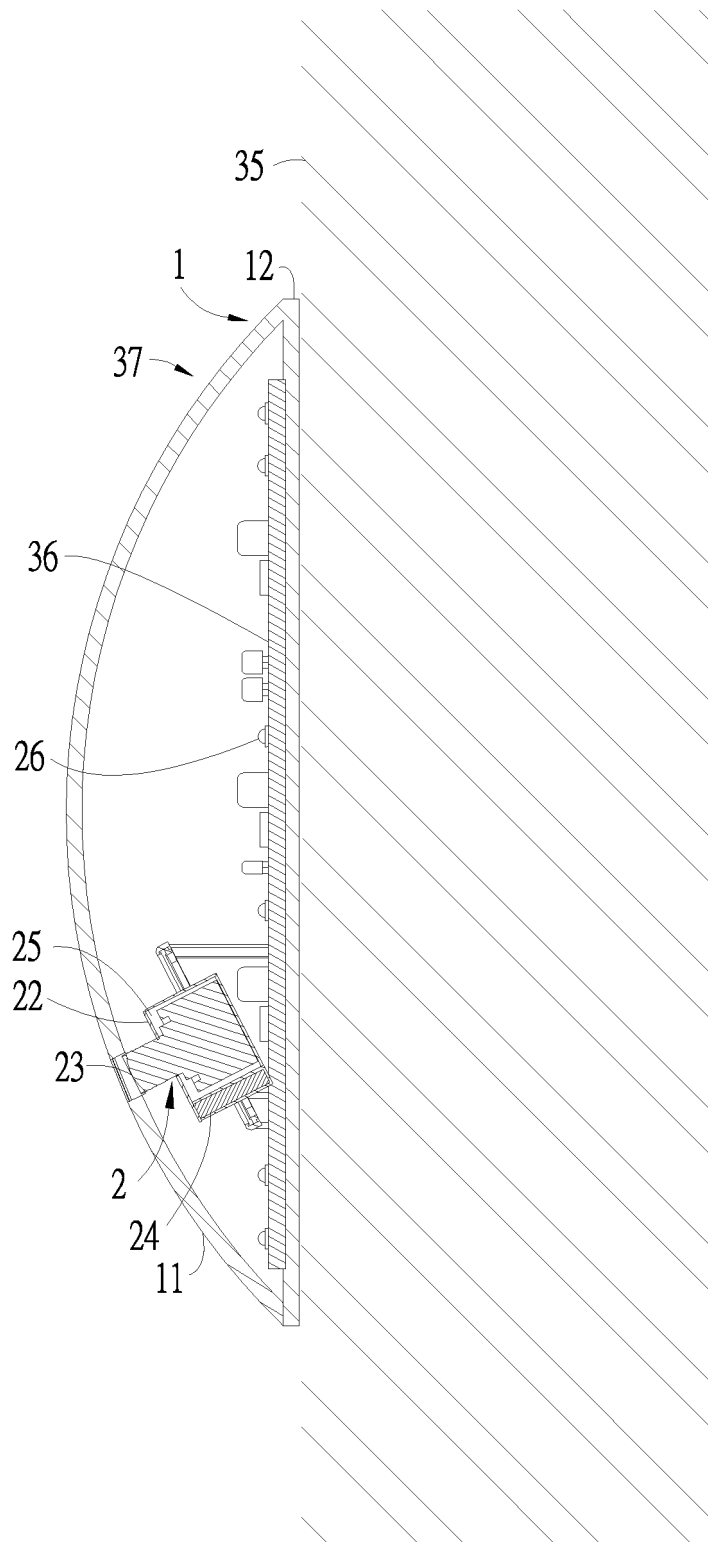


FIG. 9

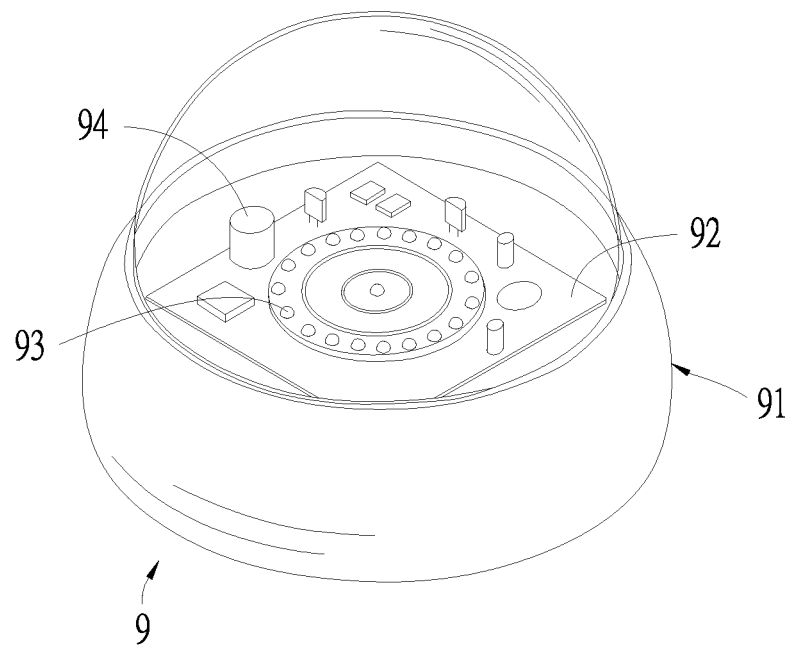


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2014/073723

A. CLASSIFICATION OF SUBJECT MATTER

F21S 2/00 (2006.01) i

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)

F21S 2/-; F21V 33/-; F21V 23/-; F21S 8/-; H05B 37/-

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)

CATXT; USTXT; GBXT; EPTXT; CNTXT; WOTXT; SGTXT; WPI, EPODOC: garden lamp, recessed lamp, F21S 2, multipurpose, light-emitting assembly, light-emitting element, wall lamp, ceiling lamp, base, light emitting diode, fluorescent tube, LAMP?, SENSOR?, TRANSDUCER?, CAMERA?, BASEBOARD, SHELL, BULB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 203454077 U (SHENZHEN ASOKA ELECTRICS CO., LTD.), 26 February 2014 (26.02.2014), description, paragraphs [0025]-[0033], and figures 2-4	1-5
Y	CN 203249196 U (OCEANS KING (DONGGUAN) LIGHTING TECHNOLOGY CO., LTD. et al.), 23 October 2013 (23.10.2013), description, paragraphs [0033]-[0041], and figures 1-3	1-5
Y	CN 203323080 U (WAROM TECHNOLOGY INCORPORATED COMPANY), 04 December 2013 (04.12.2013), description, paragraphs [0044]-[0068], and figures 1-2	1-5
Y	CN 202992916 U (NANJING JISHAN LIGHTING TECHNOLOGY CO., LTD.), 12 June 2013 (12.06.2013), description, paragraphs [0028]-[0030], and figures 1-2	1-5
A	US 2005185398 A1 (SCANNELL, J.; ROBERT, F.), 25 August 2005 (25.08.2005), the whole document	1-5
A	US 2008224849 A1 (SIRHAN, G.), 18 September 2008 (18.09.2008), the whole document	1-5

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"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
"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	"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
"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)	"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
"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	"&" document member of the same patent family

Date of the actual completion of the international search 28 November 2014 (28.11.2014)	Date of mailing of the international search report 17 December 2014 (17.12.2014)
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer LI, Xiugai Telephone No.: (86-10) 82245660

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2014/073723

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 203454077 U	26 February 2014	None	
CN 203249196 U	23 October 2013	None	
CN 203323080 U	04 December 2013	None	
CN 202992916 U	12 June 2013	None	
US 2005185398 A1	25 August 2005	US 2007268687 A1	22 November 2007
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US 2008224849 A1	18 September 2008	WO 2009117093 A1	24 September 2009

Form PCT/ISA/210 (patent family annex) (July 2009)