(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 521 688 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.08.2019 Bulletin 2019/32

(21) Application number: **17854554.7**

(22) Date of filing: **27.07.2017**

(51) Int Cl.:
F21S 8/02 *(2006.01)* ***F21V 14/02*** *(2006.01)*
F21V 15/01 *(2006.01)* ***F21V 19/00*** *(2006.01)*
F21V 29/70 *(2015.01)* ***F21V 21/00*** *(2006.01)*
F21Y 115/10 *(2016.01)*

(86) International application number:
PCT/CN2017/094646

(87) International publication number:
WO 2018/059100 (05.04.2018 Gazette 2018/14)

(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:
MA MD

(30) Priority: **28.09.2016 CN 201621089826 U**

(71) Applicant: **Vertex Lighting And Electrical Co., Ltd.**
Foshan, Guangdong 528000 (CN)

(72) Inventor: **WU, Liangju**
Foshan
Guangdong 528000 (CN)

(74) Representative: **Casalonga**
Casalonga & Partners
Bayerstraße 71/73
80335 München (DE)

(54) **LAMP WITH ADJUSTABLE ILLUMINATION ANGLE**

(57) A lamp includes a light casing, a light source unit and a light adjusting module. The light casing includes a base and a mounting bracket disposed on the base to form an accommodation cavity. The light source unit is disposed inside the accommodation cavity, wherein the light source unit includes a heat dissipation member and a light emitter coupled at the heat dissipation member. The light adjusting module includes a movable member disposed between the mounting bracket and the heat dissipation member. When an actuation force is applied to the light source unit, the light source unit rotates in the accommodation cavity to selectively adjust the illumination angle of the light source unit.

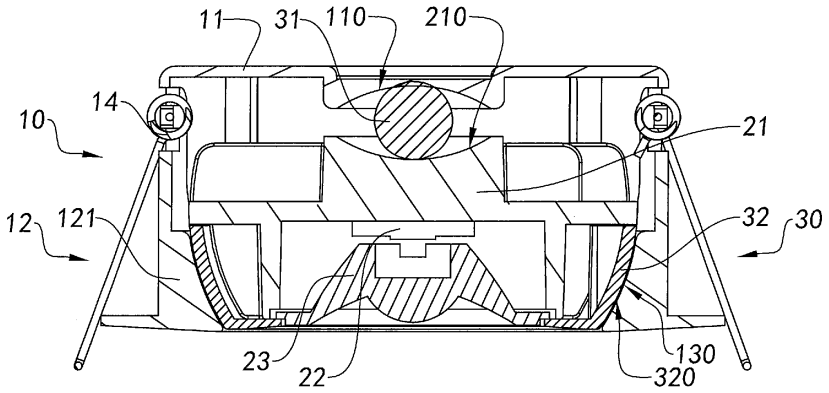

FIG. 1

EP 3 521 688 A1

Description

BACKGROUND OF THE PRESENT INVENTION

FIELD OF INVENTION

[0001] The present invention relates to a light apparatus, and more particularly to a LED lamp with an adjustable illumination angle.

DESCRIPTION OF RELATED ARTS

[0002] LED lamps become popular and is widely used because LED lamps provide different light color effects and save lots of electrical energy. Especially for the recessed light, the LED lamps is relatively small to save the installation space and to keep the aesthetic appearance when the LED lamps are embedded into the ceiling. However, the drawback of the LED recessed light is that after the LED recessed light is installed into the ceiling, the illumination angle of LED recessed light can only projected downward and is adjustable. In other words, the illumination angle of LED recessed light is fixed in a room, such that the user is unable to adjust the illumination angle to fulfill the practically needs of the user.

[0003] How to install a light adjustable device into the LED lamp is one of the major problems in the field of lamp industries. It is an urgent task to solve this existing problem since the LED lamps are so popular nowadays. Accordingly, a conventional LED lamp comprises a heat dissipation member connected to a guiding post, wherein the guiding post comprises a plurality of elastic elements. The conventional LED lamp further comprises a hemispherical rotatable member formed at an inner top end of the guiding post, wherein the guiding post is able to rotate with respect to the rotatable member to adjust the illumination angle of the conventional LED lamp. However, such configuration has lots of problems in use or in manufacturing process. For example, the connection structure is so complicated and requires a relatively large internal space of the LED lamp, such that the manufacturing cost of the LED lamp will be increased and the size of the LED lamp will be enlarged. Therefore, there must be an improvement for the LED lamp to simplify the structure and to reduce the size thereof. In other words, the lamp manufacturers always search for the solution to simplify the connections of the components for the LED lamp and to reduce the overall size of the LED lamp at the same time, so as to reduce the installation space of the LED lamp for the ceiling. Furthermore, the conventional LED lamp has a common heat dissipation problem. Accordingly, the heat dissipation member requires dissipating high heat from the LED lamp. In other words, when the LED lamp incorporates with the light adjustable device, the light adjustable device will takes lots of internal space of the LED lamp and will block the heat dissipation thereof. As a result, the heat will accumulate within the LED lamp, such that the LED lamp will be overheated and will reduce the service life span of the LED lamp.

[0004] In addition, the conventional light angle adjustment is achieved by the rotational movement of the guiding post with respect to the hemispherical rotatable member. Therefore, the frictional coefficient of the hemispherical rotatable member is relatively large, such that the frictional force between the hemispherical rotatable member and the guiding post will be increased when the light angle adjustment is actuated frequently. The structural engagement between the hemispherical rotatable member and the guiding post will be damaged due to the wear and tear. Once the connection is broken, the illumination angle of the LED lamp cannot adjusted.

SUMMARY OF THE PRESENT INVENTION

[0005] The invention is advantageous in that it provides a LED lamp with an adjustable illumination angle, wherein the light adjusting module of the LED lamp has a compact structure and requires a relatively small installation space within the LED lamp, such that the original structure of the LED lamp does not required being altered to incorporate with the light adjusting module.

[0006] Another advantage of the invention is to provide a LED lamp with an adjustable illumination angle, the light adjusting module and the light source unit are coupled with each other in a rotatably movable manner to minimize a friction coefficient thereof, so as to enhance the rotatable movement of the light source unit and to prolong the service life span of the light source unit.

[0007] Another advantage of the invention is to provide a LED lamp with an adjustable illumination angle, wherein the movable member is configured to have a ball shape for forming a ball joint between the mounting bracket and the heat dissipation member. Furthermore, the movable member is an elastic member being elastically deformed after the movement of the light source unit so as to maintain the desired illumination angle of the LED lamp.

[0008] Another advantage of the invention is to provide a LED lamp with an adjustable illumination angle, wherein a first spherical indention is formed at the mounting bracket and a second spherical indention is formed at the heat dissipation member, such that the movable member is rotatably retained between the first and second spherical indentions to reduce the friction coefficient of the light adjusting module so as to minimize any wearing of the components and to enhance the service life span of the LED lamp.

[0009] Another advantage of the invention is to provide a LED lamp with an adjustable illumination angle, which comprises a driving ring disposed in the LED lamp to couple between the light source unit and the light casing to enhance the adjustment of the illumination angle and to enhance the aesthetic appearance of the LED lamp.

[0010] Another advantage of the invention is to provide a LED lamp with an adjustable illumination angle, wherein each of the first and second spherical indentions has a predetermined curvature matching with the curvature

of the movable member to ensure the rotatable movement of the movable member and to maintain the desired illumination angle of the LED lamp.. In addition, the driving ring is tightly engaged with the light casing in a slidably movable manner to further maintain the desired illumination angle of the LED lamp.

[0011] Another advantage of the invention is to provide a LED lamp with an adjustable illumination angle, wherein the structural configuration of the light adjusting module is simple to simplify the manufacturing process of the LED lamp and the reduce the manufacturing cost of the LED lamp.

[0012] Additional advantages and features of the invention will become apparent from the description which follows, and may be realized by means of the instrumentalities and combinations particular point out in the appended claims.

[0013] According to the present invention, the foregoing and other objects and advantages are attained by a LED lamp comprises a light casing having an accommodation cavity, a light source unit disposed in the accommodation cavity and a light adjusting module. The light adjusting module comprises a movable member disposed between the light casing and the light source unit. When an actuation force is applied to the light source unit, the light source unit rotates in the accommodation cavity to selectively adjust the illumination angle of the light source unit.

[0014] In the preferred embodiment, the light casing comprises a mounting bracket and a base, wherein the mounting bracket is disposed on the base to form an accommodation cavity.

[0015] In the preferred embodiment, the light source unit comprises a heat dissipation member and a light emitter coupled at the heat dissipation member, wherein the heat dissipation member serves as a heat sink to dissipate heat generated by the light emitter during the operation.

[0016] In the preferred embodiment, a first spherical indention is formed at the mounting bracket, wherein at least a portion of the movable member is rotatably engaged with the first spherical indention.

[0017] In the preferred embodiment, a second spherical indention is formed at the heat dissipation member, wherein at least a portion of the movable member is rotatably engaged with the second spherical indention.

[0018] In the preferred embodiment, the light adjusting module further comprises a driving ring coupled at the heat dissipation member to slidably couple in the light casing, such that the illumination angle of the light source unit is selectively adjusted via the sliding movement of the driving ring.

[0019] In the preferred embodiment, the movable member is an elastic member being elastically deformed after the light source unit is moved for illumination angle adjustment so as to maintain the illumination angle of the light source unit.

[0020] In the preferred embodiment, the movable member has a ball shape being driven to rotate during the illumination angle adjustment to reduce the friction of the movable member at the first and second spherical indentions.

[0021] In the preferred embodiment, the first spherical indention has an elastic surface to generate a first elastic force to the movable member in order to maintain the illumination angle of the light source unit after the illumination angle adjustment.

[0022] In the preferred embodiment, the second spherical indention has an elastic surface to generate a second elastic force to the movable member in order to maintain the illumination angle of the light source unit after the illumination angle adjustment.

[0023] In the preferred embodiment, the base has an encircling edge outwardly extended from the base, wherein the encircling edge has an inner concave spherical surface. The driving ring has a convex spherical surface matches with and engages with the concave spherical surface of the encircling edge to tightly couple the driving ring at the base in a slidably movable manner.

[0024] In the preferred embodiment, the radius of each of the first and second spherical indentions is slightly larger than the radius of the movable member, such that the movable member is elastically deformed to maintain the illumination angle of the light source unit after the illumination angle adjustment.

[0025] In the preferred embodiment, the light source unit further comprises a light guider, wherein the light emitter is disposed at the light guider, such that the light generated by the light emitter will pass through the light guider to the exterior of the light casing.

[0026] In the preferred embodiment, the size of the light guider matches with a diameter of the opening of the light casing to define a light channel, wherein an external force is applied through the opening to the driving ring to move the light source unit for the illumination angle adjustment.

[0027] In the preferred embodiment, the light casing further comprises a plurality of resilient arms outwardly extended from two sides of the base, wherein the resilient arms are pivotally and downwardly folded to bias against an inner side of the mounting surface to support the LED lamp at the mounting surface.

[0028] In accordance with another aspect of the invention, the present invention comprises a method of adjusting the illumination angle of the LED lamp which comprises the following steps.

[0029] (a) Provide a light emitter for light generation.

[0030] (b) Apply an upward pushing force as an actuation force at a driving ring to move a light source unit within a light casing so as to adjust the illumination angle of the light source unit.

[0031] The step (b) further comprises a step of (b.1) moving the light source unit within the light casing via a movable member.

[0032] The step (b.1) further comprises a step of (b.11) rotating the movable member between first and second spherical indentions to drive the light source unit to rotate

within the light casing.

[0033] The step (b.1) further comprises a step of (b.12) slidably moving the driving ring within the base to move the light source unit.

[0034] Still further objects and advantages will become apparent from a consideration of the ensuing description and drawings.

[0035] These and other objectives, features, and advantages of the present invention will become apparent from the following detailed description, the accompanying drawings, and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036]

Fig. 1 is a sectional view of a LED lamp according to a preferred embodiment of the present invention.

Figs. 2A and 2B are sectional view of the LED lamp according to the above preferred embodiment of the present invention, illustrating the illumination angle adjustment of the LED lamp.

Fig. 3 is an exploded perspective view of the LED lamp according to the above preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0037] The following description is disclosed to enable any person skilled in the art to make and use the present invention. Preferred embodiments are provided in the following description only as examples and modifications will be apparent to those skilled in the art. The general principles defined in the following description would be applied to other embodiments, alternatives, modifications, equivalents, and applications without departing from the spirit and scope of the present invention.

[0038] As shown in Figs. 1 to 3, a LED lamp 1 with an adjustable illumination angle according to a preferred embodiment of the present invention is illustrated, wherein the LED lamp 1 is embodied as a LED recessed light for being installed into the ceiling or other mounting surface, such as a wall surface. The illumination angle of the LED lamp 1 can be selectively adjusted with respect to the mounting surface according to the need of the LED lamp 1. The LED lamp 1 comprises light casing 10, a light source unit 20, and a light adjusting module 30. The light adjusting module 30 is mounted at the light casing 10 and is disposed between the light casing 10 and the light source unit 20. Accordingly, the light casing 10 is embedded in the mounting surface, such as the ceiling surface, to install the LED lamp 1 thereat so as to adjust the illumination angle of the LED lamp 1 with respect to the mounting surface. Via the light adjusting module 30, a relative position between the light source unit 20 and the light casing 10 is shifted to move the light source unit 20 at a predetermined tilted angle so as to adjust the illumination angle of the LED lamp 1. It is worth mentioning that the structure of the light adjusting module 30 is simply to simplify the structural configuration of the LED lamp 1 and to reduce the manufacturing cost thereof. In addition, the light adjusting module 30 is compact to take a relatively small interior space of the LED lamp 1, such that the original structure of the LED lamp 1 will be not be altered by the light adjusting module 30 to minimize the overall size of the LED lamp 1 and to minimize the installation space of the LED lamp 1.

[0039] According to the preferred embodiment, the light casing 10 comprises a mounting bracket 11 and a base 12, wherein the mounting bracket 11 is mounted at the base 12. The mounting bracket 11 has a accommodation cavity 100. Particularly, the accommodation cavity 100 is formed within the mounting bracket 11 and the base 12. The light source unit 20 and the light adjusting module 30 are disposed in the accommodation cavity 100, wherein the light source unit 20 is slidable within the accommodation cavity 100 to adjust the illumination angle of the light source unit 20 at a predetermined angle. Accordingly, the base 11 of the LED lamp 1 is embedded into the mounting surface. Comparing with the conventional mounting structure of the LED lamp, the light adjusting module 30 will not substantially increase the overall size of the LED lamp 1 to increase the installation space thereof. Accordingly, the base 12 comprises an encircling edge 121 upwardly extended from the base 12. Preferably, the encircling edge 121 is perpendicularly extended from the base 12, wherein the mounting bracket 11 is connected to the base 12 via the encircling edge 121.

[0040] Accordingly, the base 12 has an opening 120, wherein when the light source unit 20 is electrified, the light generated by the light source unit 20 will pass through the opening 120 of the base 12 to project out of the light casing 10 for illumination purpose. Furthermore, the light source unit 20 is movable within the accommodation cavity 100 to adjust the illumination angle projecting out of the opening 120 of the base 12.

[0041] Accordingly, the light source unit 20 comprises a heat dissipation member 21 and a light emitter 22 coupled to the heat dissipation member 21, wherein the heat dissipation member 21 is arranged to dissipate heat generated by the light emitter 22 during the operation. In one embodiment, the light emitter 22 is a LED module which generates a large amount of heat when the light emitter 22 is electrified at a working mode. If the heat cannot be immediately dissipated out of the LED lamp 1, the heat will damage the LED module and cause the overheating problem to reduce the service life span of the LED lamp 1. Preferably, the heat dissipation member 21 is made of good thermal conductive material, such as aluminum, wherein the heat dissipation member 21 is able to immediately dissipate the heat from the LED module to maintain the LED module under the proper working temper-

ature.

[0042] It is worth mentioning that the light adjusting module 30 comprises a movable member 31 disposed between the mounting bracket 11 and the heat dissipation member 21, wherein the heat dissipation member 21 is rotatably coupled at the mounting bracket 11 via the movable member 31. In other words, the light source unit 20 is rotatably coupled to the mounting bracket 11 via the movable member 31 to allow the movement of the light source unit 20 within the light casing 10 so as to adjust and maintain the illumination angle of the light source unit 20. Therefore, the light source unit 20 is adjustably maintained at the desired illumination angle. Preferably, the movable member 31, having a spherical shape or ball shape, is an elastic member, such as made of silicon or rubber. When the light source unit 20 is moved to adjust the illumination angle thereof, the movable member 31 is elastically deformed to retain the light source unit 20 at the desired illumination angle.

[0043] Accordingly, the movable member 31 is rotated via a rotatable movement thereof between the mounting bracket 11 and the heat dissipation member 21, wherein the friction coefficient of the movable member 31 will be substantially reduced via the rotatable movement thereof, so as to minimize the damage between the mounting bracket 11 and the heat dissipation member 21 due to the wear and tear problem, as a result prolonging the service life span of the movable member 31. It is worth mentioning that the movable member 31 has a predetermined size, wherein after the light source unit 20 is moved to adjust its illumination angle thereof, the force from the heat dissipation member 21 and the mounting bracket 11 will exert to the movable member 31 to elastically deform the movable member 31. As a result, the movable member 31 will generate an outward expanding force to retain the heat dissipation member 21 at the desired position after the adjustment so as to maintain the illumination angle of the light source unit 20. Once a subsequent force is applied to the light source unit 20 to slide within the light casing 10, the illumination angle thereof will be correspondingly adjusted. In other words, the position of the light source unit 20 can be selectively adjusted and maintained via the elastically deformation of the movable member 31.

[0044] It is worth mentioning that the mounting bracket 11 has a first spherical indention 110 formed at an inner top portion of the mounting bracket 11, wherein the first spherical indention 110 is defined within the accommodation cavity 100. Preferably, the first spherical indention 110 is formed at the inner top portion of the mounting bracket 11 at a center thereof, wherein a portion of the movable member 31 is movably engaged with the first spherical indention 110. The movable member 31 is rotated at the concave surface of the first spherical indention 110 to reduce the friction coefficient. Comparing to the movement along a flat surface, the first spherical indention 110 provides a greater sliding surface to precisely adjust the rotational position of the movable member 31 so as to adjust the illumination angle of the light source unit 20.

[0045] It is worth mentioning that the heat dissipation member 21 has a second spherical indention 210 formed at a top end of the heat dissipation member 21 at a center thereof. Preferably, the second spherical indention 210 is aligned with the first spherical indention 110 that the first and second spherical indentions 110, 210 are positioned at the opposite direction with respect to the movable member 31. In other words, two sliding portions of the movable member 31 are movably engaged with the first and second spherical indentions 110, 210 respectively, wherein the center of the mounting bracket 11 is aligned with the center of the heat dissipation member 21. Therefore, the light adjusting module 30 is located at the center of the LED lamp 1, wherein the rotatable movement of the movable member 31 will not damage the structure of the LED lamp 1 when adjusting the illumination angle of the light source unit 20.

[0046] It is worth mentioning that each of sliding portions of the movable member 31 may have a convex surface to slidably engage with the first and second spherical indentions 110, 210, i.e. the top and bottom spherical indentions. It should be appreciated that the movable member 31 is configured to have a ball shape to define the spherical surface as the convex surface to slidably engage with the first and second spherical indentions 110, 210. In other words, the first and second spherical indentions 110, 210 serve as two spherical holders to retain the movable member 31 therebtween.

[0047] It is worth mentioning that each of the first and second spherical indentions 110, 210 has a predetermined curvature matching with the curvature of the movable member 31. In other words, the curvature of the first spherical indention 110 matches with the curvature of the first sliding portion of the movable member 31 while the curvature of the second spherical indention 210 matches with the curvature of the second sliding portion of the movable member 31. Preferably, the radius of each of the first and second spherical indentions 110, 210 is slightly larger than the radius of the movable member 31. When the user adjust the illumination angle of the LED lamp 1 by shifting the displacement of the light source unit 20, the force is exerted to the movable member 31 from the mounting bracket 11 and the heat dissipation member 21, so as to elastically deform the movable member 31. Therefore, the elastic deformation of the movable member 31 will maintain the light source unit 20 at the desired position after the adjustment.

[0048] It is worth mentioning that the first spherical indention 110 is an elastic indention that has an elastic surface, wherein when the movable member 31 is slid at the first spherical indention 110, the first spherical indention 110 is elastically deformed via the elastic surface to generate an elastic force to the movable member 31 so as to maintain the light source unit 20 at the desired position after the adjustment. In other words, the concave surface of the first spherical indention 110 has an elastic

ability to engage with the movable member 31.

[0049] Likewise, the second spherical indention 210 is also an elastic indention that has an elastic surface, wherein when the movable member 31 is slid at the second spherical indention 210, the second spherical indention 210 is elastically deformed via the elastic surface to generate an elastic force to the movable member 31 so as to maintain the light source unit 20 at the desired position after the adjustment. In other words, the concave surface of the second spherical indention 210 has an elastic ability to engage with the movable member 31.

[0050] It is worth mentioning that the light adjusting module 30 further comprises a driving ring 32 disposed between the light source unit 20 and the light casing 10, wherein when the force is exerted at the driving ring 32, the displacement of the light source unit 20 is shifted within the accommodation cavity 100. Therefore, the light source unit 20 is fittingly slid within the inner wall of the light casing 10 via the driving ring 32. In other words, the driving ring 32 is filled in a space between the inner wall of the light casing 10 and the light source unit 20 to allow the stably sliding movement of the light source unit 20 within the light casing 10 and to prevent any dust or dirt entering into the accommodation cavity 100 to damage the light source unit 20. At the same time, the aesthetic appearance of the LED lamp 1 can be maintained. Accordingly, the driving ring 32 is connected to a bottom side of the heat dissipation member 21 to enable the slidable movement of the light source unit 20 within the accommodation cavity 100 via the driving ring 32. In other words, the driving ring 32 is coupled at the light source unit 20 to slide at the inner wall of the light casing 10.

[0051] Accordingly, the driving ring 32 has a convex spherical surface 320 defined at a rim of the driving ring 32, wherein the convex spherical surface 320 matches with a concave spherical surface 130 of the encircling edge 121 to tightly couple the driving ring 32 with the light casing 10. When the light source unit 20 is slid at the base 12, the convex spherical surface 320 is contacted with the concave spherical surface 130, such that the convex spherical surface 320 is slid at the concave spherical surface 130 to ensure the driving ring 32 being slid in the light casing 10.

[0052] It is worth mentioning that the light source unit 20 further comprises a light guider 23 coupled at the heat dissipation member 21, wherein the light emitter 22 is disposed at the light guider 23. When the light source unit 20 is electrified to generate the light, the light will pass through the light guider 23. Preferably, the light guider 23 is arranged to focus and guide the light. Unlike the conventional LED lamp, the light guider 23 incorporating with the light emitter 22 can form a spotlight to provide a spotlight ability, wherein the angle can be preset between 10° and 60°. At the same time, the light emitted by the light source unit 20 is configured to have an uniform natural light color, natural spotlight transition, and a single colored light. Preferably, the light guider 23 can be a lens and/or a light reflective cup depending the use of the LED lamp 1.

[0053] It is worth mentioning that the light casing 10 further comprises a plurality of resilient arms 14 outwardly extended from two sides of the base 12, preferably vertically and upwardly extended therefrom, respectively. When the LED lamp 1 is installed and embedded into the mounting surface from an outer side thereof, the resilient arms 14 are pivotally and downwardly folded to bias against an inner side of the mounting surface to support the LED lamp 1 at the mounting surface.

[0054] In order to adjust the illumination angle of the LED lamp 1, the user is able to reach the light guider 23 through the opening 110, wherein the user is able to upwardly press on either side of the light guider 23 via the actuation force F1 or F2, such that the light guider 23 is driven to move within the accommodation cavity 100. Through this movement, the heat dissipation member 21 is driven to move within the mounting bracket 11 via the rotational movement of the movable member 31. Therefore, the light source unit 20 is shifted within the accommodation cavity 110 to adjust the illumination angle thereof. For example, at the original position of the light source unit 20, the light source unit 20 will generate the light to vertically and downwardly project through the opening 110. When the upward pushing force is exerted at the right side of the light guider 23, the light source unit 20 is shifted within the accommodation cavity 110 at the right side, such that the illumination angle of the light source unit 20 is shifted at the titled angle toward the right side. In other words, when the upward pushing force as the actuation force is then exerted at the left side of the light guider 23, the light source unit 20 is shifted within the accommodation cavity 110 back to its original position, such that the illumination angle of the light source unit 20 is shifted back to vertically and downwardly project through the opening 110. Accordingly, the movable member 31 serves as a rotating point of the light source unit 20 to allow the light source unit 20 being rotated within the light casing 10 and forms at a centerline of the light source unit 20 to ensure the movement of the light source unit 20 in a symmetrical manner via the upward pushing force. In other words, after the light source unit 20 is rotated at one side via the upward pushing force, another upward pushing force can be applied at the opposite side of the light source unit 20 to move the light source unit 20 back to its original position to vertically and downwardly project the light.

[0055] The present invention further provides a method of adjusting the illumination angle of the LED lamp 1 which comprises the following steps.

[0056] (a) Provide the light emitter 22 for light generation, wherein the light emitter 22 is electrified to generate the light penetrating through the light guider 23.

[0057] (b) Apply the upward pushing force at the driving ring 32 to move the light source unit 20 within the light casing 10 so as to adjust the illumination angle of the light source unit 20. Accordingly, when the upward pushing force is applied, the light source unit 20 is rotatably

moved within the accommodation cavity 100 to adjust the illumination angle of the light source unit 20.

[0058] The step (b) further comprises a step of (b.1) moving the light source unit 20 within the light casing 10 via the movable member 31. Particularly, the step (b.1) further comprises a step of (b.11) rotating the movable member 31 between the first and second spherical indentions 110, 210 to drive the light source unit 20 to rotate within the light casing 10. Preferably, the movable member 31 is configured to have a ball shape, wherein when the light source unit 20 is moved to adjust the illumination angle thereof, the movable member 31 is elastically deformed to maintain the illumination angle of the light source unit 20.

[0059] The step (b.1) further comprises a step of (b.12) slidably moving the driving ring 32 within the base 12 to move the light source unit 20. In other words, when the light source unit 20 is slid at the base 12, the convex spherical surface 320 is contacted with the concave spherical surface 130, such that the convex spherical surface 320 is slid at the concave spherical surface 130 to ensure the driving ring 32 being slid in the light casing 10.

[0060] One skilled in the art will understand that the embodiment of the present invention as shown in the drawings and described above is exemplary only and not intended to be limiting. It will thus be seen that the objects of the present invention have been fully and effectively accomplished. The embodiments have been shown and described for the purposes of illustrating the functional and structural principles of the present invention and is subject to change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

Claims

1. A lamp, comprising:

   a light casing having an accommodation cavity, a light source unit disposed in said accommodation cavity; and

   a light adjusting module which comprises a movable member disposed in said accommodation cavity and movably coupled between said light casing and said light source unit, wherein when an external actuation force is applied to said light source unit, said light source unit rotates in said accommodation cavity to selectively adjust an illumination angle of said light source unit.

2. The lamp, as recited in claim 1, wherein said light casing comprises a mounting bracket and a base, wherein said mounting bracket is coupled at said base to form said accommodation cavity.

3. The lamp, as recited in claim 2, wherein said light source unit comprises a heat dissipation member and a light emitter coupled to said heat dissipation member, wherein said heat dissipation member serves as a heat sink for dissipating heat generated by said light emitter.

4. The lamp, as recited in claim 3, wherein a first spherical indention is formed at said mounting bracket, wherein at least a portion of said movable member is rotatably engaged with said first spherical indention.

5. The lamp, as recited in claim 4, wherein a second spherical indention is formed at said heat dissipation member, wherein at least a portion of said movable member is rotatably engaged with said second spherical indention.

6. The lamp, as recited in claim 5, wherein said light adjusting module further comprises a driving ring coupled at said heat dissipation member to slidably couple in said light casing, such that said illumination angle of said light source unit is selectively adjusted via a sliding movement of said driving ring.

7. The lamp, as recited in claim 6, wherein said movable member is an elastic member being elastically deformed after said light source unit is moved for illumination angle adjustment so as to maintain said illumination angle of said light source unit.

8. The lamp, as recited in claim 7, wherein said movable member has a spherical surface that said movable member is driven to rotate during said illumination angle adjustment to reduce a friction of said movable member at said first and second spherical indentions.

9. The lamp, as recited in claim 5, wherein said first spherical indention has an elastic surface for generating a first elastic force to said movable member in order to maintain said illumination angle of said light source unit after an illumination angle adjustment.

10. The lamp, as recited in claim 9, wherein said second spherical indention has an elastic surface for generating a second elastic force to said movable member in order to maintain said illumination angle of said light source unit after said illumination angle adjustment.

11. The lamp, as recited in claim 8 or 10, wherein said base has an encircling edge outwardly extended from said base, wherein said encircling edge has an inner concave spherical surface, wherein said driving ring has a convex spherical surface matches with and engages with said concave spherical surface of

said encircling edge to tightly couple said driving ring at said base in a slidably movable manner.

12. The lamp, as recited in claim 11, wherein an radius of each of said first and second spherical indentions is slightly larger than a radius of said movable member, such that said movable member is elastically deformed to maintain said illumination angle of said light source unit after said illumination angle adjustment.

13. The lamp, as recited in claim 12, wherein said light source unit further comprises a light guider, wherein said light emitter is disposed at said light guider, such that said light generated by said light emitter passes through said light guider to an exterior of said light casing.

14. The lamp, as recited in claim 13, wherein a size of said light guider matches with a diameter of an opening of said light casing to define a light channel, wherein the external actuation force is applied through said opening to said driving ring to move said light source unit for said illumination angle adjustment.

15. The lamp, as recited in claim 14, wherein said light casing further comprises a plurality of resilient arms outwardly extended from two sides of said base, wherein said resilient arms are pivotally and downwardly folded for biasing against an inner side of a mounting surface to support said lamp at the mounting surface.

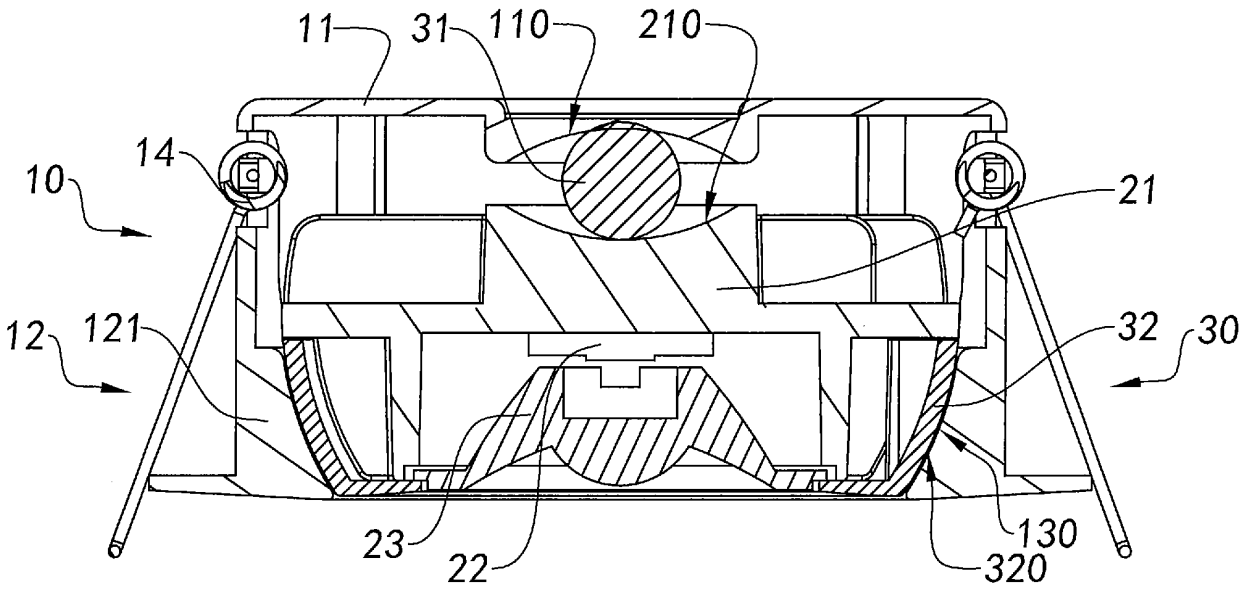

FIG. 1

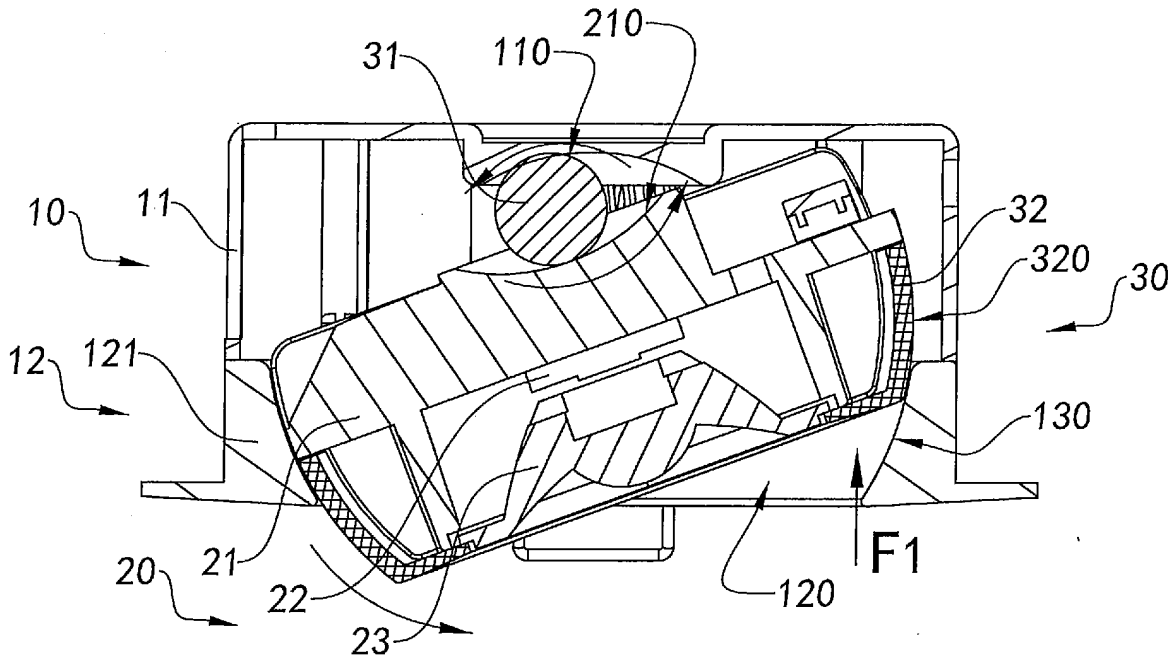
210
31
110
10
11
32
320
30
12
121
130
F1
21
20
22
120
23

FIG. 2A

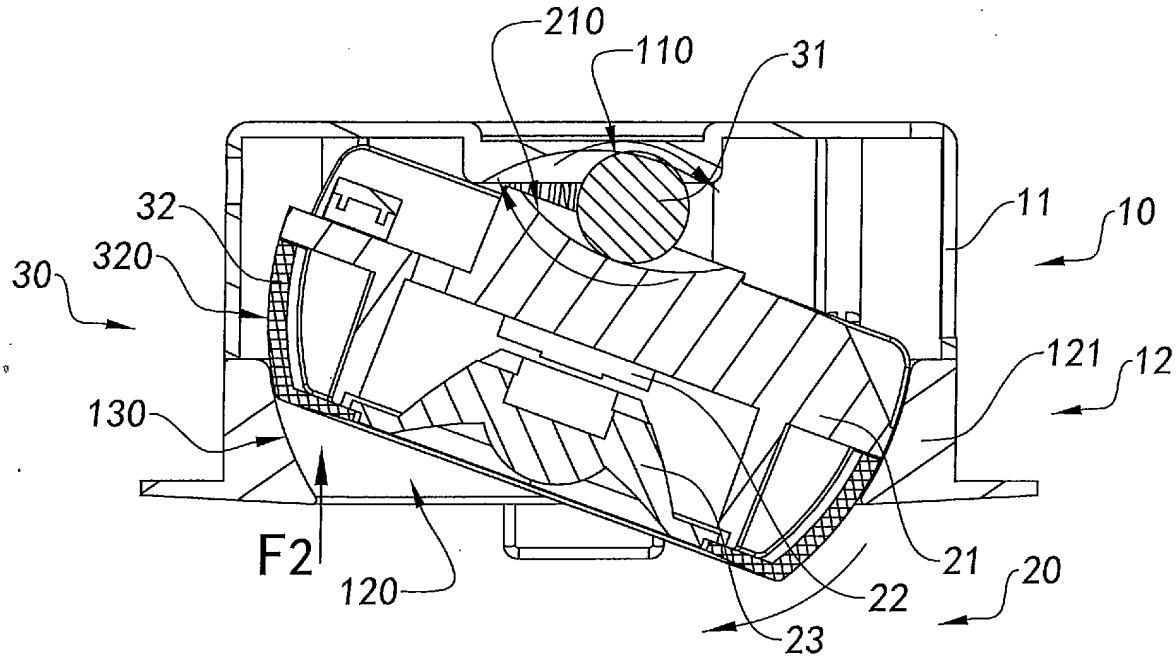
210
110
31
32
320
30
11
10
121
12
130
F2
120
21
20
22
23

FIG. 2B

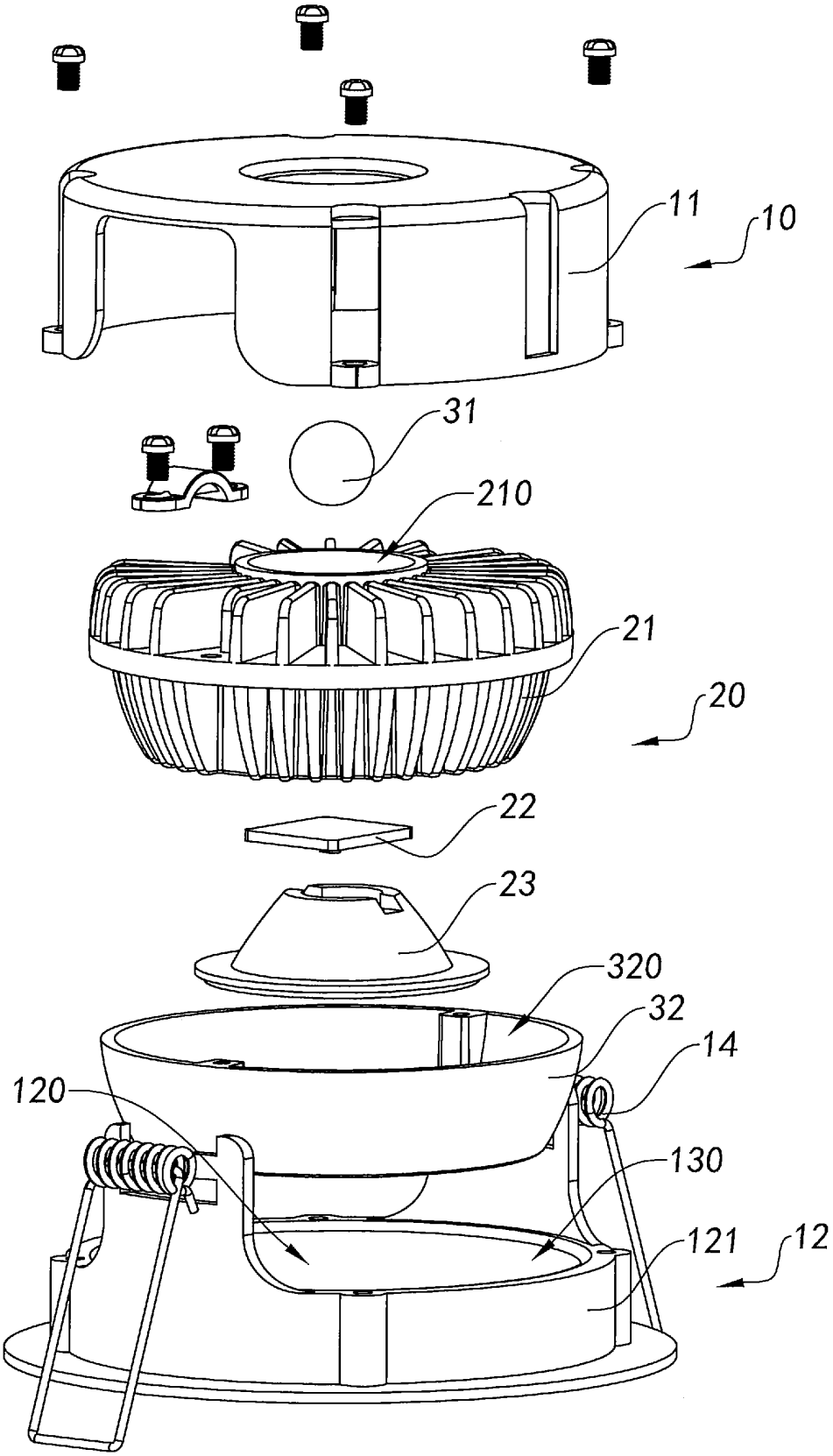

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/094646

A. CLASSIFICATION OF SUBJECT MATTER

F21S 8/02 (2006.01) i; F21V 14/02 (2006.01) i; F21V 15/01 (2006.01) i; F21V 19/00 (2006.01) i; F21V 29/70 (2015.01) i; F21V 21/00 (2006.01) i; F21Y 115/10 (2016.01) n

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)

F21

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)

CNABS, CNTXT, VEN: 照射, 范围, 角度, 滚动, 摇摆, 摆动, 旋转, 转动, 弹性, 弹力, 球面, 球形, 腔, irradiat+, illumin+, lighting, zone?, area?, field?, angle?, rotat+, roll+, elastic+, sphere+, spherical, round, chamber?, cavit+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 206093753 U (VERTEX LIGHTING AND ELECTRICAL CO.,LTD.) 12 April 2017 (12.04.2017), claims 1-15	1-15
X	CN 205351023 U (RISE LIGHTING CO., LTD.) 29 June 2016 (29.06.2016), description, paragraphs [0038]-[0045], and figures 1-5	1, 2
Y	CN 205351023 U (RISE LIGHTING CO., LTD.) 29 June 2016 (29.06.2016), description, paragraphs [0038]-[0045], and figures 1-5	3-8
A	CN 205351023 U (RISE LIGHTING CO., LTD.) 29 June 2016 (29.06.2016), description, paragraphs [0038]-[0045], and figures 1-5	9-15
Y	WO 2009092405 A1 (ZUMTOBEL LIGHTING GMBH et al.) 30 July 2009 (30.07.2009), description, page 4, line 5 to page 9, line 7, and figures 1-7	3-8

☒ 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
16 October 2017	27 October 2017
Name and mailing address of the ISA 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 HUANG, Fei Telephone No. (86-10) 62085815

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2017/094646

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2009092405 A1 (ZUMTOBEL LIGHTING GMBH et al.) 30 July 2009 (30.07.2009), description, page 4, line 5 to page 9, line 7, and figures 1-7	9-15
X	CN 102691948 A (OSRAM GMBH.) 26 September 2012 (26.09.2012), description, paragraphs [0023]-[0038], and figures 1-6B	1, 2
X	EP 1906078 A1 (RUUD LIGHTING INC.) 02 April 2008 (02.04.2008), description, paragraphs [0016]-[0020], and figure 1	1, 2

Form PCT/ISA /210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/094646

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 206093753 U	12 April 2017	None	
CN 205351023 U	29 June 2016	None	
WO 2009092405 A1	30 July 2009	DE 102008005697 A1	30 July 2009
		EP 2235436 A1	06 October 2010
CN 102691948 A	26 September 2012	WO 2012126749 A1	27 September 2012
		US 2014003061 A1	02 January 2014
		CN 102691948 B	20 April 2016
		US 9523493 B2	20 December 2016
		DE 112012000654 T5	19 December 2013
EP 1906078 A1	02 April 2008	US 7744259 B2	29 June 2010
		AT 471483 T	15 July 2010
		US 2008080190 A1	03 April 2008
		DE 602007007166 D1	29 July 2010
		CA 2602780 C	17 June 2014
		EP 1906078 B1	16 June 2010
		CA 2602780 A1	30 March 2008

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