



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

(43) Date of publication:
05.06.2019 Bulletin 2019/23

(51) Int Cl.:
F21S 8/02 (2006.01)

(21) Application number: **17845197.7**

(86) International application number:
PCT/CN2017/097208

(22) Date of filing: **11.08.2017**

(87) International publication number:
WO 2018/040895 (08.03.2018 Gazette 2018/10)

(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

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(30) Priority: **30.08.2016 CN 201610783397**
30.08.2016 CN 201610783396
30.08.2016 CN 201621013745 U
30.08.2016 CN 201621013684 U

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(54) **LED LIGHTING DEVICE**

(57) The present invention discloses a LED lighting device including a housing, a light source component, an optical lens located above the light source component and configured to distribute light for the light source component, a reflector in contact with the optical lens, and a surface ring assembled on the reflector; the housing, the light source component, the optical lens, the reflector, and the surface ring are sequentially arranged; the surface ring is fixed on the housing to delimit a receiving chamber, the light source component, the optical lens, the reflector are all located in the receiving chamber; the LED lighting device has a light exit; the light source component includes a light source base plate and LED light source particles located on the light source base plate; light of the LED light source particles sequentially passes through the optical lens and the reflector, and then emits through the light exit. The LED lighting device provided by the present invention does not need a diffusion plate to homogenize light, increases the luminous efficiency and at the same time prevents from glare, so as to achieve a good lighting effect.

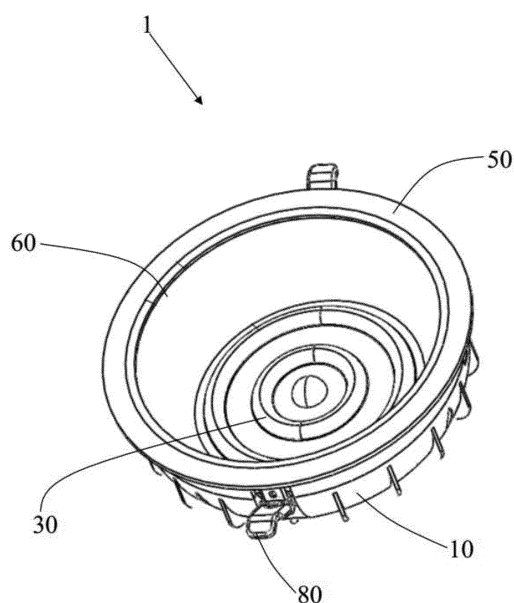


FIG. 1

Description

TECHNICAL FIELD

[0001] The present invention relates to a lighting device, and particularly to a LED lighting device.

BACKGROUND

[0002] In the current global background of energy shortage, LED is widely used in the field of lighting devices as a new solid-state light source for its advantages of energy saving, high efficiency, environmental protection, flexible control, safety, reliability, and good orientation.

[0003] LED downlight is a lighting device which has been improved and developed based on traditional downlights combined with LED lighting technology. At present, most of the LED downlights in the market use a direct-lit structure of a LED light source matched with a one-staged reflector or multi-staged reflectors or use an edge-lit attached structure of a LED light source matched with a light guide plate, which usually involves product defects such as low luminous efficiency, high glare, large size and high cost. Only high-end products of a few brands possess technical advantages such as high luminous efficiency, low glare and compact structure, which, however, are higher in price and hence are difficult to meet the market demand for large-scale applications.

[0004] Therefore, in order to overcome the above drawbacks, it is necessary to provide an improved LED lighting device.

SUMMARY

[0005] An objective of the present invention is to provide a LED lighting device in order to solve the above technical problems.

[0006] In order to achieve the above objective, the present invention adopts the following technical solution: a LED lighting device, including: a housing, a light source component, an optical lens located above the light source component and configured to distribute light for the light source component, a reflector in contact with the optical lens, and a surface ring assembled on the reflector. The housing, the light source component, the optical lens, the reflector and the surface ring are sequentially arranged; the surface ring is fixed on the housing to delimit a receiving chamber, the light source component, the optical lens and the reflector are all located in the receiving chamber; the LED lighting device has a light exit; the light source component includes a light source base plate and LED light source particles located on the light source base plate; light of the LED light source particles sequentially passes through the optical lens and the reflector and then emits through the light exit.

[0007] Preferably, the light source component is snap-fitted with the optical lens.

[0008] Preferably, the reflector is sandwiched between the surface ring and the optical lens.

[0009] Preferably, a height of the reflector is greater than two times of a height of the optical lens.

[0010] Preferably, a height of the reflector is greater than three times of a height of the optical lens.

[0011] Preferably, the optical lens is one selected from or a combination of more than one selected from the group consisting of a ring lens, a single lens, and a lens array.

[0012] Preferably, a diameter of the reflector is gradually increased from an end of the reflector connected to the optical lens to the other end of the optical lens.

[0013] Preferably, the reflector and the optical lens are fixed between the surface ring and the housing by being connected to and pressed by the surface ring.

[0014] Preferably, in the case where the light source component directly faces the light exit, a portion of the light emitted from the LED light source particles is directly emitted through the light exit, and another portion of the light emitted from the LED light source particles is reflected by the reflector and then emitted through the light exit; the light emitted from the LED light source particles, upon passing through the optical lens, is reflected by the reflector firstly and then emitted through the light exit of the LED lighting device.

[0015] Preferably, the light source component includes three portions corresponding to a first lens, a second lens and a third lens of the optical lens, respectively.

[0016] Preferably, the first lens, the second lens, and the third lens are disposed on the light source component and each cover a corresponding light source; or the first lens, the second lens, and the third lens are connected to have an integral structure.

[0017] Preferably, the first lens that is centrally located is a dot lens and corresponds to at least one LED light source particle.

[0018] Preferably, the second lens and the third lens are both annular lenses surrounding the first lens, and wherein a height of the first lens is greater than a height of the second lens and is greater than a height of the third lens, and the second lens and the third lens have a same height.

[0019] Preferably, the LED lighting device further includes a snap spring component disposed at a periphery of the housing.

[0020] Preferably, the LED lighting device is a downlight.

[0021] Compared with the prior art, the LED lighting device of the present invention has the following advantages: it has no need of providing a diffusing plate to homogenize light, which increases the luminous efficiency and meanwhile preventing from glare, so as to achieve a good lighting effect.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] In order to more clearly explain the technical

solutions of the present disclosure or in the existing technology, the drawings necessary for the description of the embodiments or the existing technology will be briefly described below. Apparently, the described drawings are just a part but not all of the embodiments of the present disclosure. Based on the described figures herein, those skilled in the art can obtain other figures, without any inventive work.

FIG. 1 is a stereographic view of a first preferred embodiment of a LED lighting device of the present invention;

FIG. 2 is an exploded stereographic view of the first preferred embodiment of the LED lighting device of the present invention;

FIG. 3 is a lateral perspective view of the LED lighting device of the present invention; and

FIG. 4 is a stereographic view of a second preferred embodiment of a LED lighting device of the present invention.

DETAILED DESCRIPTION

[0023] In order to make objectives, technical solutions and advantages of the present disclosure more apparent, the technical solutions of the present disclosure will be described clearly and completely in connection with the particular embodiments and the corresponding drawings of the present disclosure. Apparently, the described embodiments are just a part but not all of the embodiments of the present disclosure. Based on the embodiments in the present disclosure, those skilled in the art can obtain other embodiment(s), without any inventive work, which should be within the scope of the present disclosure.

[0024] Referring to FIG. 1 to FIG. 3, a LED lighting device 1 according to a first preferred embodiment of the present invention includes a housing 10, a light source component 20, an optical lens 30 located above the light source component 20 and configured to distribute light for the light source component 20, a reflector 40 in contact with the optical lens 30, and a surface ring 50 assembled on the reflector 40. The housing 10, the light source component 20, the optical lens 30, the reflector 40 and the surface ring 50 are sequentially arranged. The surface ring 50 is fixed to the housing 10 to delimit a receiving chamber 70. The light source component 20, the optical lens 30 and the reflector 40 are all located in the receiving chamber 70. The LED lighting device 1 has a light exit 60. The light source component 20 includes a light source base plate 201 and LED light source particles 202 located on the light source base plate 201. Light of the LED light source particles 202 sequentially passes through the optical lens 30 and the reflector 40, and then emits through the light exit 60. The LED lighting device 1 provided by the present invention enables light emitted from the LED lighting device 1 to be uniform and have no glare, so as to effectively improve the luminous effect without using a diffusing plate to homogenize light.

[0025] In an alternative embodiment of the present invention, the light source component 20 may be snap-fitted with the optical lens 30.

[0026] In an alternative embodiment of the present invention, the reflector 40 is sandwiched between the surface ring 50 and the optical lens 30.

[0027] The optical lens 30 may be in the form of one selected from or a combination of more than one selected from the group consisting of a ring lens, a single lens, and a lens array. In this embodiment, as illustrated in FIG. 2, the light source component 20 may be divided into three portions, which respectively correspond to a first lens 301, a second lens 302, and a third lens 303 of the optical lens 30. The first lens 301, the second lens 302, and the third lens 303 are disposed on the light source component 20 to respectively cover a corresponding light source; or, the first lens 301, the second lens 302, and the third lens 303 are connected to have an integral structure. The centrally located first lens 301 is a dot times and corresponds to at least one LED source particle; in FIG. 2, the first lens 301 corresponds to four LED source particles. The second lens 302 and the third lens 303 are both annular lenses surrounding the first lens 301; a height of the first lens 301 is greater than a height of the second lens 302 and greater than a height of the third lens 303; and the second lens 302 and the third lens 303 have the same height. In the second preferred embodiment of the present invention as illustrated in FIG. 4, the optical lens 31 is a lens array.

[0028] In this embodiment, the height of the reflector 40 is greater than three times of the height of the optical lens 30. Such a configuration enables the LED lighting device 1 to ensure that all the light emitted from the optical lens 30 can be completely reflected by the reflector 40 and then emit through the light exit 60. In other embodiments, the height of the reflector 40 may not necessary be greater than three times of the height of the optical lens 30 but may be adjustable as needed; for example, the height of the reflector 40 may be only greater than two times of the height of the optical lens 30, and the like.

[0029] In an alternative embodiment of the present invention, a diameter of the reflector 40 is gradually increased from one end of the reflector connected to the optical lens 30 to the other end of the reflector 40.

[0030] In an alternative embodiment of the present invention, the reflector 40 and the optical lens 30 are fixed between the surface ring 50 and the housing 10 by being connected to and pressed by the surface ring 50.

[0031] In an alternative embodiment of the present invention, when the light source component 20 directly faces the light exit 60, a portion of the light emitted from the LED light source particles 202 is directly emitted through the light exit 60, and another portion of the light emitted from the LED light source particles 202 is reflected by the reflector 40 and then is emitted through the light exit 60. The light emitted from the light source particles 202, upon passing through the optical lens 30, is reflected by the reflector 40 firstly and then emitted through the light

exit 60 of the LED lighting device 1.

[0032] In an alternative embodiment of the present invention, the LED lighting device 1 may further include a snap spring component 80 disposed at a periphery of the housing 10. By using the snap spring component 80 in cooperation with the housing 10, the LED lighting device 1 may be mounted to a region, for example, a ceiling or a wall, or may be directly mounted into a lighting appliance to allow the LED lighting device 1 to face an area to be irradiated by the lighting device. The LED lighting device provided by the embodiment of the present invention may be a downlight or the like, which is not particularly limited in the present invention.

[0033] The specific examples described above further describe the objectives, technical solutions and beneficial effects of the present invention in detail. It should be understood that the above descriptions are merely specific embodiments of the present invention and are not intended to limit the present invention. Any modification, equivalent replacement, improvement, etc. made within the spirit and principle of the present invention should be included in the protection scope of the present invention.

Claims

1. A LED lighting device, comprising: a housing, a light source component, an optical lens located above the light source component and configured to distribute light for the light source component, a reflector in contact with the optical lens, and a surface ring assembled on the reflector;
the housing, the light source component, the optical lens, the reflector and the surface ring being sequentially arranged;
the surface ring being fixed on the housing to delimit a receiving chamber, the light source component, the optical lens and the reflector being all located in the receiving chamber;
the LED lighting device having a light exit, the light source component comprising a light source base plate and LED light source particles located on the light source base plate, light of the LED light source particles sequentially passing through the optical lens and the reflector and then emitting through the light exit.
2. The LED lighting device according to claim 1, wherein the light source component is snap-fitted with the optical lens.
3. The LED lighting device according to claim 1, wherein the reflector is sandwiched between the surface ring and the optical lens.
4. The LED lighting device according to claim 1 wherein a height of the reflector is greater than two times of a height of the optical lens.

5. The LED lighting device according to claim 1, wherein a height of the reflector is greater than three times of a height of the optical lens.
6. The LED lighting device according to claim 1, wherein the optical lens is one selected from or a combination of more than one selected from the group consisting of a ring lens, a single lens, and a lens array.
7. The LED lighting device according to claim 1, wherein a diameter of the reflector is gradually increased from an end of the reflector connected to the optical lens to the other end of the optical lens.
8. The LED lighting device according to claim 1, wherein the reflector and the optical lens are fixed between the surface ring and the housing by being connected to and pressed by the surface ring.
9. The LED lighting device according to claim 1, wherein in the case where the light source component directly faces the light exit, a portion of the light emitted from the LED light source particles is directly emitted through the light exit, and another portion of the light emitted from the LED light source particles is reflected by the reflector and then emitted through the light exit;
the light emitted from the LED light source particles, upon passing through the optical lens, is reflected by the reflector firstly and then emitted through the light exit of the LED lighting device.
10. The LED lighting device according to claim 1, wherein the light source component comprises three portions corresponding to a first lens, a second lens and a third lens of the optical lens, respectively.
11. The LED lighting device according to claim 10, wherein the first lens, the second lens, and the third lens are disposed on the light source component and each cover a corresponding light source, or the first lens, the second lens, and the third lens are connected to have an integral structure.
12. The LED lighting device according to claim 10 or 11, wherein the first lens that is centrally located is a dot lens and corresponds to at least one LED light source particle.
13. The LED lighting device according to claim 12, wherein the second lens and the third lens are both annular lenses surrounding the first lens, and wherein a height of the first lens is greater than a height of the second lens and is greater than a height of the third lens, and the second lens and the third lens have a same height.

14. The LED lighting device according to claim 1, further comprising a snap spring component disposed at a periphery of the housing.

15. The LED lighting device according to claim 1, where- 5
in the LED lighting device is a downlight.

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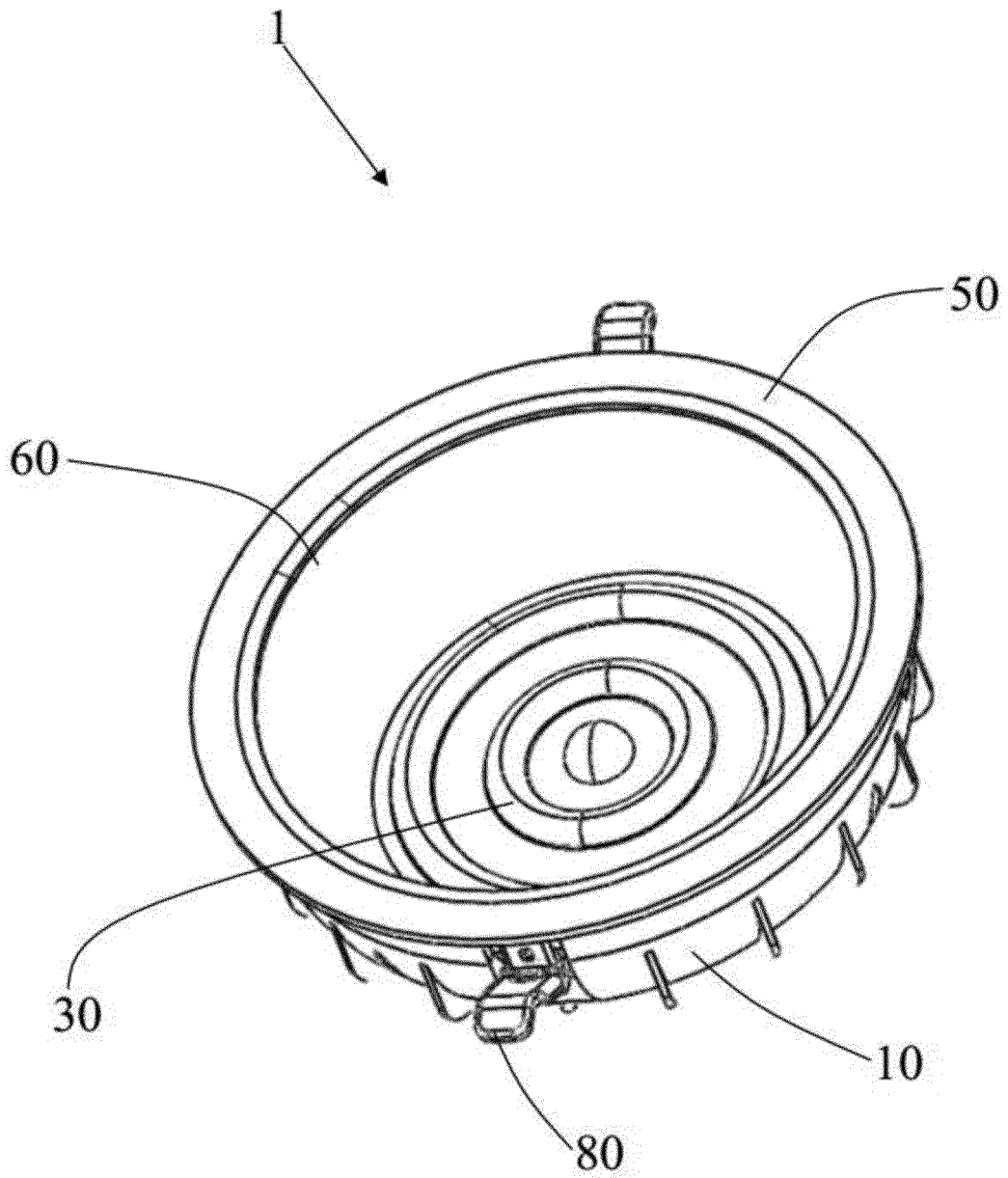


FIG. 1

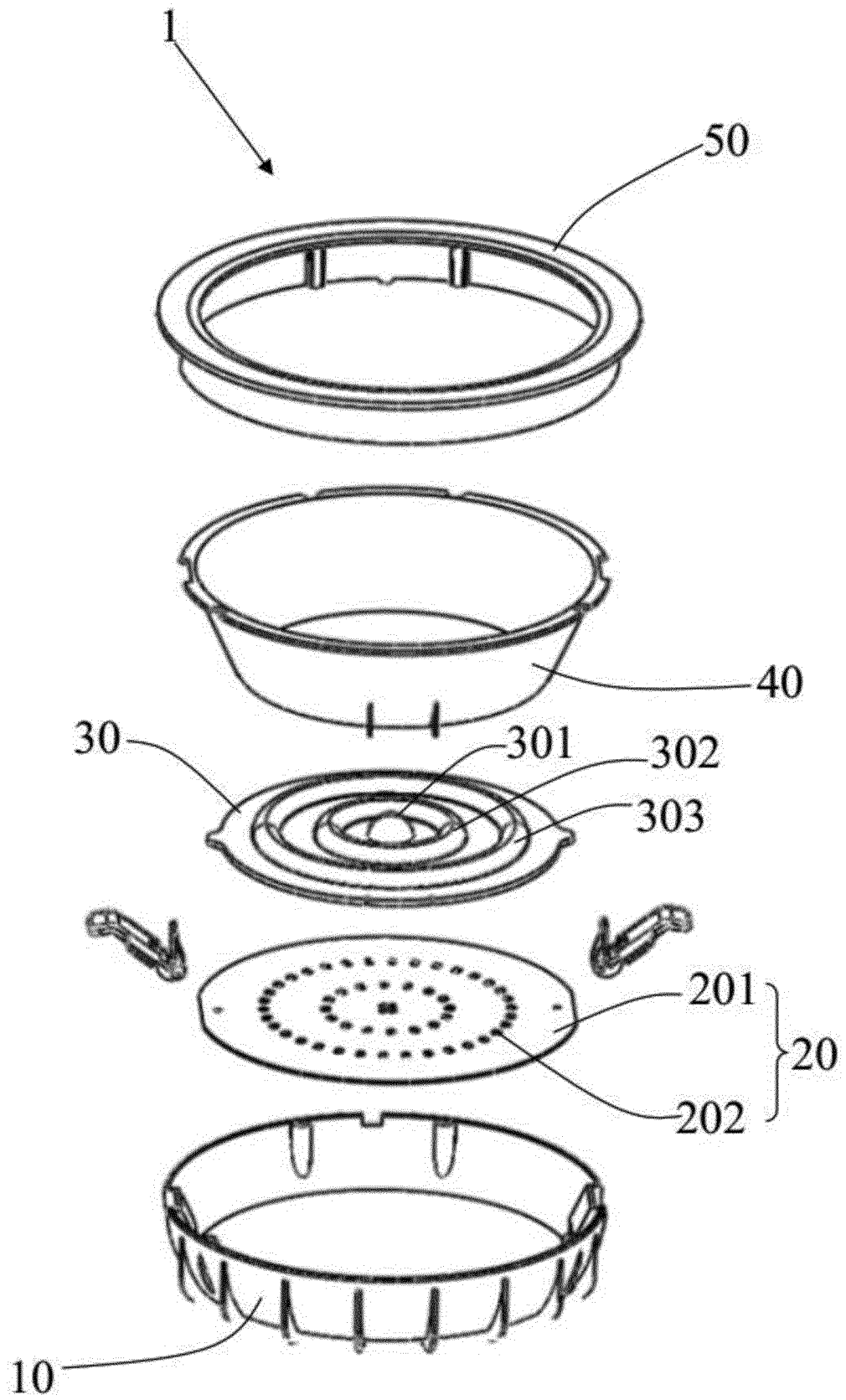


FIG. 2

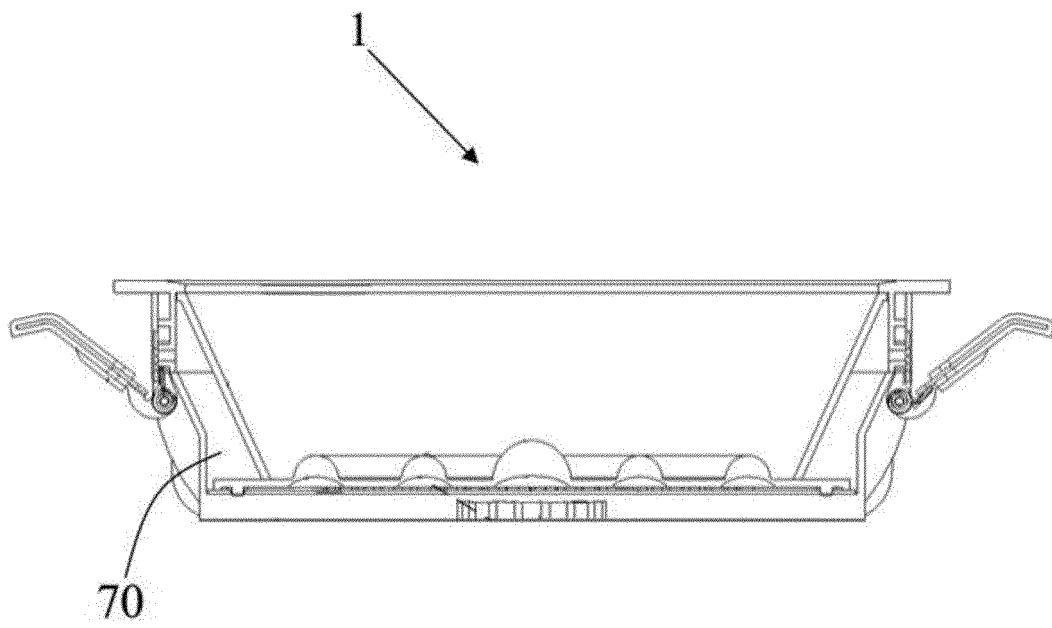


FIG. 3

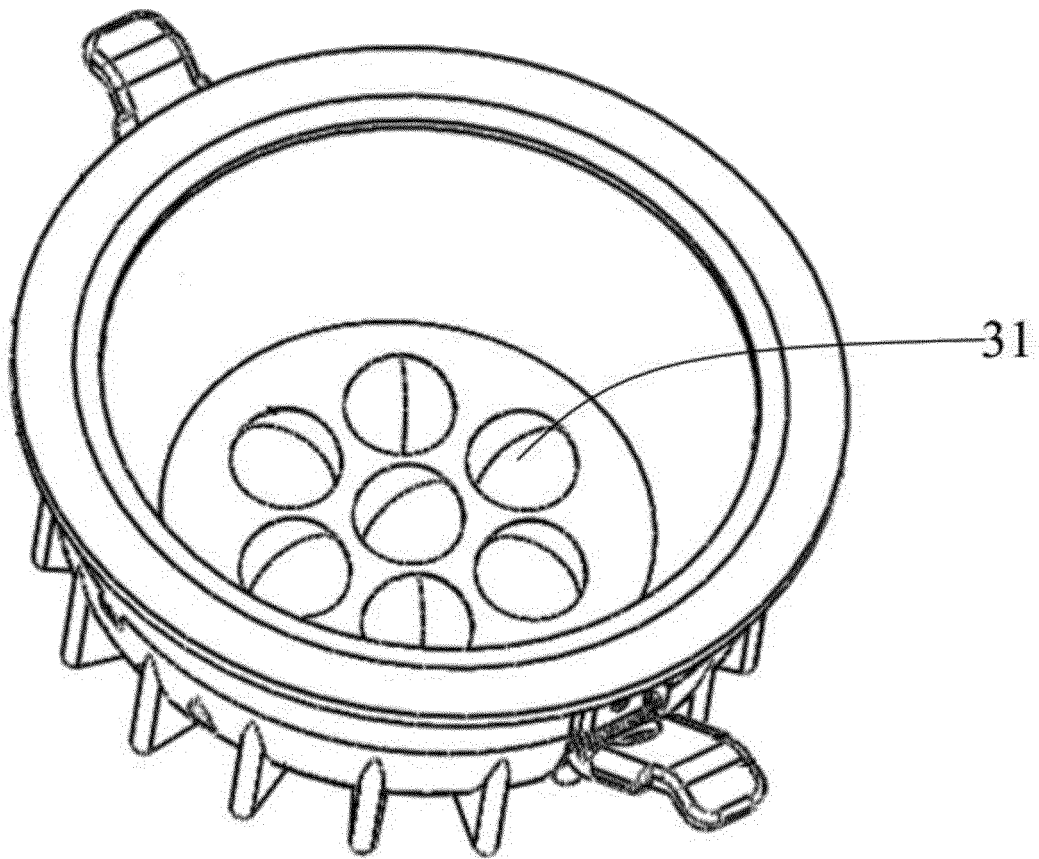


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/097208

A. CLASSIFICATION OF SUBJECT MATTER

F21S 8/02 (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

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)

CNKI, CNPAT, EPODOC, WPI: 欧普, OPPL, 王聪, 朱健, 王凯, 照明, 灯, 光源, 筒, 桶, 射灯, 发光二极管, 半导体发光, 固态照明, 透镜, 壳, 腔, 室, 反射, illumin+, lumin+, lamp?, light+, barrel?, LED?, LD?, light lw emitt+ 1w (diode? or device? or element?), lens??. shell?, room?, chamber?, vessel?, container?, reflect+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 203464067 U (XIAMEN STAR ELECTRICAL EQUIPMENT CO., LTD.) 05 March 2014 (05.03.2014), description, paragraphs [0014]-[0023], and figures 1 and 2	1-15
X	CN 201851962 U (NINGBO GLOBAL PHOTOELECTRIC CO., LTD.) 01 June 2011 (01.06.2011), description, paragraph [0011], and figures 1 and 2	1-15
X	CN 202647387 U (WUHAN NANGEER SCIENCE & TECHNOLOGY CO., LTD.) 02 January 2013 (02.01.2013), description, paragraphs [0017]-[0022], and figures 1-3	1-15
A	CN 2823771 Y (BYD CO., LTD.) 04 October 2006 (04.10.2006), entire document	1-15
A	GB 2506019 A (COSELIG TECHNOLOGY CORP.) 19 March 2014 (19.03.2014), entire document	1-15

☐ 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 14 September 2017	Date of mailing of the international search report 27 September 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 FANG, Yuanfeng Telephone No. (86-10) 62413551

INTERNATIONAL SEARCH REPORT
 Information on patent family members

 International application No.
 PCT/CN2017/097208

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 203464067 U	05 March 2014	None	
CN 201851962 U	01 June 2011	None	
CN 202647387 U	02 January 2013	None	
CN 2823771 Y	04 October 2006	None	
GB 2506019 A	19 March 2014	JP 3187450 U	28 November 2013
		GB 201316365 D0	30 October 2013
		FR 2995664 A3	21 March 2014
		GB 2506019 B	12 November 2014
		DE 202013104150 U1	05 December 2013
		US 2014078754 A1	20 March 2014
		FR 2995664 B3	08 May 2015
		TW M449238 U	21 March 2013