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(54) **Title**: TUNABLE REFLECTOR AND LIGHTING DEVICE COMPRISING THE SAME

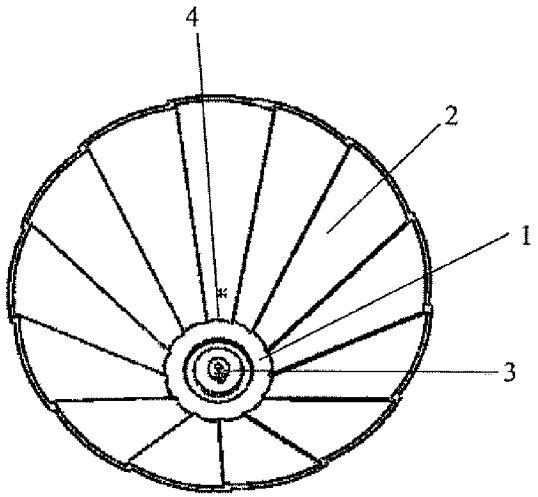


Figure 1

(57) **Abstract**: The present invention relates to a tunable reflector comprising a mounting seat (1) and multiple independent flake reflecting bodies, and such flake reflecting bodies (2) are connected to the mounting seat (1) at one end, wherein the respective flake reflecting bodies (2) are joined with one another and can swing with respect to the mounting seat (1). This type of tunable reflector can freely adjust the incident angle of the light of a light source with respect to the reflecting bodies, thereby obtaining a tunable light distribution range and changeable light strength. In addition, the present invention also relates to a lighting device comprising this type of tunable reflector.

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Description

Tunable Reflector and Lighting Device Comprising the Same

Technical Field

The present invention relates to a tunable reflector. In addition, the present invention also relates to a lighting device comprising the tunable reflector.

Background of the Invention

An excellent lighting device should have not only a beautiful appearance, a reasonable structure and high quality electric assemblies, but also a highly efficient reflector so as to achieve high reflecting performance, a fine light control angle and reflection uniformity. In the prior art, usually an integrally designed lamp cup is used to serve as a basic architecture of the reflector, and a reflective coating, for example, made from aluminum, is provided at the inner side of the lamp cup. In view of users' different use conditions, usually it is necessary to adjust a lighting angle and a light distribution range of the lighting device. Redesigning the reflector or changing the relative position of a light source and the reflector is the most conventional solution. However, this obviously increases the production cost of the lighting device and the mounting and adjusting cost thereof.

Summary of the Invention

Hence, it is an object of the present invention to provide a tunable reflector. This type of tunable reflector can be used to freely adjust the incident angle of the light of a light source with respect to a reflecting body according to needs, thereby obtaining a tunable light distribution range and changeable light strength. Another object of the

present invention is to provide a lighting device comprising this type of tunable reflector.

The first object of the present invention is realized in the following way, that is, the tunable reflector comprises a mounting seat and multiple independent flake reflecting bodies, and the flake reflecting bodies are connected to the mounting seat at one end, wherein the respective flake reflecting bodies are joined with one another and can swing with respect to the mounting seat. When the respective flake reflecting bodies swing with respect to the mounting seat, the incident angle of the light from a light source with respect to the reflecting bodies changes, so that a light distribution range as formed is amplified or reduced, thus further resulting in changes in light strength.

As put forward in a preferable design of the present invention, the outer side of one flake reflecting body is joined at the inner side of another one of the flake reflecting bodies. By making one flake reflecting body swing, the other flake reflecting bodies also swing with it, thus realizing linkage adjustment of all flake reflecting bodies and further realizing simple adjustment of the overall reflector.

As put forward in a design of the present invention, the mounting seat is molded integrally with the flake reflecting bodies using an elastic material. Due to the use of the elastic material, preferably a plastic or resin material having certain elasticity, the flake reflecting bodies can swing to a certain extent with respect to the mounting seat. Alternatively, a broken line part is provided at the junction of the flake reflecting bodies and the mounting seat, so that the flake reflecting bodies can simply while accurately swing about the broken line part with respect to the mounting seat.

As put forward in another preferable design of the present invention, the mounting seat and the flake reflecting bodies are separately formed, wherein, one end of the respective

flake reflecting bodies is inserted-connected with or stuck to the mounting seat, respectively. In this way, the materials for forming the flake reflecting body and the mounting seat can be made from different materials, , and also, requirements on the mold are lowered during making a reflector having a complex shape.

As put forward in a preferable design of the present invention, multiple of the flake reflecting bodies enclose a conical cup shape on the mounting seat, wherein the respective flake reflecting bodies can swing with respect to the mounting seat. Through the swinging of the respective flake reflecting bodies, cup opening of the reflector in the conical cup shape is also relatively amplified or reduced, so that the incident angle of the light with respect to the reflecting bodies changes, thus obtaining a tunable light distribution range and changeable light strength.

As put forward in another design of the present invention, multiple of the flake reflecting bodies form an arch bridge shape on the mounting seat, wherein the respective flake reflecting bodies can swing with respect to the mounting seat. Through the swinging of the respective flake reflecting bodies, the radian of the arch face of the reflector in the arch bridge shape is also changed correspondingly, so that the incident angle of the light with respect to the reflecting bodies changes, thus obtaining a tunable light distribution range and changeable light strength.

According to the present invention, a light reflecting layer is disposed at the sides of the respective flake reflecting bodies facing a light source.

Another object of the present invention is realized by a lighting device comprising the above type of tunable reflector. By using the tunable reflector, the lighting device obtains a tunable light distribution range and changeable light strength.

Brief Description of the Accompanying Drawings

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

Figure 1 is a schematic view of the first embodiment of the tunable reflector according to the present invention;

Figure 2 is a schematic view of a split-type tunable reflector as designed;

Figure 3 is a schematic view of the flake reflecting bodies of the split-type reflector;

Figure 4 is a schematic view of the mounting seat of the split-type reflector;

Figure 5 is a schematic view that the flack reflecting bodies of the tunable reflector according to Figure 1 swing with respect to the mounting seat;

Figure 6 is a schematic view of the second embodiment of the tunable reflector according to the present invention; and

Figure 7 is a schematic view that the flack reflecting bodies of the tunable reflector according to Figure 6 swing with respect to the mounting seat.

Detailed Description of the Invention

Figure 1 is a schematic view of the first embodiment of the tunable reflector according to the present invention. Seen

from Figure 1, the tunable reflector comprises a mounting seat 1 and multiple flake reflecting bodies 2. Such flake reflecting bodies 2 enclose a conical cup shape on the mounting seat 1, and the outer side of one flake reflecting body 2 is joined at the inner side of another flake reflecting body 2. These flake reflecting bodies 2 can swing with respect to the mounting seat 1, wherein a light source 3 is provided at the center of the mounting seat 1.

In this embodiment, the flake reflecting bodies 2 are formed integrally with the mounting seat 1 using an elastic material, and the elastic material can be plastic or resin. Also, a broken line part 4 is formed at the junction of the flake reflecting bodies 2 and the mounting seat 1.

Alternatively, the mounting seat 1 and the flake reflecting bodies 2 according to the present invention can also be separately formed. Figure 2 illustrates a tunable reflector which is designed to have a split-type structure. Seen from Figure 2, one end of the respective flake reflecting bodies 2 is connected to the mounting seat 1. As the flake reflecting bodies 2 are made from an elastic material, after the flake reflecting bodies 2 are fixedly connected with the mounting seat 1, the flake reflecting bodies 2 can still change shape of the reflecting bodies and adjust the incident angle of the light of the light source with respect to the reflecting bodies when having elastic deformation.

Figure 3 is a schematic view of the flake reflecting bodies of the split-type reflector. Seen from Figure 3, the flake reflecting bodies 2 have a column pin at the bottom, and the column pin 5 is used for connection with the mounting seat 1.

Figure 4 is a schematic view of the mounting seat of the split-type reflector. Seen from Figure 4, the mounting seat 1 comprises multiple support columns 7 extending from its bottom plane 6. A through hole 8 is provided in each support column 7. The column pin 5 of the flake reflecting body 2

passes through the through hole 8. Here the diameter of the column pin 5 is slightly larger than that of the through hole 8, so that an interference matching between the column pin 5 and the through hole 8 is achieved to insert-connect the flake reflecting bodies 2 into the mounting seat 1. Of source, in a preferable design, the ends of the flake reflecting bodies 2 can also be directly stuck to the support columns 7.

Figure 5 is a schematic view that the flack reflecting bodies of the tunable reflector according to Figure 1 swing with respect to the mounting seat; two tunable reflectors can be seen from Figure 2, wherein the reflector at the outer side shows the state of the flake reflecting bodies 2 deployed towards the outer side, and the reflector at the inner side shows the state of the flake reflecting bodies 2 converged towards the inner side. Figure 2 clearly shows the change of the size of the cup opening of the reflectors and the change of the incident angle of the light.

Figure 6 is a schematic view of the second embodiment of the tunable reflector according to the present invention, being different from the first embodiment, multiple flake reflecting bodies 2 form an arch bridge shape on the mounting seat 1. Wherein, a light source 3 is disposed at opposite sides of the flake reflecting bodies 2.

Figure 7 is a schematic view that the flack reflecting bodies of the tunable reflector according to Figure 6 swing with respect to the mounting seat. Two tunable reflectors can be seen from Figure 4, wherein the reflector at the outer side shows the state of the flake reflecting bodies 2 deployed towards the outer side, and the reflector at the inner side shows the state of the flake reflecting bodies 2 converged towards the inner side. Figure 4 clearly shows the change of the radian of the arch face of the reflector and the change of the incident angle of the light.

The descriptions above are only preferable embodiments of the present invention and are not used to restrict the present invention. For those skilled in the art, the present invention may have various changes and variations. Any modifications, equivalent substitutions, improvements etc. within the spirit and principle of the present invention shall all be included in the scope of protection of the present invention.

Reference signs:

1	Mounting seat
2	Flake reflecting body
3	Light source
4	Broken line part
5	Column pin
6	Bottom plane
7	Support column
8	Through hole

Patent claims

1. A tunable reflector, characterized in that the tunable reflector comprises a mounting seat (1) and multiple independent flake reflecting bodies, and the flake reflecting bodies (2) are connected to the mounting seat (1) at one end, wherein the respective flake reflecting bodies (2) are joined with one another and can swing with respect to the mounting seat (1).

2. The tunable reflector according to claim 1, characterized in that the outer side of one of the flake reflecting bodies (2) is joined at the inner side of another one of the flake reflecting bodies (2).

3. The tunable reflector according to claim 1, characterized in that the mounting seat (1) is molded integrally with the flake reflecting bodies (2) using an elastic material.

4. The tunable reflector according to claim 1, characterized in that the mounting seat (1) and the flake reflecting bodies (2) are separately formed.

5. The tunable reflector according to claim 4, characterized in that one end of the respective flake reflecting bodies (2) is inserted-connected with or stuck to the mounting seat (1).

6. The tunable reflector according to any of claims 1 to 5, characterized in that the elastic material is plastic or resin.

7. The tunable reflector according to any of claims 1 to 5, characterized in that multiple of the flake reflecting bodies (2) enclose a conical cup shape

on the mounting seat (1), wherein the respective flake reflecting bodies (2) can swing with respect to the mounting seat (1).

8. The tunable reflector according to any of claims 1 to 5, characterized in that multiple of the flake reflecting bodies (2) form an arch bridge shape on the mounting seat (1), wherein the respective flake reflecting bodies (2) can swing with respect to the mounting seat (1).

9. The tunable reflector according to any of claims 1 to 5, characterized in that a light reflecting layer is disposed at the sides of the respective flake reflecting bodies (2) facing a light source (3).

10. A lighting device, characterized in that the lighting device comprises the tunable reflector according to any of claims 1 to 9.

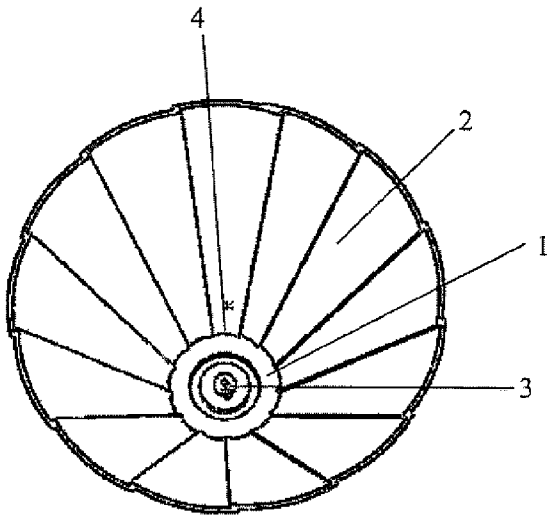


Figure 1

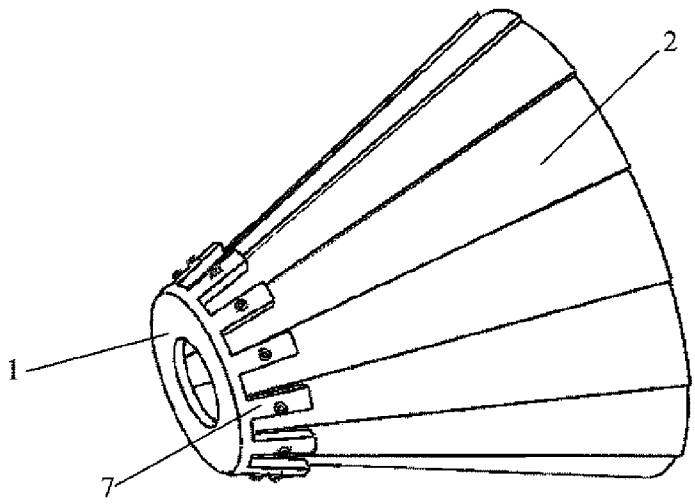


Figure 2

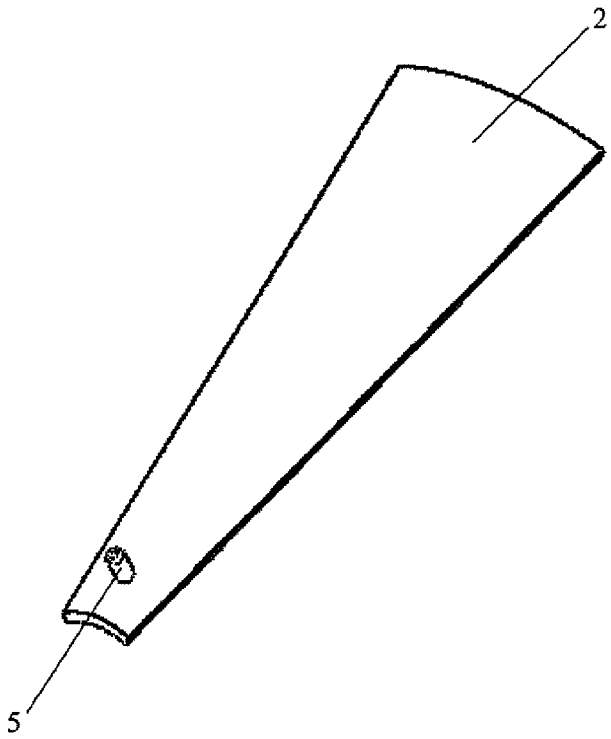


Figure 3

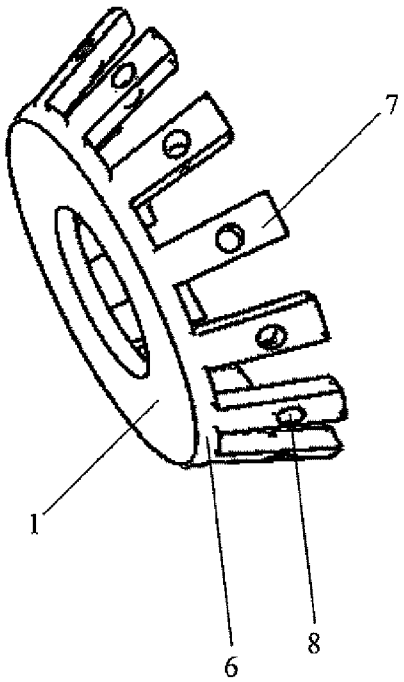


Figure 4

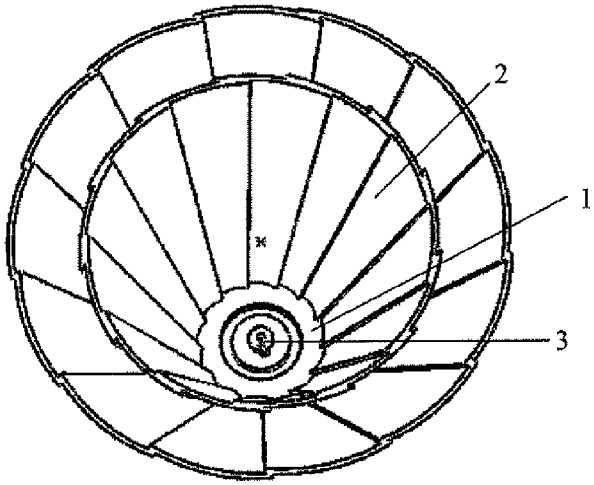


Figure 5

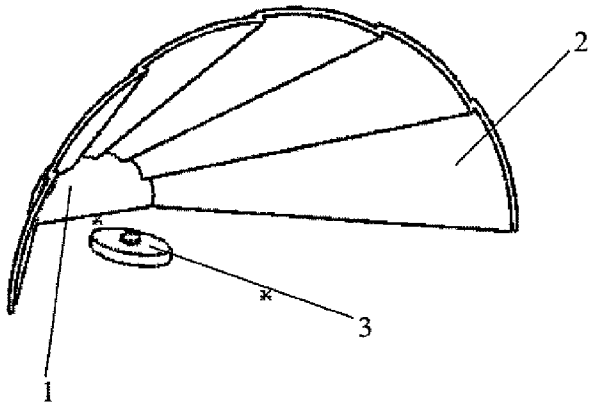


Figure 6

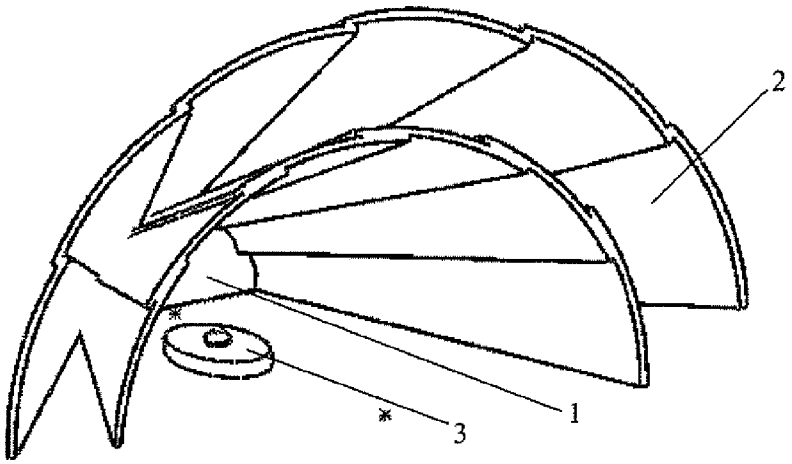


Figure 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/072267

A. CLASSIFICATION OF SUBJECT MATTER
INV. F21V7/16
ADD.

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)
F21V G03B

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 practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 20 2004 011140 U1 (ANSORG BELUX GMBH [DE]) 16 September 2004 (2004-09-16) paragraph [0001] paragraph [0020] - paragraph [0025] figures 1a-1c	1,2,4,5, 7-10
X	WO 89/05420 A1 (MORPHEUS LIGHTS INC [US]) 15 June 1989 (1989-06-15) page 1, line 7 - line 8 page 5, line 21 - page 9, line 17 figure 3	1,3,6-10
X	DE 20 2010 014260 U1 (BLESSING KURT [DE]) 9 December 2010 (2010-12-09) paragraph [0001] paragraph [0037] - paragraph [0044]	1,2,4,5, 7-10

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

☒ See patent family annex.

* Special categories of cited documents :

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

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"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

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Date of the actual completion of the international search	Date of mailing of the international search report
12 April 2012	19/04/2012

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2011/072267

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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