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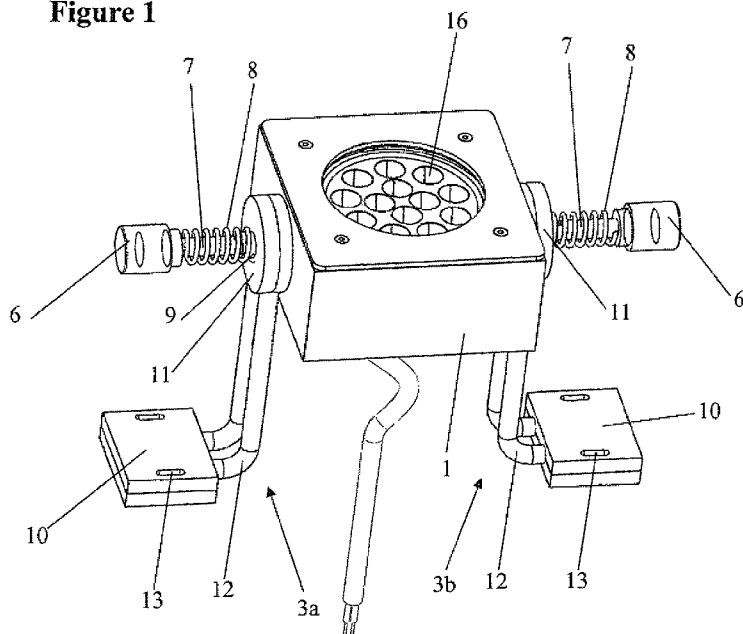
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(54) Title: A HEAT DISSIPATION STRUCTURE AND AN ILLUMINATING SYSTEM HAVING THE STRUCTURE

Figure 1



(57) Abstract: The present invention relates to a heat dissipation structure, for an illuminating system, having a first heat dissipation assembly (1) fixedly connected with an object from which heat is to be dissipated, wherein the heat dissipation structure further has a second heat dissipation assembly clamping the first heat dissipation assembly (1) on both sides, and wherein the second heat dissipation assembly has an axis portion for the first heat dissipation assembly (1) to pivot thereon, and the second heat dissipation assembly transfers heat from the first heat dissipation assembly (1). By application of the heat dissipation structure according to the present invention, on one aspect, an orientation of the object from which heat is to be dissipated is adjusted, and a good heat dissipation performance also can be provided. In addition, the present invention further relates to an illuminating system having the heat dissipation structure of the above type.



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Description

A Heat Dissipation Structure and an Illuminating System
Having the Structure

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Technical Field

The present invention relates to a heat dissipation structure for an illuminating system. In addition, the present invention further relates to an illuminating system having the heat dissipation structure.

10

Background Art

In the illuminating system, especially in a high power light emitting diode illuminating system, good heat dissipation is a most important aspect that should be taken into consideration because good heat dissipation performance usually would affect the working efficiency and service life of the illuminating system. A fine contact between an internal LED module and an external metal housing in the high power light emitting diode illuminating system is required so as to render a better thermal management performance of the illumination system. However, in practical applications, particularly in an embedded illuminating system, a light output direction often should be adjusted according to different application environments, especially in the architecture illumination. In view of the special assembling manner in the embedded illuminating system, an orientation of a lighting assembly in the illuminating system usually should be adjusted so as to adjust the light output direction. This needs to provide the lighting assembly, i.e. LED module, to be rotatable, in which situation both rotatable adjustment of the LED module and good heat dissipation of the LED module should be assured.

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Therefore, a plurality of solutions are provided in the prior art. Particularly, it is provided in one solution that a lighting assembly is mounted on a large heat dissipation body which is fixed on a housing via an adjustable bolt and transfers heat of the lighting assembly to the outside via contact with the housing; moreover, an angle of the heat dissipation body may be adjusted by adjusting the bolt so as to further adjust a light output direction. However, the disadvantages of this solution lie in that it is relatively complex to adjust the light output direction and it is expensive and heavy.

In another solution in the prior art, for example, a heat pipe is provided in an illuminating system, the heat pipe is fixed on a housing of the illuminating system and transfers heat from a lighting assembly to the outside environment. The heat pipe is also configured as a rotation axis of the lighting assembly so that a light output direction may be adjusted. However, this solution also has the defect, i.e. a gap necessarily exists between the heat pipe and the lighting assembly as the lighting assembly needs to rotate around the heat pipe, which is quite adverse to heat dissipation. Moreover, it is difficult to solder the heat pipe onto a housing that is usually made of aluminum when manufacturing such illuminating system.

Summary of the Invention

Therefore, the object of the present invention lies in providing a heat dissipation structure for an illuminating system. The heat dissipation structure provides an excellent heat dissipation performance while simply adjusting a light output direction. In addition, the other object of the present invention lies in providing an illuminating system having such heat dissipation structure.

The first object of the present invention is accomplished via a heat dissipation structure for an illuminating system, i.e.

the heat dissipation structure has a first heat dissipation assembly fixedly connected with an object from which heat to be dissipated, wherein the heat dissipation structure further has a second heat dissipation assembly clamping the first
5 heat dissipation assembly on both sides, and wherein the second heat dissipation assembly has an axis portion for the first heat dissipation assembly to pivot thereon, and the second heat dissipation assembly transfers heat from the first heat dissipation assembly. The heat dissipation structure according to the present invention is usually applied in
10 a high power LED illuminating system. Such illuminating system often has a very high demand to heat dissipation, and also may need to adjust a light output direction in some special applications. By application of the heat dissipation structure according to the present invention, on one aspect,
15 an orientation of the object from which heat to be dissipated, i.e. LED lighting module, may be adjusted; and a good heat dissipation performance also can be provided.

According to a preferred solution of the present invention,
20 the second heat dissipation assembly has first and second heat dissipation portions arranged on both sides of the first heat dissipation assembly, respectively, and each of the first and second heat dissipation portions has a trunnion configured as the axis portion. The trunnion stretches into
25 an accommodating groove provided on the first heat dissipation assembly. As the second heat dissipation assembly may clamp the first heat dissipation assembly, that is to say, the second heat dissipation assembly clamps the first heat dissipation assembly on both sides using the first and second
30 heat dissipation portions, heat from the first heat dissipation assembly may be transferred to the second heat dissipation assembly. Moreover, the first heat dissipation assembly also may rotate around an axis of the trunnion to further achieve the object of adjusting the orientation of the first
35 heat dissipation assembly.

Preferably, each of the first and second heat dissipation

portions is equipped with a clamping force adjusting mechanism arranged on a side opposite to the trunnion. An acting force may be applied to each of the first and second heat dissipation portions by such clamping force adjusting mechanism, so as to enable the first and second heat dissipation portions to be against the first heat dissipation assembly more tightly. Such tight contact is favorable to heat conduction from the first heat dissipation assembly to the first and second heat dissipation portions; moreover, such tight contact further increases a friction force between the first heat dissipation assembly and the first and second heat dissipation portions so that the first heat dissipation assembly, when it is adjusted to a predetermined orientation, is held on this orientation.

Further preferably, the clamping force adjusting mechanism consists of an adjusting nut, an adjusting bolt and a pressure spring sleeved on the adjusting bolt, wherein the adjusting bolt has one end inserted into an axis hole on a side opposite to the trunnion and the other end connected with the adjusting nut via screw threads, and wherein the pressure spring has one end against the adjusting nut and the other end against a side opposite to the trunnion. When the adjusting nut is rotated, the adjusting bolt will move towards directions of the first and second heat dissipation portions, the pressure spring is compressed so that the pressure of the pressure spring is applied on the first and second heat dissipation portions to enable the first and second heat dissipation portions to be against the first heat dissipation assembly more tightly.

According to a preferred solution in the present invention, each of the first and second heat dissipation portions has a clamping seat for clamping, together with a clamping seat of the first or the second heat dissipation portion, the first heat dissipation assembly, wherein the trunnion is provided on the clamping seat. As the clamping seat is configured to clamp the first heat dissipation assembly, a clamping surface

of the clamping seat preferably has a big contact surface so as to obtain a relatively big heat conduction surface between the clamping seat and the first heat dissipation assembly, which is more favorable to heat conduction.

5 Preferably, each of the first and second heat dissipation portions has a heat pipe extending from the clamping seat. The heat pipe is a heat conduction element having very high heat conduction performance, transfers heat via evaporation and condensation of a working medium in a totally closed vacuum tube, and has quite high heat conduction property and
10 good isothermality. A prominent heat dissipation performance may be accomplished using the heat pipe.

According to the present invention, the heat dissipation structure further has a third heat dissipation assembly for
15 fixing the second heat dissipation assembly. The third heat dissipation assembly is configured to transfer heat from the first and second heat dissipation assemblies to the outside environment.

Preferably, the clamping force adjusting mechanism is fixed
20 between the third heat dissipation assembly and the first and second heat dissipation portions of the second heat dissipation assembly, respectively. In a preferred solution of the present invention, the adjusting nut of the clamping force adjusting mechanism is against the third heat dissipation assembly, so that the third heat dissipation assembly can provide a supporting point when the adjusting nut is rotated, so
25 as to enable the clamping force adjusting mechanism to apply an acting force on the second heat dissipation assembly.

Further preferably, each of the first and second heat dissipation portions has a base, the heat pipe is connected between the base and the clamping seat, the base fixes the first and second heat dissipation portions on the third heat dissipation assembly. Due to the special structure of the heat pipe, it is difficult to fix the heat pipe on the third
30

heat dissipation assembly in a soldering or bonding manner. The base provided herein well solves the problem of mounting the heat pipe. Moreover, a contact surface between the base and the third heat dissipation assembly is configured to be
5 as big as possible in order to obtain a good heat conduction effect as much as possible.

Preferably, the base is provided with a long assembling hole through which a fastening bolt passes to fix the first and second heat dissipation portions in the third heat dissipa-
10 tion assembly. Particularly, the long assembling hole allows the first and second heat dissipation portions to move close to or away from each other in a situation that the fastening bolt is loosened. When the heat dissipation structure accord-
ing to the present invention is assembled, firstly, the first
15 and second heat dissipation portions are placed roughly on both sides of the heat dissipation assembly and held loosely via the fastening bolt, then positions of the first and sec-
ond heat dissipation portions may be further adjusted until they reach predetermined positions, and the fastening bolt is
20 screwed down to further fix the first and second heat dissipation portions on the predetermined positions.

Further preferably, the base and the clamping seat are made of copper or aluminum, and, of course, also may be made of other materials having a high heat conduction performance.

25 The other object of the present invention is accomplished via an illuminating system. The illuminating system has a lighting assembly, wherein the illuminating system according to the present invention further has the heat dissipation struc-
ture of the above type, and the lighting assembly is fixed on
30 the first heat dissipation assembly of the heat dissipation structure. A light output direction of the illuminating system according to the present invention may be adjusted at will, and the illuminating system further has excellent heat dissipation performance.

According to a preferred solution of the present invention, the illuminating system further has a top cover with a transparent glass. The top cover is fixed on the third heat dissipation assembly. Preferably, the top cover is fixed on the
5 third heat dissipation assembly of the heat dissipation structure so as to construct an external housing of the illuminating system together with the third heat dissipation assembly, wherein a sealing element is provided between the top cover and the third heat dissipation assembly. As the illuminating system according to the present invention is usually
10 applied in the outdoor environment, the sealing element is capable of providing a good sealing performance and prevents dust or water from entering in the housing, so that the illuminating system according to the present invention satisfies
15 predetermined requirements of the IP protection level.

Brief Description of the Drawings

The drawings constitute a portion of the Description for further understanding of the present invention. These drawings illustrate the embodiments of the present invention and explain the principle of the present invention together with
20 the Description. In the drawings, the same element is represented by the same reference sign, wherein

Fig. 1 is a schematic diagram of a heat dissipation structure according to the present invention;

25 Fig. 2 is a schematic diagram of a clamping force adjusting mechanism of a heat dissipation structure according to the present invention;

Fig. 3 is a local top view of a heat dissipation structure according to the present invention;

30 Fig. 4 is an exploded perspective view of an illuminating system according to the present invention; and

Fig. 5 is a perspective view of an illuminating system according to the present invention.

Detailed Description of the Embodiments

Fig. 1 is a schematic diagram of a heat dissipation structure according to the present invention. The heat dissipation structure is configured to be mounted in an illuminating system, especially in a high power LED illuminating system. It can be seen from the figure that the heat dissipation structure has a first heat dissipation assembly 1 and a second heat dissipation assembly fixedly connected with an object from which heat to be dissipated. In the present embodiment, the object from which heat to be dissipated is configured as a lighting assembly 16, particularly LED lighting assembly, of the illuminating system, while the first heat dissipation assembly 1 is configured as a heat sink. According to the present invention the second heat dissipation assembly has first and second heat dissipation portions 3a, 3b arranged on both sides of the first heat dissipation assembly 1, respectively. The first and second heat dissipation portions 3a, 3b clamp the first heat dissipation assembly 1 on both sides, wherein each of the first and second heat dissipation portions 3a, 3b has a trunnion 4 (see Fig. 2) for the first heat dissipation assembly 1 to pivot thereon and for transferring heat from the first heat dissipation assembly 1. The trunnion 4 stretches into an accommodating groove 5 (see Fig. 4) provided on the first heat dissipation assembly 1.

It can be seen from Fig. 1 that each of the first and second heat dissipation portions 3a, 3b has a clamping seat 11 for clamping, together with a clamping seat 11 of the first heat dissipation portion 3a or the second heat dissipation portion 3b, the first heat dissipation assembly 1, wherein the trunnion 4 is provided on the clamping seat 11. In addition, each of the first and second heat dissipation portions 3a, 3b has a heat pipe 12 and a base 10 extending from the clamping seat 11. The heat pipe 12 is connected between the base 10 and the

clamping seat 11, and the base 10 fixes the first and second heat dissipation portions 3a, 3b on a third heat dissipation assembly 2 (see Fig. 5).

Besides, it further can be seen from Fig. 1 that each of the first and second heat dissipation portions 3a, 3b is equipped with a clamping force adjusting mechanism arranged on a side opposite to the trunnion 4 of corresponding first or second heat dissipation portion 3a, 3b. The mechanism is shown in detail in Fig. 2. Next, the clamping force adjusting mechanism is explained according to Fig. 2.

It can be seen from Fig. 2 that the mechanism is provided on a side opposite to the trunnion 4. It can be seen from the figure that the clamping force adjusting mechanism consists of an adjusting nut 6, an adjusting bolt 7 and a pressure spring 8 sleeved on the adjusting bolt 7, wherein the adjusting bolt 7 has one end inserted into an axis hole on a side opposite to the trunnion 4 and the other end connected with the adjusting nut 6 via screw threads. The pressure spring 8 has one end against the adjusting nut 6 and the other end against a side opposite to the trunnion 4. The adjusting nut 6 is against the third heat dissipation assembly 2 that is not shown so that the third heat dissipation assembly 2 can provide a supporting point when the adjusting nut 6 is rotated, and the adjusting bolt 7 will move towards directions of the first and second heat dissipation portions 3a, 3b, the pressure spring 8 is compressed so that the pressure of the pressure spring 8 is applied on the first and second heat dissipation portions 3a, 3b to enable the first and second heat dissipation portions 3a, 3b to be against the first heat dissipation assembly 1 more tightly.

Fig. 3 is a local top view of a heat dissipation structure according to the present invention. The base 10 can be seen from the figure and it is provided with a long assembling hole 13 through which a fastening bolt 14 passes to fix the first and second heat dissipation portions 3a, 3b in the

third heat dissipation assembly 2. Particularly, the long assembling hole 13 allows the first and second heat dissipation portions 3a, 3b to move close to or away from each other in a situation that the fastening bolt 14 is loosened. When the heat dissipation structure according to the present invention is assembled, firstly, the first and second heat dissipation portions 3a, 3b are placed roughly on both sides of the heat dissipation assembly 1 and held loosely via the fastening bolt 14, then positions of the first and second heat dissipation portions 3a, 3b may be further adjusted until they reach predetermined positions, and the fastening bolt 14 is screwed down to further fix the first and second heat dissipation portions 3a, 3b on the predetermined positions.

In the present embodiment, the base 10 and the clamping seat 11 are made of copper or aluminum, and, of course, also may be made of other materials having high heat conduction performance.

Fig. 4 is an exploded perspective view of an illuminating system according to the present invention. It can be seen from the figure that the illuminating system according to the present invention has a lighting assembly 16 configured as LED assembly and a heat dissipation structure according to the present invention, wherein the lighting assembly 16 is fixed on the first heat dissipation assembly 1, i.e. heat sink, of the heat dissipation structure. The second heat dissipation assembly of the heat dissipation structure is fixed in the third heat dissipation assembly 2 configured as a housing of the illuminating system. In addition, the illuminating system further has a top cover 15 with a transparent glass 18. The top cover 15 is fixed on the third heat dissipation assembly 2 of the heat dissipation structure so as to construct an external housing of the illuminating system together with the third heat dissipation assembly 2. Besides, a sealing element 17 is provided between the top cover 15 and the third heat dissipation assembly 2. The sealing element 17 is capable of providing good sealing performance and prevents

dust or water from entering in the housing, so that the illuminating system according to the present invention satisfies requirements of the IP protection level.

5 Fig. 5 is a schematic diagram of an assembled illuminating system according to the present invention. The positional relationship between the heat dissipation structure and components of the illuminating system according to the present invention can be seen from the figure.

10 The above is merely preferred embodiments of the present invention but not to limit the present invention. For the person skilled in the art, the present invention may have various alterations and changes. Any alterations, equivalent substitutions, improvements, within the spirit and principle of the present invention, should be covered in the protection
15 scope of the present invention.

List of reference signs

	1	first heat dissipation assembly
	2	third heat dissipation assembly
	3a	first heat dissipation portion
5	3b	second heat dissipation portion
	4	trunnion
	5	accommodating groove
	6	adjusting nut
	7	adjusting bolt
10	8	pressure spring
	9	axis hole
	10	base
	11	clamping seat
	12	heat pipe
15	13	long assembling hole
	14	fastening bolt
	15	top cover
	16	lighting assembly
	17	sealing element
20	18	transparent glass

Patent claims

1. A heat dissipation structure, for an illuminating system, having a first heat dissipation assembly (1) fixedly
5 connected with an object from which heat to be dissipated, wherein the heat dissipation structure further has a second heat dissipation assembly clamping the first heat dissipation assembly (1) on both sides, and wherein the second heat dissipation assembly has an axis portion for the first heat dis-
10 sipation assembly (1) to pivot thereon, and the second heat dissipation assembly transfers heat from the first heat dissipation assembly (1).
2. The heat dissipation structure according to claim 1,
15 wherein the second heat dissipation assembly has first and second heat dissipation portions (3a, 3b) arranged on both sides of the first heat dissipation assembly (1), respectively.
- 20 3. The heat dissipation structure according to claim 2, wherein each of the first and second heat dissipation portions (3a, 3b) has a trunnion (4) configured as the axis portion, and the trunnion (4) stretches into an accommodating groove (5) provided on the first heat dissipation assembly
25 (1).
4. The heat dissipation structure according to claim 3, wherein each of the first and second heat dissipation portions (3a, 3b) is equipped with a clamping force adjusting
30 mechanism arranged on a side opposite to the trunnion (4).
5. The heat dissipation structure according to claim 4, wherein the clamping force adjusting mechanism consists of an adjusting nut (6), an adjusting bolt (7) and a pressure

spring (8) sleeved on the adjusting bolt (7), and wherein the adjusting bolt (7) has one end inserted into an axis hole (9) on a side opposite to the trunnion (4) and the other end connected with the adjusting nut (6) via screw threads, and the pressure spring (8) has one end against the adjusting nut (6) and the other end against a side opposite to the trunnion (4).

6. The heat dissipation structure according to any one of claims 3-5, wherein each of the first and second heat dissipation portions (3a, 3b) has a clamping seat (11) for clamping, together with a clamping seat (11) of the first or second heat dissipation portion (3a, 3b), the first heat dissipation assembly (1), and wherein the trunnion (4) is provided on the clamping seat (11).

7. The heat dissipation structure according to claim 6, wherein each of the first and second heat dissipation portions (3a, 3b) has a heat pipe (12) extending from the clamping seat (11).

8. The heat dissipation structure according to claim 7, wherein the heat dissipation structure further has a third heat dissipation assembly (2) for fixing the second heat dissipation assembly.

9. The heat dissipation structure according to claim 8, wherein the clamping force adjusting mechanism is fixed between the third heat dissipation assembly (2) and the first and second heat dissipation portions (3a, 3b) of the second heat dissipation assembly, respectively.

10. The heat dissipation structure according to claim 8, wherein each of the first and second heat dissipation por-

tions (3a, 3b) further has a base (10), the heat pipe (12) is connected between the base (10) and the clamping seat (11), and the base (10) fixes the first and second heat dissipation portions on the third heat dissipation assembly (2).

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11. The heat dissipation structure according to claim 10, wherein the base (10) is provided with a long assembling hole (13) through which a fastening bolt (14) passes to fix the first and second heat dissipation portions (3a, 3b) in the
10 third heat dissipation assembly (2), and wherein the long assembling hole (13) allows the first and second heat dissipation portions (3a, 3b) to move close to or away from each other in a situation that the fastening bolt (14) is loosened.

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12. The heat dissipation structure according to claim 11, wherein the base (10) and the clamping seat (11) are made of copper or aluminum.

20 13. An illuminating system, having a lighting assembly 17, wherein the illuminating system further has the heat dissipation structure according to any one of claims 1-12, and wherein the lighting assembly (16) is fixed on the first heat dissipation assembly (1) of the heat dissipation structure.

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14. The illuminating system according to claim 13, wherein the illuminating system further has a top cover (15) with a transparent glass (18), and the top cover (15) is fixed on the third heat dissipation assembly (2) of the heat dissipation
30 structure.

15. The illuminating system according to claim 14, wherein the third heat dissipation assembly (2) is configured as a housing of the illuminating system.

16. The illuminating system according to any one of claims 13-15, wherein a sealing element (17) is provided between the top cover (15) and the third heat dissipation assembly (2).

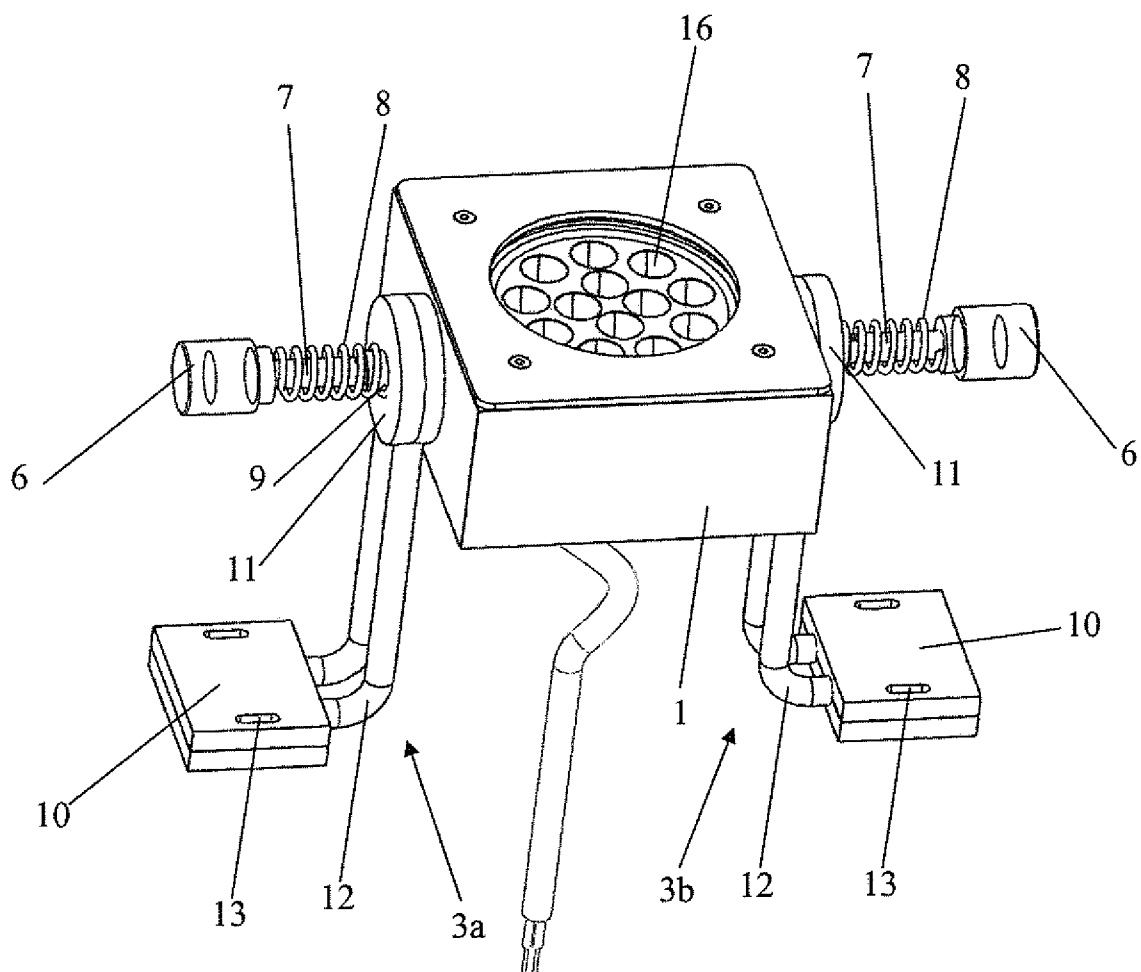


Figure 1

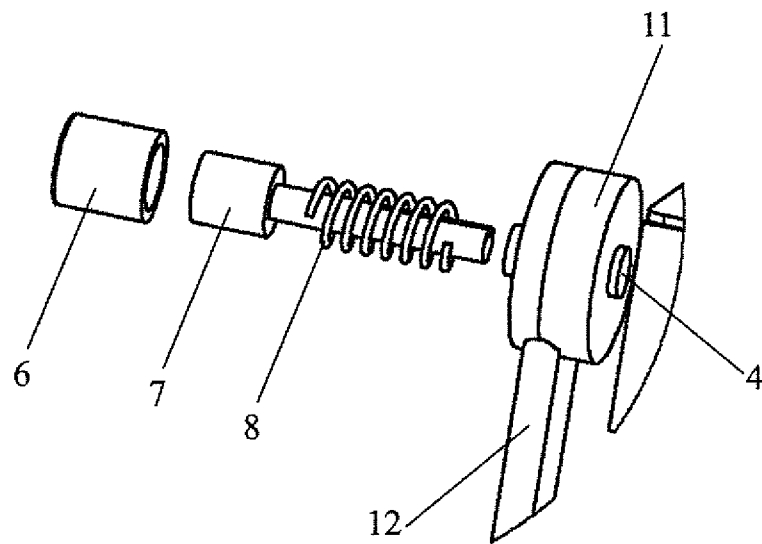


Figure 2

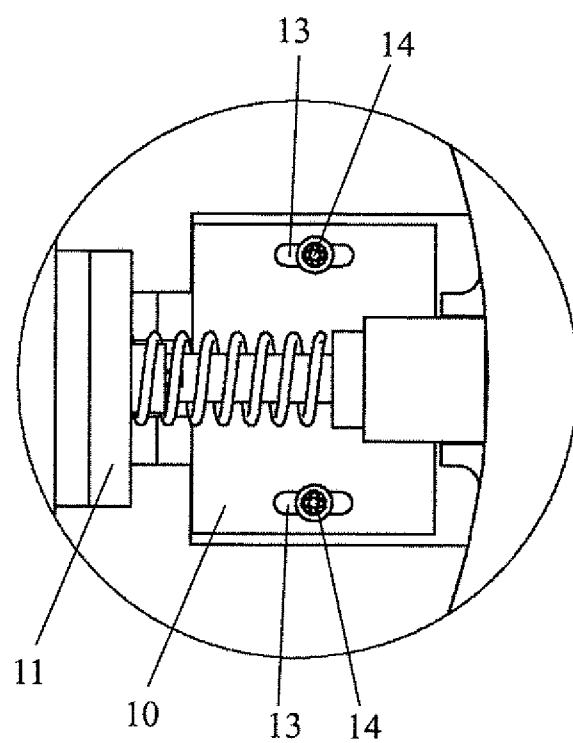


Figure 3

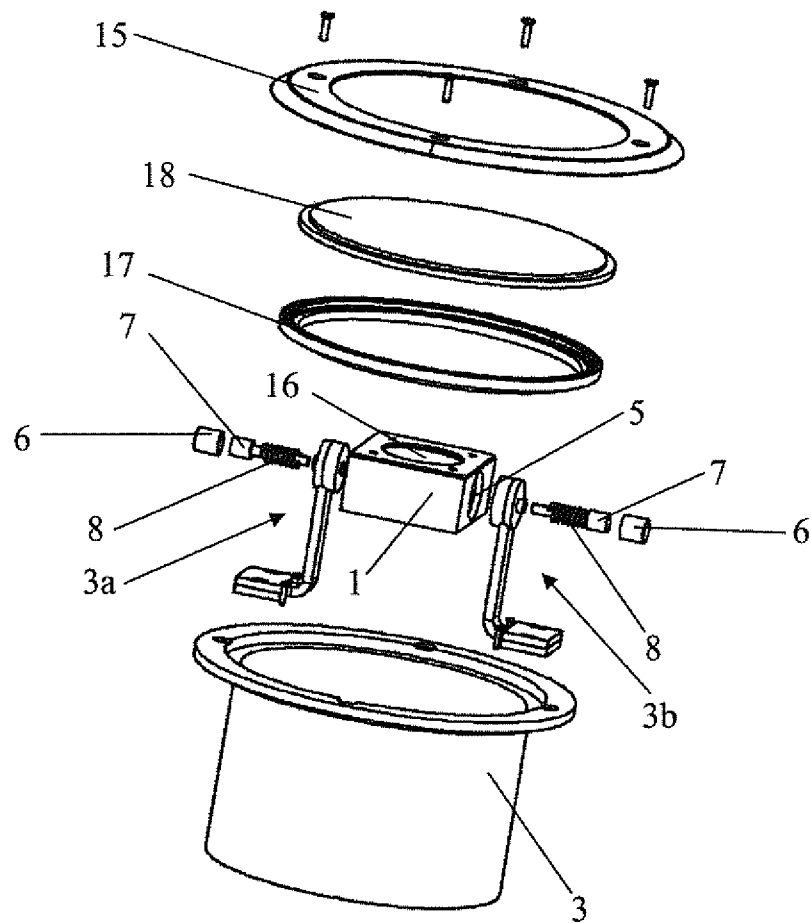


Figure 4

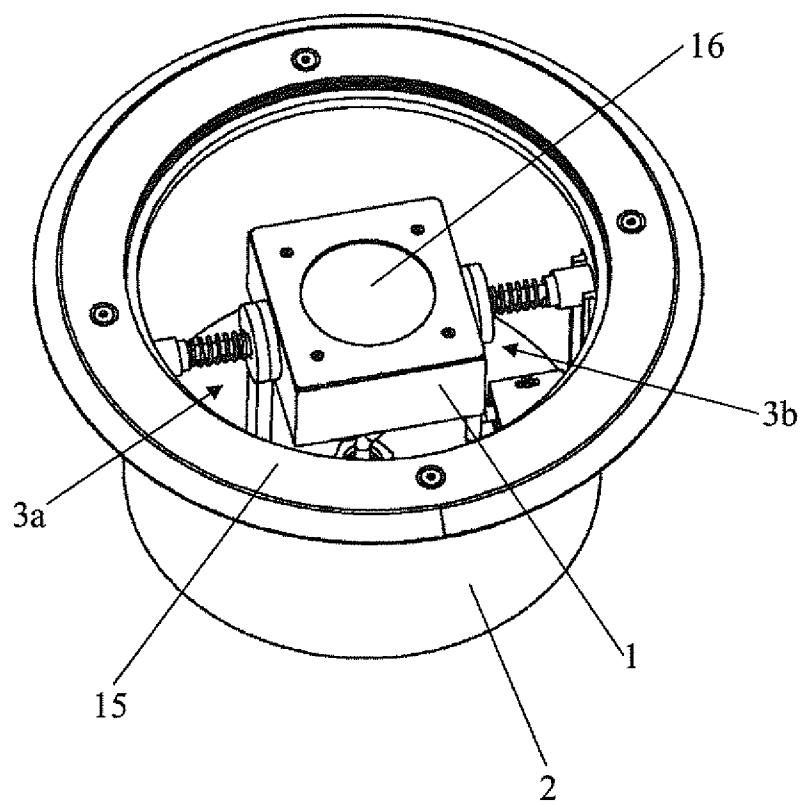


Figure 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/058817

A. CLASSIFICATION OF SUBJECT MATTER

INV. F21V29/00

ADD. F21V14/02 F21Y101/02 F21Y105/00

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 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)

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	WO 2010/009665 A1 (WU LIANGJU [CN]) 28 January 2010 (2010-01-28)	1-4,6,13
A	abstract; automatic translation by the Intellectual Property Publishing House of SIPO provided for patent family member CN201237125Y; figures 1, 2	14,15
X	EP 1 357 335 A2 (NICHIA CORP [JP]) 29 October 2003 (2003-10-29) paragraphs [0057] - [0073]; figures 3, 5	1-3,6-8, 10,13-16
X	WO 2006/052022 A1 (SHOWA DENKO KK [JP]; WAKABAYASHI NOBUHIRO; YAMAUCHI SHINOBU [JP]) 18 May 2006 (2006-05-18)	1,2,13
A	page 15, line 10 - page 19, line 13; figures 1-3	3-7, 14-16
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Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

4 October 2012

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16/10/2012

Name and mailing address of the ISA/

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von der Hardt, M

INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

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