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(54) Title: A HOUSING FOR AN ILLUMINATING APPARATUS, A MANUFACTURING METHOD OF THE SAME, AND AN ILLUMINATING APPARATUS HAVING THE HOUSING

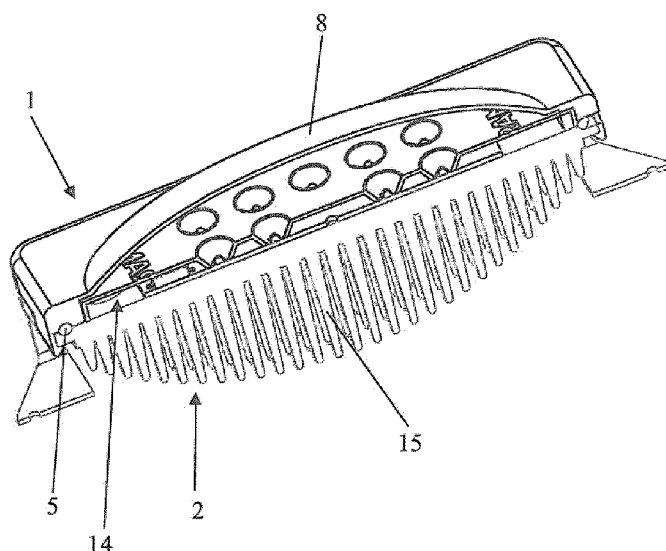


Figure 4

(57) Abstract: The present invention relates to a housing for an illuminating apparatus comprising an upper housing portion (1) and a lower housing portion (2) assembled together with respective contact surfaces to form an assembling cavity (14), wherein a first groove (3) and a second groove (4) are formed on contact surfaces of the upper housing portion (1) and the lower housing portion (2) respectively, and the first groove (3) and the second groove (4) jointly constitute a filling channel (5) surrounding the assembling cavity (14), and wherein the filling channel (5) is filled with a solidifiable liquid potting glue (16) for forming a sealing structure. The present invention further relates to an illuminating apparatus having the housing of the above type, and a manufacturing method of the housing for the illuminating apparatus of the above type.



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Description

A Housing for an Illuminating Apparatus, a Manufacturing
Method of the Same, and an Illuminating Apparatus Having the
5 Housing

Technical Field

The present invention relates to a housing for an illuminat-
ing apparatus and a manufacturing method of the same. In ad-
10 dition, the present invention further relates to an illumi-
nating apparatus having the housing of the above type.

Background Art

With the constant improvement of the level of the material
and cultural life, more and more choose to go out at night to
15 take part in various activities. Consequently, it becomes
more and more important to well illuminate the street. Be-
sides, with the continuous development of the LED chip tech-
nology, people use the LED more and more as the light source
applied to the streetlamp for illuminating the street. How-
20 ever, this requires the housing of the streetlamp to have a
good waterproof and dustproof performance since the street-
lamp is used in the outdoor environment.

In the prior art, the housing of the streetlamp is usually
composed of an upper housing portion and a lower housing por-
25 tion. The two housing portions are locked together and form
a cavity for accommodating an LED lighting assembly therein,
wherein one housing portion has a transparent cover. In or-
der to seal the housing, on a joint surface where the upper
housing portion and the upper housing portion are against
30 each other is usually arranged a sealing ring made from a

rubber. Such housing can be dustproof and waterproof to a certain degree. However, since the two housing portions are locked together or fixed together via fastening bolts, the sealing ring is compressed to different degrees at different places between the housing portions, i.e. it may be tightly held at some places and loosely at some other places. The sealing effect may be unfavorable at the places where the sealing ring is loosely held, and water and dust possibly enter an inside of the housing from such places, thus causing damage to the LED lighting assembly therein.

Summary of the Invention

In order to solve the above problem, the present invention provides a housing for an illuminating apparatus. The housing is capable of providing an excellent waterproof performance with a simple structure and a low cost. In addition, the present invention further provides an illuminating apparatus having the housing of the above type and a manufacturing method of the housing of the above type.

The first object of the present invention is accomplished via a housing for an illuminating apparatus through the following solution. The housing comprises an upper housing portion and a lower housing portion assembled together with respective contact surfaces to form an assembling cavity, wherein a first groove and a second groove are formed on contact surfaces of the upper housing portion and the lower housing portion respectively, and the first groove and the second groove jointly define a filling channel surrounding the assembling cavity, and wherein the filling channel is filled with a solidifiable liquid potting glue. In one solution of the present invention, a close matching between the contact surfaces of the two housing portions is assured by improving the

manufacturing precision, so as to guarantee a sufficient anti-leakage performance of the filling channel constituted by the first groove and the second groove, because the liquid potting glue will not easily flow out from the contact surfaces of the two housing portions since the filling channel should be potted with the liquid potting glue. Moreover, in one solution of the present invention, no matter how irregular a shape of the filling channel constituted by the two grooves is, the liquid potting glue can be completely potted into any area of the filling channel, and a situation of loss of sealing caused by deformation due to stress will not appear when the housing is exerted with a non-uniform external force. Therefore, the housing according to the present invention provides an excellent sealing performance.

Preferably, the first groove and the second groove extend in form of labyrinth respectively to define a labyrinth-type filling channel that further increases the difficulty of the water entering the inside of the housing, so as to improve the waterproof performance of the housing.

According to the present invention, the liquid potting glue is made from epoxy resin, silicon rubber or polyurethane. Of course, the liquid potting glue also may be made from other liquid potting materials suitable as waterproof sealing material.

According to one preferred solution of the present invention, the upper housing portion or the lower housing portion is provided with an injection hole and an vent hole opening into the filling channel. After the upper and lower housing portions are locked together, the filling channel relatively sealed is formed between the contact surfaces. Thus, a gas in the filling channel might block filling of the liquid pot-

ting glue when the liquid potting glue is filled through the injection hole, then addition of a vent hole will smooth the potting, and could effectively prevent generation of bubbles in the filling channel that will negatively affect the sealing effect.

According to one preferred solution of the present invention, a transparent cover is mounted on one of the upper housing portion and the lower housing portion, and the other one of the upper housing portion and the lower housing portion is designed as a heat sink with a plurality of fins. The configuration of one housing portion as the heat sink can effectively decrease the number of parts of the housing and reduce the cost; and using one portion of the housing simultaneously as the heat sink also effectively shortens a length of a thermal path between a lighting assembly and the heat sink, reduces a thermal resistance, improves a thermal dissipating performance, and further improves an illuminating efficiency of the lighting assembly, especially of an LED lighting assembly.

Preferably, the transparent cover is made from a glass or plastic.

According to the present invention, the upper housing portion and the lower housing portion are bonded or welded together. Since the filling channel has been filled with the liquid potting glue that can be effectively filled in every corner of the filling channel after solidification, there is no need to use bolts to tightly fasten the two housing portions, as in the prior art, for further holding a sealing member between the two housing portions. The housing according to the present invention effectively decreases the number of parts. Moreover, since the bolts are not used in the housing of the

present invention, stress concentration points causing deformation of a sealing member at places where the bolts are installed as in the prior art will not appear.

Preferably, one of the upper housing portion and the lower housing portion is provided with at least one hook, and the other one of the upper housing portion and the lower housing portion is provide with at least one recess engaging wiht the hook. Such a simple hook connection enables the upper housing portion and the lower housing portion to be simply combined with and separated from each other. Accordingly, the hook can be simply withdrawn from the recess to open the housing in a situation that the lighting assembly in the housing is failed, and the hook is again snapped into the recess after maintenance so as to lock the upper and lower housing portions once again; and a perfect sealing housing is formed again after the liquid potting glue is filled.

Another object of the present invention is accomplished via a manufacturing method of a housing for an illuminating apparatus through the following solution. The method includes the steps of: a) providing an upper housing portion and a lower housing portion; b) forming a first groove and a second groove on contact surfaces of the upper housing portion and the lower housing portion, respectively; c) providing an injection hole and an vent hole on the upper housing portion or the lower housing portion; d) assmebling the upper housing portion and the lower housing portion together to form an assembling cavity, and the first groove and the second groove defined a filling channel surrounding the assembling cavity; e) injecting a liquid potting glue into the filling channel through the injection hole; and f) solidifying the liquid potting glue. The housing manufactured by the method according to the present invention has a simpler structure and a

better sealing performance.

According to the method of the present invention, in the step a), mounting a transparent cover on one of the upper housing portion and the lower housing portion, and providing the other one of the upper housing portion and the lower housing portion is as a heat sink with a plurality of fins. The configuration of one housing portion as the heat sink can effectively decrease the number of parts of the housing and reduce the cost. Using one portion of the housing simultaneously as the heat sink also effectively shortens a length of a thermal path between a lighting assembly and the heat sink, reduces a thermal resistance, improves a thermal dissipating performance, and further improves an illuminating efficiency of the lighting assembly, especially of the LED lighting assembly.

Preferably, in the step d), the upper housing portion and the lower housing portion are bonded or welded together, which effectively decreases the number of the parts. Moreover, since bolts are not used in the method of the present invention, stress concentration points causing deformation of a sealing member at places where the bolts are installed as in the prior art will not appear.

Further preferably, in the step d), one of the upper housing portion and the lower housing portion is provided with at least one hook, and the other one of the upper housing portion and the lower housing portion is provided with at least one recess engaging with the hook. Such simple hook connection enables the upper housing portion and the lower housing portion to be simply combined with and separated from each other. Accordingly, the hook can be simply withdrawn from the recess to open the housing in a situation that the light-

ing assembly in the housing is failed, and the hook is again snapped into the recess after maintenance so as to lock the upper and lower housing portions once again; and a perfect sealing housing is formed again after the liquid potting glue
5 is filled.

The last object of the present invention lies in providing an illuminating apparatus having the housing of the above type. An LED lighting assembly is arranged in an assembling cavity of the housing of the illuminating apparatus. The illuminat-
10 ing apparatus has an excellent waterproof performance with a simple structure and a low cost.

Preferably, a reflector array is further arranged in the assembling cavity of the housing, each LED chip of the LED lighting assembly corresponds to one reflector element of the
15 reflector array, which is favorable for adjusting independently light from the LED chip according to different situations so as to realize different optical performances.

Brief Description of the Drawings

The accompanying drawings constitute a part of the present
20 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 com-
25 ponents are represented by the same reference numbers. As shown in the drawings:

Fig. 1 is a schematic diagram of an upper housing portion of a housing according to the present invention;

Fig. 2 is a schematic diagram of a lower housing portion of the housing according to the present invention;

Fig. 3 is a schematic diagram of the housing in an assembled state according to the present invention;

5 Fig. 4 is a sectional view of the housing according to the present invention; and

Fig. 5 is a schematic diagram of an illuminating apparatus according to the present invention.

Detailed Description of the Embodiments

10 Fig. 1 is a schematic diagram of an upper housing portion 1 of a housing according to the present invention. As can be seen from the figure, the upper housing portion 1 has a top surface configured as a transparent cover 8 and four side walls reaching uprightly from the top surface. These side
15 surfaces jointly define an assembling cavity 14. Besides, it can be seen from Fig. 1 that end surfaces of the four side walls are configured with a first groove 3 extending on respective end surfaces. Meanwhile, a hook 9 is further configured on the four side walls. In one solution of the pre-
20 sent invention, the transparent cover 8 may be made from a transparent glass or plastic. In addition, it also can be seen from Fig. 1 that the upper housing portion 1 is further configured with an injection hole 6 communicating with a filling channel 5, and a potting glue 16 is filled into the
25 housing through the injection hole 6.

Fig. 2 is a schematic diagram of a lower housing portion 2 of the housing according to the present invention. The lower housing portion 2 in one solution of the present invention is

configured as heat sink that has a plurality of fins 15. Meanwhile, a mounting surface of the lower housing portion 2 is configured with a second groove 4 that corresponds to an extending direction of the first groove 3 shown in Fig. 1, so as to constitute jointly with the first groove 3 the filling channel 5 (see Fig. 4) when the upper housing portion 1 is locked onto the lower housing portion 2. Moreover, it can be seen from Fig. 2 that on the lower housing portion 2 is further configured a recess 10 corresponding to a position of the hook 9 shown in Fig. 1, so as to allow the hook 9 to be snapped into the recess 10 when the upper housing portion 1 and the lower housing portion 2 are locked together, and thus fixedly connecting the upper housing portion 1 and the lower housing portion 2. Certainly, the upper housing portion 1 and the lower housing portion 2 according to the present invention also may be welded or bonded together. Besides, on the lower housing portion 2 is further configured a corresponding vent hole 7 communicating with the filling channel 5 for exhausting a gas when the liquid potting glue 16 is filled.

Fig. 3 is a schematic diagram of the housing in an assembled state according to the present invention. As can be seen from the figure, the hook 9 has been snapped into the recess 10, and the injection hole 6 and the vent hole 7 can be seen from a side surface of the housing.

Fig. 4 is a sectional view of the housing according to the present invention. As can be seen from the figure, the first groove 3 and the second groove 4 jointly constitute the filling channel 5 after the upper housing portion 1 and the lower housing portion 2 are locked together. The filling channel 5 surrounds the assembling cavity 14 so as to provide a sealing structure for the assembling cavity 14 when the liquid pot-

ting glue 16 is filled into the filling channel 5. Of course, the first groove 3 and the second groove 4 also may extend in a labyrinth manner so as to form a labyrinth-type filling channel 5.

5 Fig. 5 is a schematic diagram of an illuminating apparatus according to the present invention. The illuminating apparatus further comprises an LED lighting assembly arranged in the assembling cavity 14 of the housing. The LED lighting
10 assembly comprises a plurality of LED chips 11 and a reflector array 12, wherein the reflector array 12 comprises a plurality of reflector elements 13, and wherein each reflector element 13 corresponds to one LED chip 11.

In a manufacturing method of the present invention, firstly the upper housing portion 1 and the lower housing portion 2
15 are locked together, wherein the hook 9 is snapped into the recess 10, so that the first groove 3 and the second groove 4 constitute the filling channel 5. Consequently, the liquid potting glue 16 is filled into the filling channel 5 through the injection hole 6 until a minute amount of the liquid pot-
20 ting glue 16 flows out from the vent hole 7. A sealing structure is formed upon solidification of the liquid potting glue 16.

The above is merely preferred embodiments of the present invention but not to limit the present invention. For the per-
25 son 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 scope of the present invention.

List of reference signs

1	upper housing portion
2	lower housing portion
5 3	first groove
4	second groove
5	filling channel
6	injection hole
7	vent hole
10 8	transparent cover
9	hook
10	recess
11	LED chip
12	reflector array
15 13	reflector element
14	assembling cavity
15	fin
16	potting glue

Patent claims

1. A housing for an illuminating apparatus, comprising an upper housing portion (1) and a lower housing portion (2) assembled together with respective contact surfaces to form an assembling cavity (14), wherein a first groove (3) and a second groove (4) are formed on the contact surfaces of the upper housing portion (1) and the lower housing portion (2) respectively, and the first groove (3) and the second groove (4) jointly define a filling channel (5) surrounding the assembling cavity (14), and wherein the filling channel (5) is filled with a solidifiable liquid potting glue (16).
2. The housing according to Claim 1, wherein the first groove (3) and the second groove (4) extend in form of labyrinth respectively to define a labyrinth-type filling channel (5).
3. The housing according to Claim 1 or 2, wherein the liquid potting glue (16) is made from epoxy resin, silicon rubber or polyurethane.
4. The housing according to Claim 1 or 2,, wherein the upper housing portion (1) or the lower housing portion (2) is provided with an injection hole (6) and a vent hole (7) opening into the filling channel (5).
5. The housing according to Claim 1 or 2,, wherein a transparent cover (8) is mounted on one of the upper housing portion (1) and the lower housing portion (2).

6. The housing according to Claim 5, wherein the other one of the upper housing portion (1) and the lower housing portion (2) is designed as a heat sink with a plurality of fins (15).

7. The housing according to Claim 5, wherein the transparent cover (8) is made from a glass or plastic.

10 8. The housing according to any one of Claim 1 or 2, wherein the upper housing portion (1) and the lower housing portion (2) are bonded or welded together.

15 9. The housing according to any one of Claim 1 or 2, wherein one of the upper housing portion (1) and the lower housing portion (2) is provided with at least one hook (9), and the other one of the upper housing portion (1) and the lower housing portion (2) is provided with at least one recess (10) engaging with the hook (9).

20

10. A manufacturing method of a housing for an illuminating apparatus, including steps of:

a) providing an upper housing portion (1) and a lower housing portion (2);

25 b) forming a first groove (3) and a second groove (4) on contact surfaces of the upper housing portion (1) and the lower housing portion (2), respectively;

c) providing an injection hole (6) and an vent hole (7) on the upper housing portion (1) or the lower housing portion (2);

5 d) assembling the upper housing portion (1) and the lower housing portion (2) together to form an assembling cavity (14), and the first groove (3) and the second groove (4) defined a filling channel (5) surrounding the assembling cavity (14);

10 e) injecting a liquid potting glue (16) into the filling channel (5) through the injection hole (6); and

f) solidifying the liquid potting glue (16).

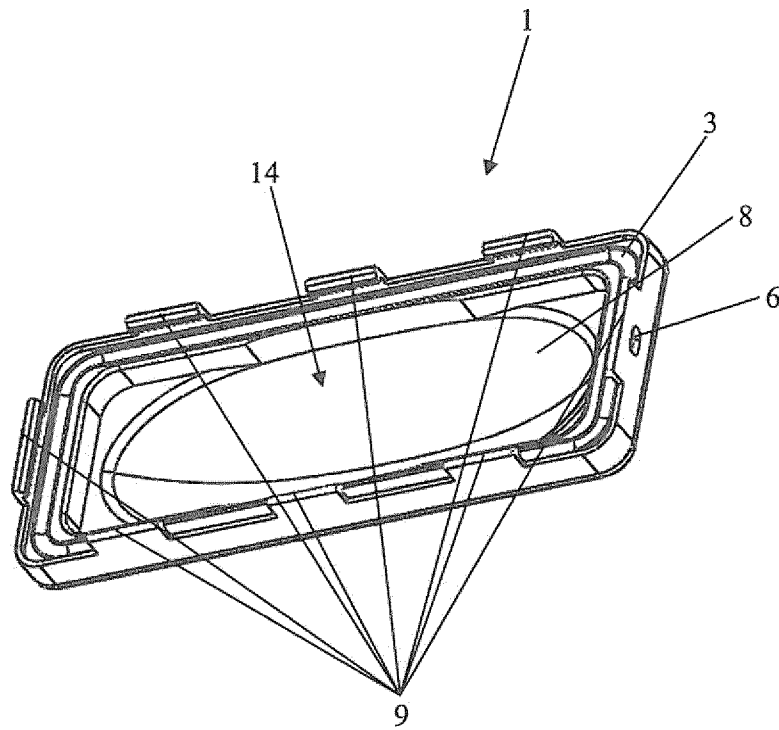
11. The manufacturing method according to Claim 10, wherein in the step a), mounting a transparent cover (8) on one of 15 the upper housing portion (1) and the lower housing portion (2), and providing the other one of the upper housing portion (1) and the lower housing portion (2) as a heat sink

12. The manufacturing method according to Claim 10, wherein 20 in the step d), the upper housing portion (1) and the lower housing portion (2) are bonded or welded together.

13. The manufacturing method according to Claim 10, wherein in the step d), one of the upper housing portion (1) and the 25 lower housing portion (2) is provided with at least one hook (9), and the other one of the upper housing portion (1) and the lower housing portion (2) is provided with at least one recess (10) engaging with the hook (9).

14. An illuminating apparatus, wherein the illuminating apparatus has the housing according to any one of Claims 1-9, and an LED lighting assembly is arranged in an assembly cavity (14) of the housing.

15. The illuminating apparatus according to Claim 13, wherein a reflector array (12) is further arranged in the assembling cavity (14) of the housing, each LED chip (11) of the LED lighting assembly corresponds to one reflector element (13) of the reflector array (12).

**Figure 1**

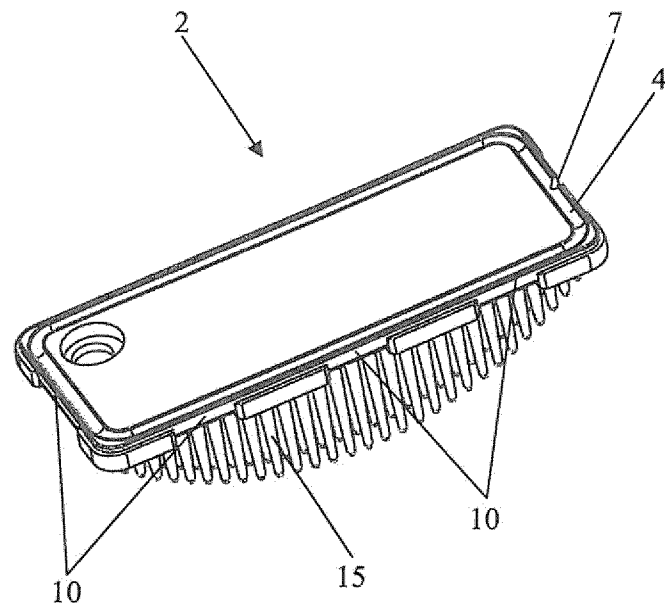


Figure 2

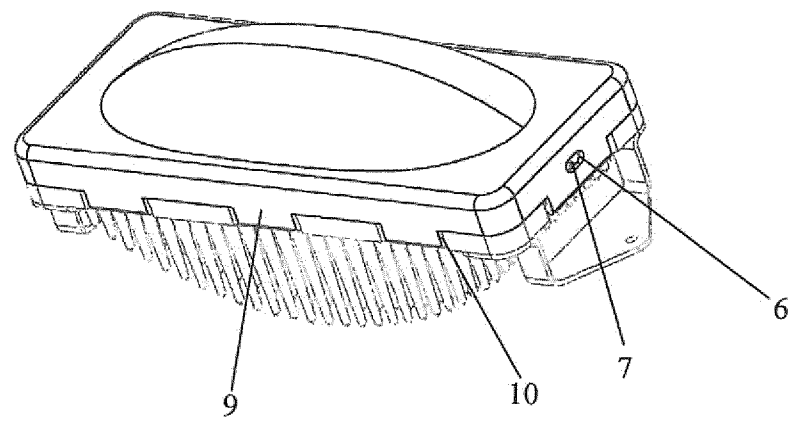
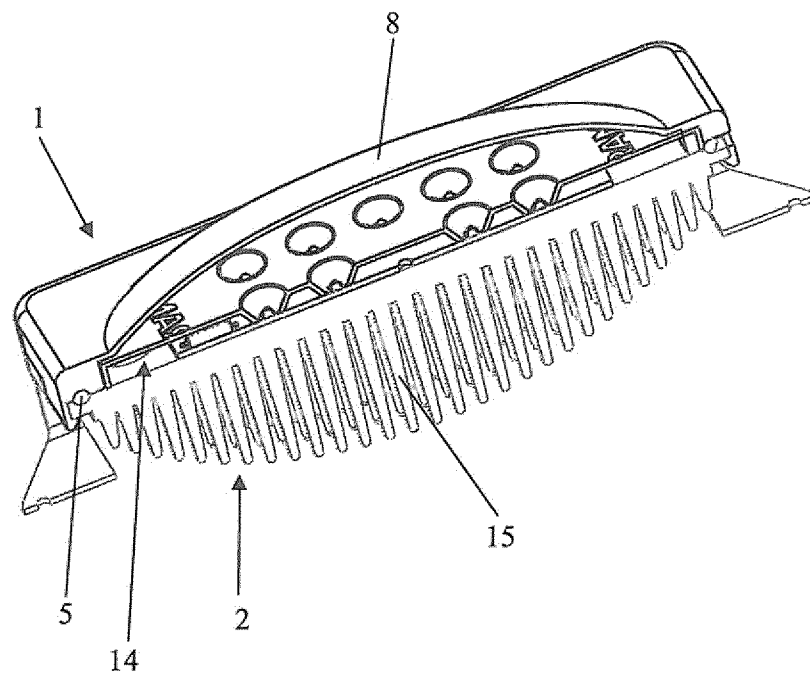
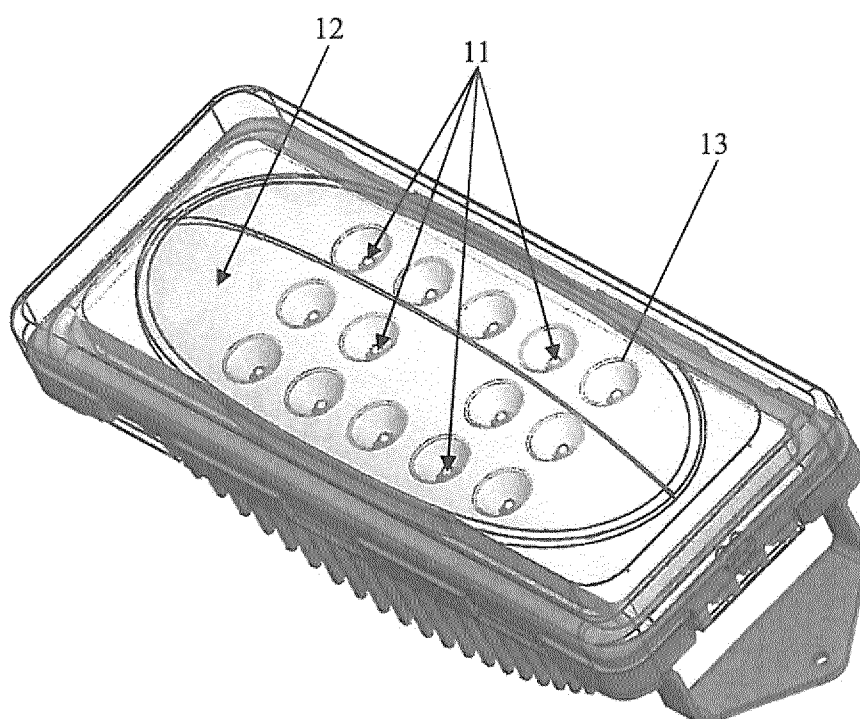


Figure 3

**Figure 4**

**Figure 5**

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2012/066943

A. CLASSIFICATION OF SUBJECT MATTER

INV. F21V15/01 F21V31/00
 ADD. F21Y101/02

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

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 2006 001910 U1 (CARL PETERSEN METALLVERARBEITU [DE]) 13 April 2006 (2006-04-13) paragraphs [0048] - [0051], [0060] figures 2, 3 -----	1-3,5-9, 14
A,P	WO 2012/031874 A1 (OSRAM AG [DE]; HE YUBAO [CN]; DAI CHENGLONG [CN]; LUO YABIN [CN]; YANG) 15 March 2012 (2012-03-15) page 3, line 18 - page 4, line 21 page 5, line 28 - page 6, line 1 figures 1-3 -----	4,10



Further documents are listed in the continuation of Box C.



See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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"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

23 November 2012

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04/12/2012

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2012/066943

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 202006001910 U1	13-04-2006	NONE	

WO 2012031874 A1	15-03-2012	CN 102401252 A	04-04-2012
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