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(71) Applicant: **OSRAM GMBH** [DE/DE]; Mar-
cel-Breuer-Straße 6, 80807 München (DE).

(72) Inventors: **BUCHHAUSER, Dirk**; 5F, Hantang Building,
OCT (Overseas Chinese Town), Shenzhen, Guangdong
518053 (CN). **LIN, Jing**; 5F, Hantang Building, OCT
(Overseas Chinese Town), Shenzhen, Guangdong 518053
(CN). **HU, Jin**; 5F, Hantang Building, OCT (Overseas
Chinese Town), Shenzhen, Guangdong 518053 (CN).
ZHANG, HongWei; 5F, Hantang Building, OCT (Over-

seas Chinese Town), Shenzhen, Guangdong 518053 (CN).
PAN, Gengjun; 5F, Hantang Building, OCT (Overseas
Chinese Town), Shenzhen, Guangdong 518053 (CN).
LAN, Tingbiao; 5F, Hantang Building, OCT (Overseas
Chinese Town), Shenzhen, Guangdong 518053 (CN).

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[Continued on next page]

(54) **Title:** LAMP HOUSING, METHOD OF MANUFACTURING THE SAME, AND ILLUMINATING DEVICE COMPRISING THE SAME

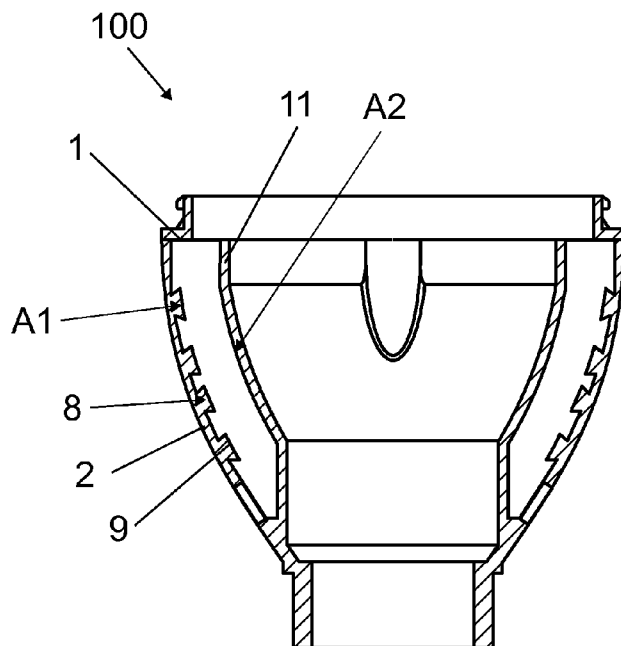


FIG 2

(57) **Abstract:** The present invention relates to lamp housing (100) for an illuminating module, comprising a first housing (1) and an insulating second housing (2) surrounding the first housing (1), wherein the second housing (2) is molded on an outer circumferential wall (A1) of the first housing (1), characterized in further comprising an anti-stripping structure to prevent the second housing (2) from being stripped from the first housing (1). Moreover, the present invention relates to a method of manufacturing the lamp housing and an illuminating device comprising the lamp housing.



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SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
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Description

Lamp Housing, Method of Manufacturing the same, and
Illuminating Device Comprising the same

5

Technical Field

The present invention relates to a lamp housing, a method of manufacturing the lamp housing, and an illuminating device comprising the lamp housing.

10 **Background Art**

Molding, in particular, over-molding process is used more and more in the manufacture of a modern electronic device, especially an LED illuminating device, to manufacture a lamp housing of the illuminating device. Manufacture using this process not only allows the lamp housing to achieve excellent heat exchange, but also allows the lamp housing to ensure an excellent insulating characteristic of the illuminating device. A hybrid heat sink made of metal and plastic is generally used in the prior art as a lamp housing of an illuminating device. This lamp housing has a first housing made of metal and a second housing made of plastic and covered on the first housing. Thus, heat in the illuminating device can be effectively and rapidly transferred to the second housing by a thermal conductivity of the metal so as to achieve an excellent heat dissipating effect. Moreover, since the second housing serving as an electrical insulator is covered on the first housing made of metal, the first housing can be electrically insulated from the outside.

For the hybrid heat sink designed as a lamp housing, for example casting aluminum for manufacturing the first housing

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has a thermal expansion coefficient of $2.38 \times 10^{-5}/^{\circ}\text{C}$, and thermally conductive plastic for manufacturing the second housing has a thermal expansion coefficient of $6.0 \times 10^{-5}/^{\circ}\text{C}$, that is, the thermal expansion coefficient of the second housing is greater than that of the first housing. Hence, when the lamp housing is at a high temperature or being subjected to stability test, the first housing made of metal and the second housing made of plastic of the lamp housing may be partially separated from each other, that is to say, the second housing may be stripped from the first housing.

Summary of the invention

Therefore, an object of the present invention is to provide a lamp housing for an illuminating module which is simply manufactured, has excellent firmness and stability, and is particularly suitable for used in a high temperature environment.

The lamp housing for an illuminating module according to the present invention comprises a first housing and an insulating second housing surrounding the first housing and molded on an outer circumferential wall of the first housing, characterized in further comprising an anti-stripping structure to prevent the second housing from being stripped from the first housing. For example, by the over-molding process, a liquid insulating material can be covered on a solid first housing and cured to obtain a second housing, thus a connection with certain strength is formed between an outer circumferential wall of the first housing and an inner circumferential wall of the second housing. However, the connection in this case has a low stability and may be destroyed especially in a bad condition such as a high temperature condition. Therefore, according to the present invention, the lamp housing formed

by the over-molding process is particularly provided with an anti-stripping structure to enhance the stability and reliability of the connection between the first housing and the second housing by the additional structure.

5 According to a preferred design of the present invention, the anti-stripping structure is an engagement structure formed on the first housing for enhancing a coupling force with the second housing. The engagement structure allows mechanical connecting structures matching each other to be formed be-
10 tween the first housing and the second housing in addition to the binding connection formed therebetween in the over-molding, thus a coupling force between the first and second housings can be improved.

According to a preferred design of the present invention, the
15 engagement structure is designed so that the second housing is formed, during a molding process, with a corresponding structure having a shape matching that of the engagement structure. Since the second housing is cured on the outer circumferential wall of the first housing after treated by
20 molding (for example over-molding), mechanical connecting structures matching each other can be formed on the first housing and the second housing formed after curing to enhance the strength of the connection between the first and second housings, as long as an engagement structure having a par-
25 ticular geometric profile is arranged on the first housing.

According to a preferred design of the present invention, the engagement structure is hooks extending radially outwardly from both edges of the outer circumferential wall, a slot is defined between the hooks and the outer circumferential wall,
30 and the second housing has, as the corresponding structure, a slot and a hook respectively matching the hook and the slot.

In a preferable case, a plurality of hooks distributed uniformly in a circumferential direction extend downwardly from an upper edge of the outer circumferential wall, and on the other hand, a plurality of hooks distributed uniformly in the circumferential direction extend upwardly from an lower edge of the outer circumferential wall, and these hooks define, together with the outer circumferential wall, slots extending in a longitudinal direction, thus the hooks can be engaged with the corresponding structure of the second housing.

According to a preferred design of the present invention, the engagement structure is a plurality of through holes provided in the outer circumferential wall, and the second housing has, as the corresponding structure, a plurality of pillars inserted into the plurality of through holes. During the over-molding, the liquid material is partially filled in the through holes and cured to form pillars on the second housing, and the locking between the first and second housings in the longitudinal direction can be ensured by the pillars.

According to a preferred design of the present invention, the engagement structure is a plurality of grooves formed in the outer circumferential wall, and the second housing has, as the corresponding structure, a plurality of protrusions inserted into the plurality of grooves. Preferably, the groove is any one of a U-shaped groove, a T-shaped groove, a key groove and a dovetail groove. These grooves can be formed uniformly in a central region of the outer circumferential wall of the first housing, thus an engagement area with the second housing can be increased, and thereby points where the force is to be applied which affect the connection between the first and second housings are increased.

According to a preferred design of the present invention, the

engagement structures are arranged in an array form on the first housing. Thus, in the case where the first and second housings are subjected to an external force or expand by themselves, a uniform force can be obtained between the first and second housings by the engagement structures, and thereby the first and second housings can be prevented from being separated from each other.

According to a preferred design of the present invention, the anti-stripping structure is an adhesive layer attached to the outer circumferential wall. It is also possible to spray a layer of adhesive plastic on the outer circumferential wall of the first housing before covering the first housing by the over-molding process, thus the adhesive layer is used as, for example, a "double-sided tape" to enhance the binding force between the first housing and the second housing which is then covered on the adhesive layer.

According to a preferred design of the present invention, the first housing is basin-shaped, and an accommodating cavity in which the illuminating module is placed is defined by an inner circumferential wall of the first housing. Since the illuminating module generally needs to be placed in an electrically insulating accommodating space, it is preferred that the inner circumferential wall is coated with an insulating layer.

According to a preferred design of the present invention, the thermal conductivity of the first housing is greater than that of the second housing. Preferably, the first housing is made of metal, and the second housing is made of plastic. The thermal conductivity of the first housing made of metal is greater than that of plastic, thus heat generated by the illuminating module in the first housing can be rapidly and ef-

fectively transferred to the external environment through the first and second housings. Therefore, according to a preferred design of the present invention, the lamp housing is used as a heat sink.

5 Moreover, the present invention relates to a method of manufacturing the above lamp housing, characterized in comprising the steps of: a) providing a first housing; b) forming an anti-stripping structure on the first housing; and c) molding an insulating second housing on the first housing with anti-
10 stripping structure.

The first housing and the second housing can be connected by the anti-stripping structure to each other more firmly so as to form a lamp housing having particularly excellent reliability and stability.

15 According to a preferred design of the present invention, in the step b), an adhesive layer is formed, as the anti-stripping structure, on an outer circumferential wall of the first housing. A binding force can be formed between the first and second housings by the adhesive layer arranged on
20 the outer circumferential wall.

According to a preferred design of the present invention, in the step b), an engagement structure for enhancing a coupling force with the second housing is formed, as the anti-stripping structure, on an outer circumferential wall of the
25 first housing. Mechanical connecting forces acting on each other can be formed between the first and second housings by the engagement structure therebetween.

The present invention further relates to an illuminating device comprising an illuminating module, characterized in fur-

ther comprising the above lamp housing.

It is to be understood that both the foregoing brief description and the following detailed description are exemplary and explanatory and are intended to provide further explanation
5 of the invention as claimed.

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
10 the Description. In the drawings, the same part is represented by the same reference sign. In the drawings,

Fig. 1 illustrates a first embodiment of a lamp housing according to the present invention;

15 Fig. 2 illustrates a second embodiment of the lamp housing according to the present invention;

Fig. 3 illustrates a third embodiment of the lamp housing according to the present invention;

20 Fig. 4 illustrates a fourth embodiment of the lamp housing according to the present invention.

Detailed Description of the Embodiments

In the following detailed description, reference is made to the accompanying drawings, which form a part hereof, and in which is shown by way of illustration specific embodiments in
25 which the invention may be practiced. In this regard, direc-

tional terminology, such as "top", "bottom", "inside", "outside", etc., is used reference to the orientation of the Figure(s) being described. Because components of embodiments can be positioned in a number of different orientations, the directional terminology is used for purposes of illustration and is in no way limiting. It is to be understood that other embodiments may be utilized and structural or logical changes may be made without departing from the scope of the present invention. The following detailed description, therefore, is not to be taken in a limiting sense, and the scope of the present invention is defined by the appended claims.

It is to be understood that the features of the various exemplary embodiments described herein may be combined with each other, unless specifically noted otherwise.

Fig. 1 illustrates a first embodiment of a lamp housing for an illuminating module according to the present invention. In Fig. 1, a lamp housing 100 with a basin-shaped profile is designed to accommodate an illuminating module. The lamp housing 100 according to the present invention comprises a first housing 1 in an inner portion thereof and a second housing 2 surrounding the first housing 1, wherein the first housing 1 is made of metal, and the second housing 2 is formed on an outer circumferential wall A1 of the first housing 1 by curving a liquid thermally conductive plastic using an overmolding process. In general, metal has a better thermal conductivity than plastic, thus heat generated by the illuminating module in the first housing 1 can be rapidly and effectively transferred by the first and second housings 1, 2 to the external environment. Therefore, the lamp housing 100 can be preferably used as a hybrid heat sink of an illuminating device. Moreover, to ensure electrical insulation between the first housing 1 made of metal and the illuminating module ac-

commodated in an accommodating cavity 10 defined by the first housing 1, an inner circumferential wall A2 of the first housing 1 is particularly coated with an insulating layer 11 made of, for example, plastic.

5 It is known that a thermal expansion coefficient of metal is for example $2.38 \times 10^{-5}/^{\circ}\text{C}$, and a thermal expansion coefficient of plastic is for example $6.0 \times 10^{-5}/^{\circ}\text{C}$. When the lamp housing 100 is at a high temperature or being subjected to stability test, the first and second housings 1 and 2 made of different
10 materials will be stripped from each other since they have different thermal expansion coefficients. Thus, an anti-stripping structure is particularly arranged in the lamp housing 100 according to the present invention to enhance the stability and firmness of the lamp housing 100.

15 In the first embodiment illustrated in Fig. 1, the anti-stripping structure may be hooks 4 on the outer circumferential wall A1 of the first housing 1. A pair of hooks 4 illustrated in the sectional view extend radially outwardly from the respective upper and lower two edges of the outer circumferential wall A1 to form an engagement structure for the
20 second housing 2. A slot 5 is defined between two hooks 4 on the left side of the figure and the outer circumferential wall A1 on the left side, and similarly, a slot 5 is defined by two hooks 4 on the right side of the figure and the outer circumferential wall A1 on the right side. The second housing
25 2 surrounding the first housing 1 is formed, during the over-molding, with a corresponding structure matching the engagement structure that includes a slot 5' and a hook 4' engaging with the first housing 1. As is clear from the figure, the
30 hook 4 of the first housing 1 is inserted into the slot 5' of the second housing 2, and the hook 4' of the second housing 2 is just accommodated in the slot 5 of the first housing 1.

In a preferable case, a plurality of engagement structures and corresponding structures distributed uniformly can be arranged at the respective upper and lower edges of the first housing 1 and the second housing 2, thus a mechanical connecting force between the first housing 1 and the second housing 2 can be distributed uniformly in the circumferential direction.

In a second embodiment illustrated in Fig. 2, the anti-stripping structure may be a plurality of grooves 8 formed in the outer circumferential wall A1, and these grooves 8 each having, for example, a dovetail profile which are engagement structures are inserted and connected with a plurality of protrusions 9 formed on an inner circumferential wall of the second housing 2 in such a manner that the grooves 8 and the protrusions 9 are fitted to each other in shape. These grooves 8 are distributed uniformly in a central region of the outer circumferential wall A1, thus an area of the first housing 1 that is engaged with the second housing 2 can be ensured to be as large as possible.

In an embodiment not shown, the grooves may be U-shaped grooves, T-shaped grooves, or grooves in other shape. Accordingly, the protrusions formed on the inner wall of the second housing have a shape fitted to these grooves to ensure that the first and second housings can be closely and firmly connected together by means of their profiles matching each other.

In a third embodiment shown in Fig. 3, the anti-stripping structure may be a plurality of through holes 6 provided in the outer circumferential wall A1, and a plurality of pillars 7 formed on the inner wall of the second housing 2 during over-molding are inserted directly into these through holes 6

serving as engagement structures to form corresponding structures matching the through holes 6. These pillars 7 extending into the first housing 1 through the through holes 6 in a radial direction allow the first housing 1 and the second housing 2 to be locked and connected to each other in a longitudinal direction perpendicular to the radial direction.

In the above embodiments, the engagement structures formed on the first housing 1 can be configured in an array form, and the second housing 2 is accordingly formed, during the over-molding, with corresponding structures in an array form which match the engagement structures. Thus, a connecting force formed by the anti-stripping structure can be made uniform and can act on the first housing 1 and the second housing 2 over a large area.

In a fourth embodiment shown in Fig. 4, an anti-stripping structure in another form is provided. An adhesive layer which can be regarded as a "double-sided tape" is directly sprayed on the outer circumferential wall A1 of the first housing 1. That is to say, during the manufacture of the lamp housing 100, prior to over-molding, the first housing 1 should be subjected to spray coating once so that plastic with high viscosity is coated on the outer circumferential wall A1, and then the over-molding is performed to form the second housing 2. Thus, an additional adhesive layer 3 is formed between the first and second housings 1 and 2, and thereby the strength of connection between the first and second housings 1 and 2 can be enhanced. In this way, the second housing 2 can be also effectively prevented from being stripped from the first housing 1.

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

son skilled in the art, the present invention may have various alterations and changes. Any alterations, equivalent substitutions, and improvements, within the spirit and principle of the present invention, should be covered in the protection
5 scope of the present invention.

List of reference signs

1		first housing
2		second housing
3		adhesive layer
5	4	hook
	4'	hook
	5	slot
	5'	slot
	6	through hole
10	7	pillar
	8	groove
	9	protrusion
	10	accommodating cavity
	11	insulating layer
15	100	lamp housing
	A1	outer circumferential wall
	A2	inner circumferential wall

Claims

1. A lamp housing (100) for an illuminating module, comprising a first housing (1) and an insulating second housing (2) surrounding the first housing (1), wherein the second housing (2) is molded on an outer circumferential wall (A1) of the first housing (1), characterized in further comprising an anti-stripping structure to prevent the second housing (2) from being stripped from the first housing (1).
2. The lamp housing (100) according to claim 1, characterized in that the anti-stripping structure is an engagement structure formed on the first housing (1) for enhancing a coupling force with the second housing (2).
3. The lamp housing (100) according to claim 2, characterized in that the engagement structure is designed so that the second housing (2) is formed, during a molding process, with a corresponding structure having a shape matching that of the engagement structure.
4. The lamp housing (100) according to claim 3, characterized in that the engagement structure is hooks (4) extending radially outwardly from both edges of the outer circumferential wall (A1), a slot (5) is defined between the hooks (4) and the outer circumferential wall (A1), and the second housing (2) has, as the corresponding structure, a slot (5') and a hook (4') respectively matching the hook (4) and the slot (5).
5. The lamp housing (100) according to claim 3, characterized in that the engagement structure is a plurality of through holes (6) provided in the outer circumferential wall (A1), and the second housing (2) has, as the corresponding

structure, a plurality of pillars (7) inserted into the plurality of through holes (6).

6. The lamp housing (100) according to claim 3, characterized in that the engagement structure is a plurality of
5 grooves (8) formed in the outer circumferential wall (A1), and the second housing (2) has, as the corresponding structure, a plurality of protrusions (9) inserted into the plurality of grooves (8).

7. The lamp housing (100) according to claim 5 or 6, characterized in that the engagement structures are arranged in
10 an array form on the first housing (1).

8. The lamp housing (100) according to claim 6, characterized in that the groove is any one of a U-shaped groove, a T-shaped groove, a key groove and a dovetail groove.

15 9. The lamp housing (100) according to claim 1, characterized in that the anti-stripping structure is an adhesive layer (3) attached to the outer circumferential wall (A1).

10. The lamp housing (100) according to any of claims 1 to 6, characterized in that the first housing (1) is basin-
20 shaped, and an accommodating cavity (10) in which the illuminating module is placed is defined by an inner circumferential wall (A2) of the first housing (1).

11. The lamp housing (100) according to any of claims 1 to 6, characterized in that the inner circumferential wall (A2)
25 is coated with an insulating layer (11).

12. The lamp housing (100) according to any of claims 1 to 6, characterized in that a thermal conductivity of the first

housing (1) is greater than that of the second housing (2).

13. The lamp housing (100) according to claim 12, characterized in that the first housing (1) is made of metal, and the second housing (2) is made of plastic.

5 14. The lamp housing (100) according to claim 13, characterized in that the lamp housing (100) is used as a heat sink.

15. A method of manufacturing a lamp housing (100) according to any of claims 1 to 14, characterized in comprising the steps of:

10 a) providing a first housing (1);
 b) forming an anti-stripping structure on the first housing (1); and
 c) molding an insulating second housing (2) on the first housing (1) with anti-stripping structure.

15 16. The method according to claim 15, characterized in that in the step b), an adhesive layer (3) is formed, as the anti-stripping structure, on an outer circumferential wall (A1) of the first housing (1).

20 17. The method according to claim 15, characterized in that in the step b), an engagement structure for enhancing a coupling force with the second housing (2) is formed, as the anti-stripping structure, on an outer circumferential wall (A1) of the first housing (1).

25 18. An illuminating device comprising an illuminating module, characterized in further comprising a lamp housing (100) according to any of claims 1-14.

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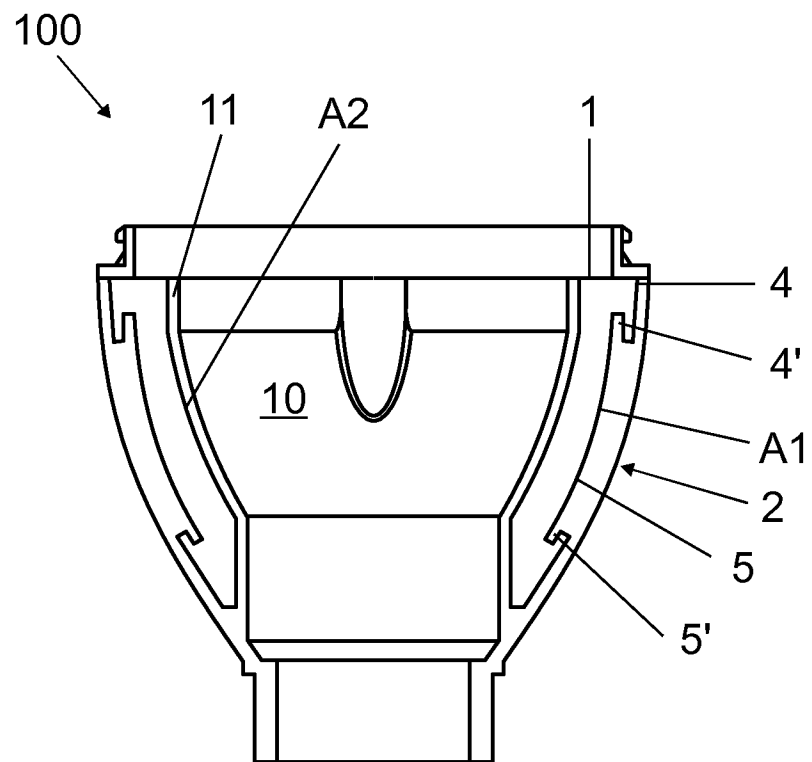


FIG 1

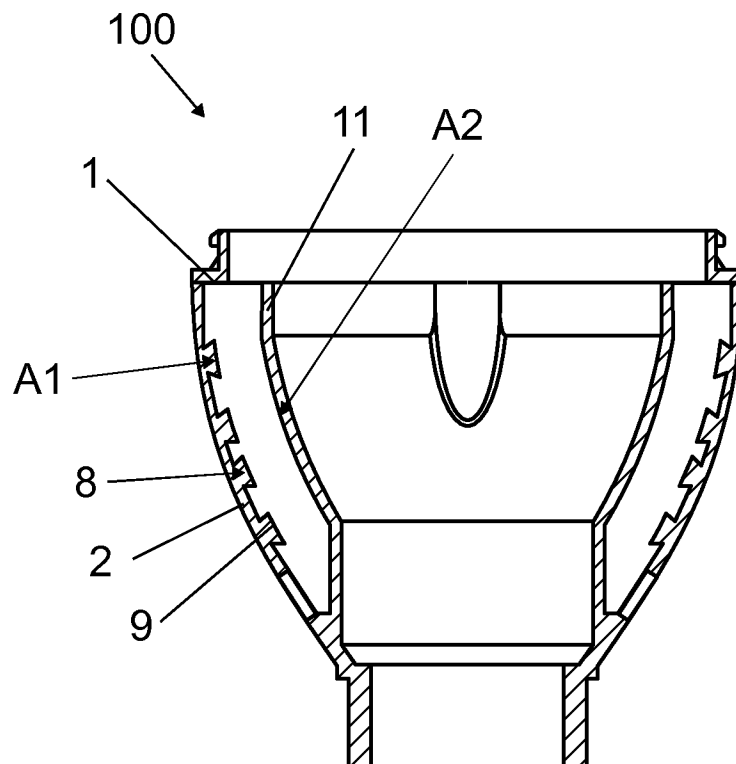


FIG 2

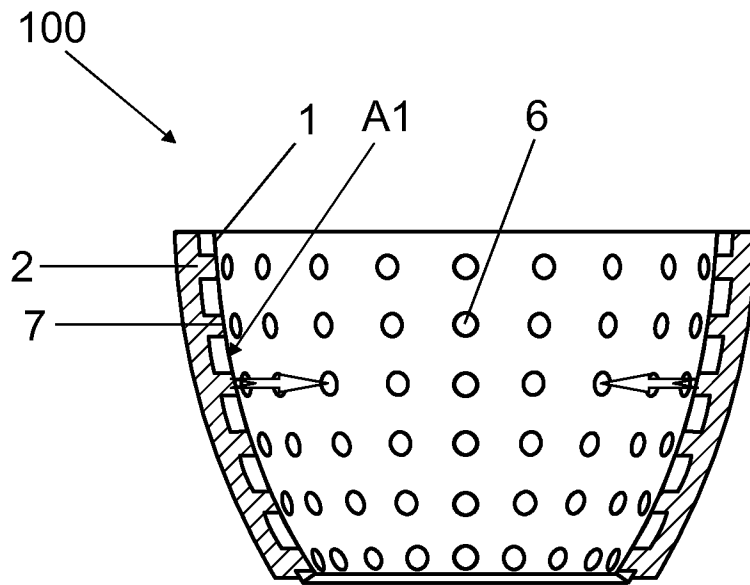


FIG 3

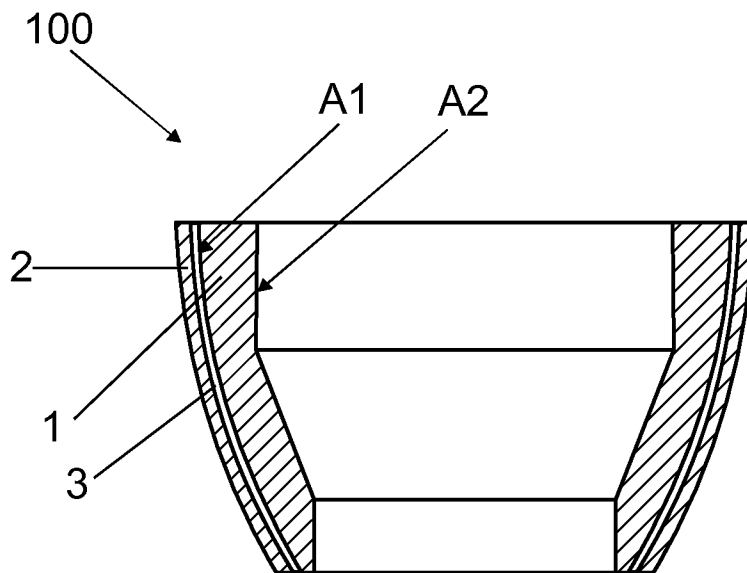


FIG 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/066414

A. CLASSIFICATION OF SUBJECT MATTER

INV. F21V15/01 B29C45/14 F21V25/00
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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 B29C F21Y

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	EP 1 762 432 A2 (KOMPLED GMBH & CO KG [DE] KOMPLED LIGHTSYSTEMS GMBH [DE]) 14 March 2007 (2007-03-14) paragraph [0021] - paragraph [0047] figures 1-4	1-4,6-18
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A	US 2010/046211 A1 (SPARTANO DAVID A [US] ET AL) 25 February 2010 (2010-02-25) paragraph [0044] - paragraph [0091] figures 1,2,5,	1



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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