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(54) **Title:** ILLUMINATING DEVICE

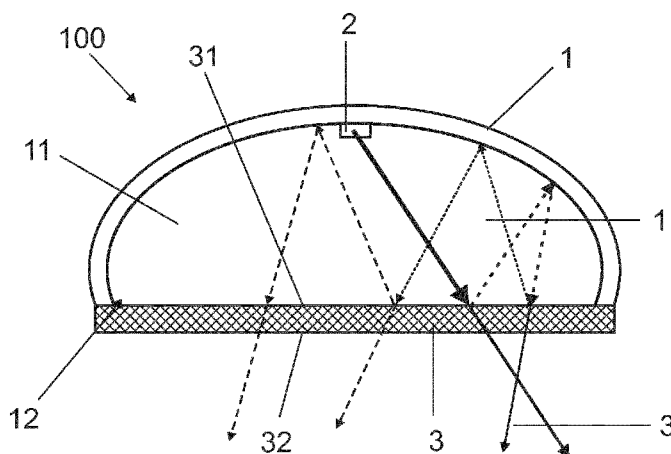


Figure 1

(57) **Abstract:** The present invention relates to an illuminating device (100), comprising a reflector (1) and a light source (2), wherein the reflector (1) defines an accommodation cavity (11) having an opening (12), the light source (2) is arranged in the accommodation cavity (11), and the opening (12) is used as a light emergent opening of the light source (2), wherein the illuminating device (100) further comprises an enclosing cover (3) for enclosing the opening (12), the enclosing cover (3) allows part of light among incident light to directly emerge through the enclosing cover (3), and remaining light to be reflected to the reflector (1), and reflected again by the reflector (1) to the enclosing cover (3), the remaining light is used to be incident light such that the incident light is incident on the enclosing cover (3) in a degressive tendency.



Description

Illuminating Device

5 **Technical Field**

The present invention relates to an illuminating device.

Background Art

A lamp designer usually will not consider the appearance of optical parts of the illuminating device designed, but puts
10 emphasis on the optical performances of the optical parts.
As a result, a large number of optical parts having different mechanical shapes are designed, and these optical parts often are reflectors or lenses. However, when the illuminating device is observed, the interior of the illuminating device can
15 be easily seen through these optical parts, for instance, even the light source itself can be seen. There are a lot of such monotonous illuminating devices with traditional appearance available in the market. These illuminating devices themselves only have the illumination function, and when they
20 are turned off, the optical parts in the interior of the illuminating device can be seen directly.

Summary of the Invention

In order to solve the above technical problem, the present invention provides an illuminating device. Such illuminating
25 device has a good appearance, and when it does not operate, users cannot easily see the interior of the illuminating device, moreover, the illuminating device also has other additional functions, such as use as a mirror. In addition, the illuminating device according to the present invention fur-

ther has quite good optical distribution performance.

The object of the present invention is accomplished via an illuminating device. The illuminating device comprises a reflector and a light source, wherein the reflector defines an accommodation cavity having an opening, the light source is
5 arranged in the accommodation cavity, and the opening is used as a light emergent opening of the light source, wherein the illuminating device further comprises an enclosing cover for enclosing the opening, the enclosing cover permits part of
10 light among incident light to directly emerge through the enclosing cover, and remaining light to be reflected to the reflector, and reflected again by the reflector to the enclosing cover, and the remaining light is used to be incident light such that the incident light is incident on the enclosing
15 ing cover in a degressive tendency. The enclosing cover used in the illuminating device according to the present invention only permits part of light to pass through the enclosing cover, thus, when a user observes the illuminating device, it is hard for him to see the interior of the illuminating de-
20 vice through the enclosing cover. In addition, as the light emitted from the light source is cyclically reflected multiple times between the reflector and the enclosing cover, an emergent angle of emergent light emitted is changed, which greatly improves the optical distribution performance of the
25 light emitted from the illuminating device, such that the emergent light looks more uniform.

According to the present invention, the enclosing cover is configured to be semitransparent, wherein the semitransparent enclosing cover is capable of preventing interior of the ac-
30 commodation cavity from being observed. Such semitransparent enclosing cover permits the light emitted from the illuminating device to be partially emergent and partially reflected,

and also serves the same function for light from the outside; therefore, it is not easy for the observer to see the interior of the accommodation cavity of the illuminating device, improving the aesthetics of the illuminating device.

5 Preferably, the enclosing cover is configured in such a manner that 50% of light incident on the enclosing cover directly emerges through the enclosing cover and 50% of the light is reflected to the reflector. In this solution, the enclosing cover both can permit a small optical loss when the
10 light transmits the enclosing cover and can effectively prevent the observer from seeing the interior of the accommodation cavity of the illuminating device.

According to the present invention, the reflector is configured in such a manner that light reflected back by the enclosing cover is incident on the enclosing cover, after re-
15 flected by the reflector, at a changed incident angle. Diffusive reflection effect is created for the light through cooperative use of the reflector and the enclosing cover, thereby quite uniform optical distribution is obtained.

20 Further according to the present invention, the enclosing cover has a first surface facing to the light source and a second surface facing to ambient environment, wherein the second surface is a planar surface. Since the enclosing cover itself is semitransparent and has certain reflective
25 capability, the second surface can be used as a mirror, especially as a make-up mirror, when the second surface is a planar surface, especially when the illuminating device is in an off state.

Preferably, the enclosing cover is configured to be in a
30 plate shape, wherein the first surface is parallel to the

second surface. Such type of enclosing cover does not have a complex structure, and therefore it is more easily manufactured, so that the manufacturing cost of the illuminating device is reduced.

5 Preferably, the first surface and/or the second surface is coated or bonded with a semitransparent film. The semitransparent enclosing cover can be obtained just by simply coating or bonding a semitransparent film on the first surface and/or the second surface, which further decreases the manufacturing
10 hardship of the enclosing cover.

According to the present invention, the reflector is configured as a holophote reflector. Light could be totally reflected by the so called holophote reflector but not refracted by the same. Of course, designers also can choose
15 other types of reflectors, such as diffuse reflector, according to different illumination effects desired.

Preferably, the light source is an LED light source. The LED light source has the advantages of long service lifetime, high lighting efficiency and environmental friendliness.

20 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.

Brief Description of the Drawings

The accompanying drawings constitute a part of the present
25 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 by the same reference numbers. As shown in the drawings:

Fig. 1 is a schematic section diagram of an illuminating device according to the present invention;

Fig. 2 is a principle schematic diagram of the illuminating device according to the present invention;

Fig. 3 is an optical pathway diagram of light reflected by the illuminating device according to the present invention;
and

Fig. 4 is a schematic diagram of the illuminating device according to the present invention used as a mirror.

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 which the invention may be practiced. In this regard, directional terminology, such as "front", "back", "inner", "outer", is used in reference to the orientation of the figures being described. Because components of embodiments of the present invention 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.

Fig. 1 is a schematic section diagram of an illuminating device 100 according to the present invention. It can be seen from the figure that the illuminating device 100 comprises a reflector 1 and a light source 2, wherein the reflector 1 defines an accommodation cavity 11 having an opening 12, and the light source 2 is arranged in the accommodation cavity 11. In the present embodiment, the light source 2 is configured as an LED light source and is arranged right in a center of a bottom of the accommodation cavity 11, and the reflector 1 is configured as a holophote reflector, and of course, the reflector 1 also can be configured as a diffuse reflector according to requirements. It can be seen from the figure that the opening 12 is used as a light emergent opening of the light source 2, wherein the illuminating device 100 further comprises an enclosing cover 3 for enclosing the opening 12, wherein the enclosing cover 3 is configured to be semitransparent, and the semitransparent enclosing cover 3 can prevent the interior of the accommodation cavity 11 from being observed. It can be seen from the figure that the enclosing cover 3 has a first surface 31 facing to the light source 2 and a second surface 32 facing to ambient environment, wherein the second surface 32 is a planar surface. In the present embodiment, the enclosing cover 3 is configured to be in a plate shape, the first surface 31 is parallel to the second surface 32, wherein the first surface 31 and/or the second surface 32 is coated or bonded with a semitransparent film so as to form the semitransparent enclosing cover 3. The enclosing cover 3 permits part of light among incident light to directly emerge through the enclosing cover 3, and the remaining light to be reflected to the reflector 1, and then again reflected by the reflector 1 to the enclosing cover 3, and part of light among the remaining light to di-

rectly emerge through the enclosing cover 3 such that the incident light is incident on the enclosing cover 3 in a degressive tendency.

In order simply illustrate the operation principle of the illuminating device 100 of the present invention, Fig. 1 merely shows an optical pathway diagram of one beam of light reflected by LED chips. Further explanations and illustrations will be made in reference to the principle schematic diagram of the illuminating device according to the present invention shown in Fig. 2. In the present embodiment, the enclosing cover 3 is configured in such a manner that 50% of light incident on the enclosing cover 3 directly emerges through the enclosing cover 3, and 50% of light is reflected to the reflector 1. In reference to Fig. 2, in an ideal situation that optical loss is not taken into consideration, assume that incident light of $1T$ is incident on the enclosing cover 3, and then 50% of the light, i.e. $0.5T$ of the light, directly emerges through the enclosing cover 3, and 50% of light is reflected by the enclosing cover 3 to the reflector 1. The reflector 1 reflects the $0.5T$ of light to the enclosing cover 3, at which time $0.25T$ of light directly emerges through the enclosing cover 3, and $0.25T$ of light is reflected by the enclosing cover 3 to the reflector 1. The light is cyclically reflected and emerges in a degressive tendency. Thus, such type of semitransparent enclosing cover 3 can achieve certain mirror effects due to certain reflective capability so as to be used as a mirror. Moreover, it is not easy for an observer to see the interior of the illuminating device 100 when the illuminating device 100 does not operate.

Fig. 2 shows an optical pathway diagram of light reflected by the illuminating device 100 in an ideal situation. The re-

flector 1 in Fig. 2 has a structural profile different from that in Fig. 1, such that light reflected to the reflector 1 is incident on the enclosing cover 3, after reflected by the reflector 1, at a changed incident angle. Diffusive reflection effect is created for the light through cooperative use of the reflector 1 and the enclosing cover 3, thereby quite uniform optical distribution is obtained. Fig. 3 shows a complete optical pathway diagram of the illuminating device 100 according to the present invention, from which it can be seen that the light emitted from the illuminating device 100 according to the present invention has more uniform optical distribution.

Fig. 4 is a schematic diagram of the illuminating device 100 according to the present invention used as a mirror. When the illuminating device 100 does not operate, that is, it does not emit light, when a user observes the illuminating device 100, light is incident on the semitransparent enclosing cover 3 from ambient environment, wherein 50% of the light passes through the enclosing cover 3 to strike the interior of the illuminating device 100, the reflector 1 deflects this part of light to another direction and prevents this part of light, in cooperation with the enclosing cover 3, from entering user's eyes, and 50% of light will be reflected to the user's eyes, thus, the user can see a relatively clear image of himself or the ambient environment on the enclosing cover 3. Moreover, the semitransparent enclosing cover 3 prevents the user from seeing the interior of the illuminating device 100 to a great extent, so as to serve a good function of shielding internal structures of the illuminating device 100.

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, 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	reflector
	11	accommodation cavity
	12	opening
5	2	light source
	3	enclosing cover
	31	first surface
	32	second surface
	100	illuminating device

Claims

1. An illuminating device (100), comprising a reflector (1) and a light source (2), the reflector (1) defining an accommodation cavity (11) having an opening (12), the light source (2) is arranged in the accommodation cavity (11), and the opening (12) is used as a light emergent opening of the light source (2), characterized in that the illuminating device (100) further comprises an enclosing cover (3) for enclosing the opening (12), the enclosing cover (3) permits part of light among incident light to directly emerge through the enclosing cover (3), and remaining light to be reflected to the reflector (1), and reflected again by the reflector (1) to the enclosing cover (3), and the remaining light is use to be incident light such that the incident light is incident on the enclosing cover (3) in a degressive tendency.
2. The illuminating device (100) according to Claim 1, characterized in that the enclosing cover (3) is configured to be semitransparent, the semitransparent enclosing cover (3) is capable of preventing interior of the accommodation cavity (11) from being observed.
3. The illuminating device (100) according to Claim 1 or 2, characterized in that the enclosing cover (3) is configured in such a manner that 50% of light incident on the enclosing cover (3) directly emerges through the enclosing cover (3) and 50% of the light is reflected to the reflector (1).
4. The illuminating device (100) according to Claim 1 or 2, characterized in that the reflector (1) is configured in

such a manner that light reflected back by the enclosing cover (3) is incident on the enclosing cover (3), after reflected by the reflector (1), at a changed incident angle.

- 5 5. The illuminating device (100) according to Claim 1 or 2, characterized in that the enclosing cover (3) has a first surface (31) facing to the light source (2) and a second surface (32) facing to ambient environment, and the second surface (32) is a planar surface.
- 10 6. The illuminating device (100) according to Claim 5, characterized in that the enclosing cover (3) is configured to be in a plate shape, and the first surface (31) is parallel to the second surface (32).
- 15 7. The illuminating device (100) according to Claim 5, characterized in that the first surface (31) and/or the second surface (32) is coated or adhered with a semi-transparent film.
- 20 8. The illuminating device (100) according to Claim 1 or 2, characterized in that the reflector (1) is configured as a holophote reflector.
9. The illuminating device (100) according to Claim 1 or 2, characterized in that the light source (2) is an LED light source.

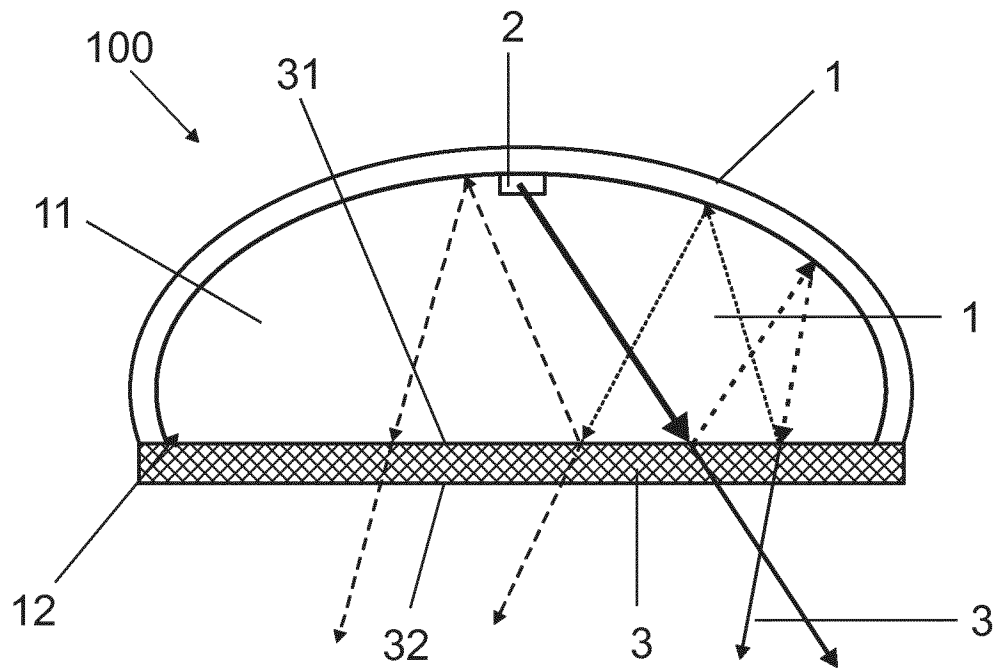
$\frac{1}{2}$ 

Figure 1

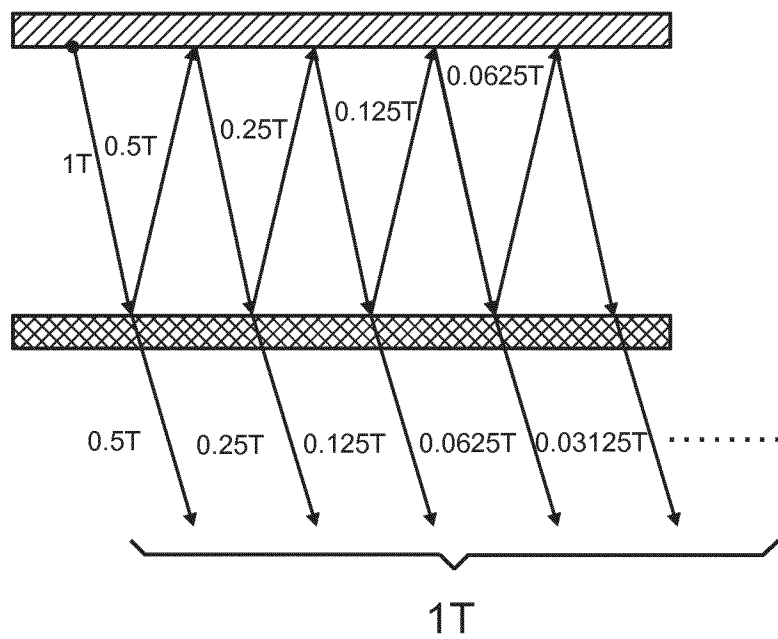


Figure 2

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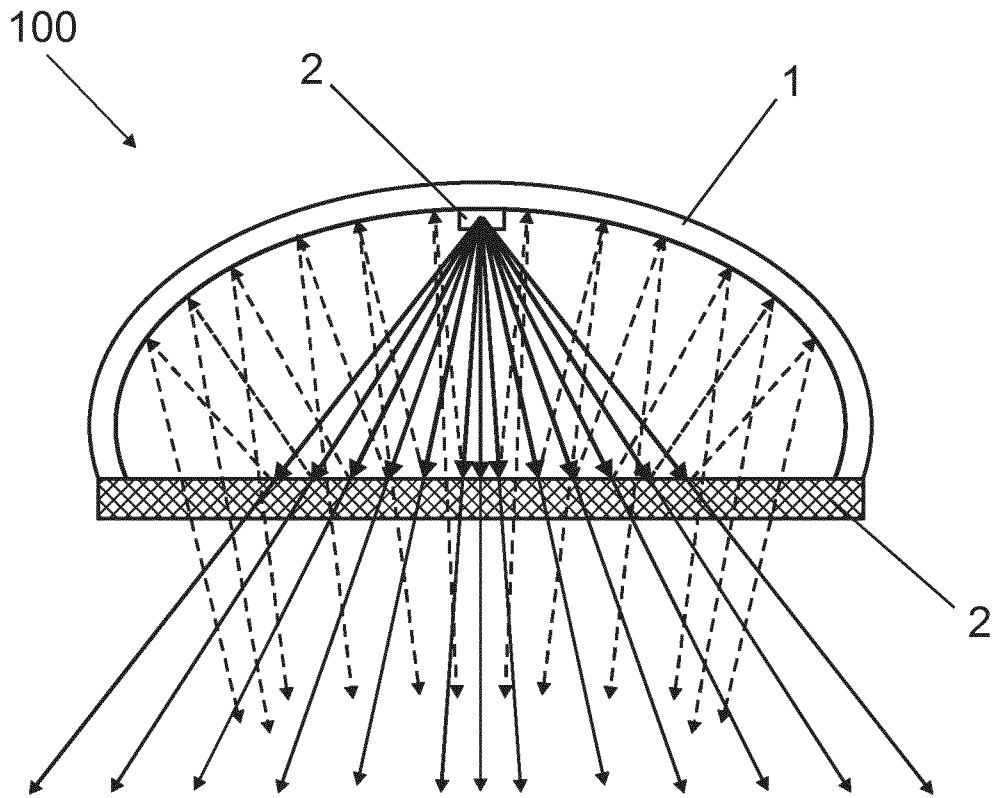


Figure 3

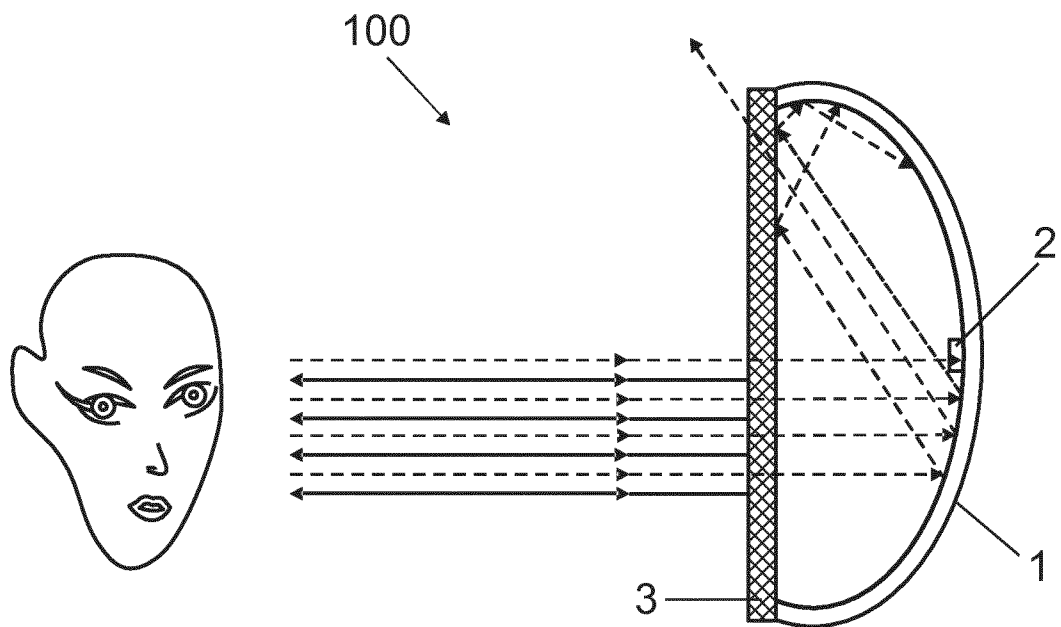


Figure 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/071067

A. CLASSIFICATION OF SUBJECT MATTER
INV. F21V11/16
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 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 0 756 131 A1 (MAGNETI MARELLI SPA [IT]) 29 January 1997 (1997-01-29) column 2, line 6 - line 53 figures 1,2	1-9
X	----- WO 2007/036185 A1 (OSRAM OPTO SEMICONDUCTORS GMBH [DE]; BLUEMEL SIMON [DE]) 5 April 2007 (2007-04-05) page 23, line 23 - page 27, line 29 figure 1	1-3,9
A	----- DE 102 37 365 A1 (SEMPERLUX AG [DE]) 26 February 2004 (2004-02-26) paragraph [0015] - paragraph [0019] figure 2	1
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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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

21 November 2013

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04/12/2013

Name and mailing address of the ISA/

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Schulz, Andreas

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/071067

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 10 2006 019202 A1 (KARL GERHARD [DE]) 8 November 2007 (2007-11-08) paragraph [0032] - paragraph [0036] figure 1 -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2013/071067

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