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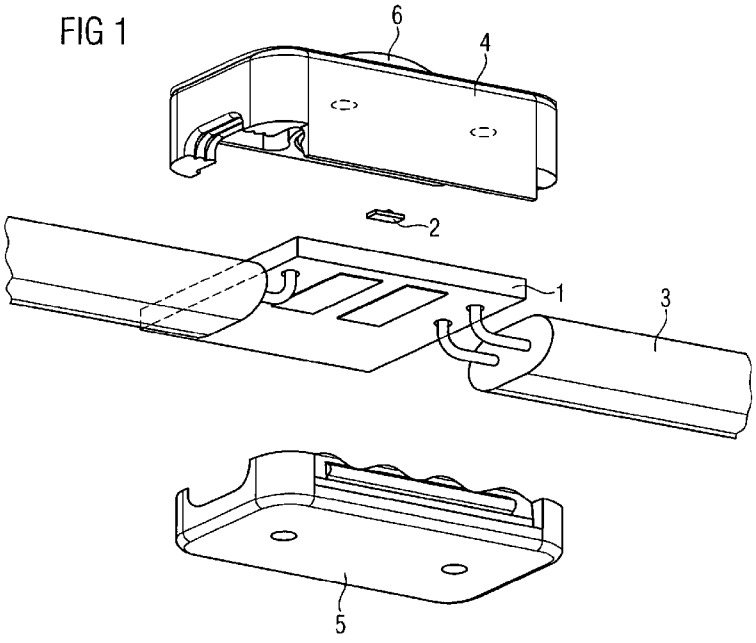
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(54) **Title**: AN LED MODULE, METHOD FOR MANUFACTURING THE SAME AND AN LED CHAIN CONSISTING OF LED MODULES

FIG 1



(57) **Abstract**: LED module, having: a housing; a PCB board (1) provided in the housing; an LED chip (2) provided on the PCB board (1); and an electrical lead (3) connected to the PCB board (1), wherein, the housing comprises at least a first housing part (4) and a second housing part (5) that can be closely clamped to each other, the first housing part (4) being provided with an optical lens (6) and the second housing part (5) being provided with the potting material hole (7) through which a potting material is potted into the housing for envelopment. The LED module according to the present invention is capable of rendering favorable light distribution effect with separately provided optical lens, and possesses good waterproof and dustproof performance. In addition, the present also relates to an LED chain consisting of LED Modules and a method for manufacturing the LED module of the above type.

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Description

An LED Module, Method for Manufacturing the same and an LED chain consisting of LED modules

Technical Field

The present invention relates to an LED module for backlight illuminating apparatus. In addition, the present invention also relates to an LED chain consisting of LED modules and a method for manufacturing the LED module of the above type.

Background Art

The low power LED chain is currently very popular for the backlight illuminating apparatus. In the LED chain of such type, a plurality of LED modules is connected in series by wires to form the LED chain. Generally, the backlight illuminating apparatus of such type are usually for outdoor application; therefore, the IP protection degree should be met. In order to obtain good protection, the one-side potting is usually used in the prior art, i.e. the PCB board bearing the LED module is firstly placed in one completely opened side of the housing, then, the PCB board and the wires extracted from the PCB board are potted and enveloped by the potting material so as to obtain good protective effect, which can meet the requirement of the IP protection degree. However, the disadvantage of this method is that it is impossible to make the second optics design on the LED module, that is to say, separate optical lens cannot be put on the LED module. Another method is to envelop the LED module by the low pressure molding, but the protection performance of the LED module enveloped with such process is unfavorable, because the low pressure molding cannot well seal the place where the wire is extracted on the LED module. In addition, though in the low pressure molding, respective independent optical lenses can be firstly disposed on the plane where the light is emitted on the LED chip, then they are enveloped, the place where the wire is extracted on the LED module still cannot be well sealed.

Summary of the Invention

Therefore, the objective of the present invention is to provide an LED module. The LED module according to the present invention is capable of rendering favorable

light distribution effect with separately provided optical lens, and possesses good waterproof and dustproof performance.

The objective of the present invention is accomplished in the way as follow: the LED module has: a housing; a PCB board provided in the housing; an LED chip provided on the PCB board; and an electrical lead connected to the PCB board, wherein, the housing comprises at least a first housing part and a second housing part that can be closely clamped to each other, the first housing part being provided with the optical lens and the second housing part being provided with the potting material hole through which the potting material is potted into the housing for envelopment. The LED module according to the present invention is capable of rendering expected optical intensity distribution by separately provided optical lens, and the protection requirement of IP protection degree can be satisfied due to the potting material potted therein.

According to a preferred solution of the present invention, the potting material is capable of covering the PCB board, the joint between the PCB board and the electrical leads and the joint between the PCB board and the LED chip. All the electrical parts of the LED module are enveloped by the potting material so as to render excellent waterproof and dustproof performance, and the plane where the light is emitted on the LED chip is not covered by the potting material, which therefore lowers the requirement to the potting material, for instance, it is unnecessary to use nontransparent potting material.

According to a preferred solution of the present invention, the first housing part and the second housing part are tightly clamped to each other by snap-fitting. Of course, they can be clamped together in some other manner, thereby the potting material will not overflow from the gap between the housings when it is potted into the housing.

According to the present invention, it is provided to form the accommodating portion closely coordinating with the circumferential profile of the electrical lead when the first housing part and second housing part are clamped together. The accommodating portion for the housings closely coordinates with the electrical lead to avoid the gap between the accommodating portion and the electrical lead, which therefore effectively prevents the external water or dust from going into the housings. Moreover, when the potting material is potted, it will not overflow from the gap between the housings and the electrical lead.

According to a preferred solution of the present invention, the optical lens and the first housing part are formed integrally, which reduces the difficulty and costs in manufacturing to a great extent.

Preferably, the second housing part is provided with the exhaust hole thereon. When the potting material is potted into the housing, air within the housing will be exhausted through the exhaust hole, which effectively decreases the possibility of producing air bubble in the potting material during the potting process.

Advantageously, the potting material is one selected from the group consisting of epoxy potting material, silastic potting material, polyurethane potting material and thermally melting potting material. Of course, it also can be some other material adapted to potting with effective waterproof and dustproof performance.

Another object of the present invention is to provide an LED chain consisting of above LED modules. The LED modules can be connected to each other in series, by connecting the electrical leads to each other, to form the LED chain. The length of the LED chain can be extended to six meters. The LED chain according to the present invention is capable of rendering favorable light distribution effect, and possesses good waterproof and dustproof performance.

Another objective of the present invention is to provide a method for manufacturing an LED module. The method includes the following steps:

a) providing a PCB board;

b) providing an LED chip onto the PCB board;

c) connecting an electrical lead to the PCB board;

d) providing a first housing part and a second housing part, wherein, the first housing part has an optical lens, the PCB board is placed into the second housing part, and the first housing part and the second housing part are tightly clamped together; and

e) potting a potting material though a potting material hole on the second housing part.

The LED module manufactured by the method according to the present invention is capable of rendering favorable light distribution effect with separately provided optical lens, and possesses good waterproof and dustproof performance as well.

In a preferred solution of the method according to the present invention, in step d), the first housing part is provided with the optical lens integrally formed thereon, which reduces the difficulty and costs in manufacturing to a great extent.

According to a preferred solution of the present invention, in step c), the potting material is potted through the potting material hole on the second housing part until the potting material covers the PCB board, the joint between the PCB board and the electrical lead, and the joint between the PCB board and the LED chip. All the electrical parts of the LED module are enveloped by the potting material so as to render excellent waterproof and dustproof performance, and the plane where the light is emitted on the LED chip is not covered by the potting material, which therefore lowers the requirement to the potting material, for instance, it is unnecessary to use nontransparent potting material.

Preferably, in step c), air is exhausted through the exhaust hole provided on the second housing part. When the potting material is potted into the housing, air in the housing is exhausted through the exhaust hole, which therefore effectively reduces the possibility of producing air bubble in the potting material during the potting process.

It should be understood that the general descriptions above and the detailed descriptions below are illustrative, and aim at providing further understanding to the claimed invention.

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 the Description. In the drawings, the same element is represented by the same reference sign, wherein

Figure 1 is an exploded view of the LED module according to the present invention;

Figure 2 is a pre-assembling scheme of the LED module according to the present invention;

Figure 3 is a scheme of the second housing part of the LED module according to the present invention; and

Figure 4 is a scheme of the LED chain formed by the LED modules according to the present invention.

Detailed Description of the Embodiments

Figure 1 is an exploded view of the LED module according to the present invention. From the figure it can be seen that the LED module comprises PCB board 1, LED chip 2, electrical lead 3, first housing part 4 and second housing part 5, wherein, the first housing part 4 is integrally formed with the optical lens 6 thereon, and the optical lens 6 is corresponding to the location of the LED chip 2.

Figure 2 is a pre-assembling scheme of the LED module according to the present invention. From the figure it can be seen that one electrical lead 3 is connected to both ends of the PCB board 1. The LED chip 2 has been already mounted onto the PCB board 1, but it cannot be seen from the figure due to the angle. In addition, it can be seen clearly from the figure that the hook 10 is provided on the first housing part 4, and the projection 11 is provided on the second housing part 5 to coordinate with the hook 10. Under the assembly condition, the hook 10 is tightly clamped onto the projection 11, and the opposing faces of the first housing part 4 and the second housing part 5 abut against each other such that there is no gap therebetween.

From Figure 2 it also can be seen that the electrical leads 3 are extracted from both sides of the housings, therefore, when the first housing part 4 and the second housing part 5 are clamped to each other, the accommodating portion 9 is formed, respectively, at both ends of the housings to closely coordinate with the circumferential profile of the electrical lead 3, so that water or dust cannot go into the interior of the housings therefrom.

Figure 3 is a scheme of the second housing part 5 of the LED module according to the present invention. From the figure it can be seen that the second housing part 5 has the potting material hole 7 and the exhaust hole 8. When the potting material is potted into the second housing part 5, air within the housing is exhausted from the

exhaust hole 8, so as to reduce the possibility of producing air bubble.

Figure 4 is a scheme of the LED chain formed by the LED modules according to the present invention. The LED modules according to the present invention can be connected to each other in series, by connecting the electrical leads 3 to each other, to form the LED chain. The length of the LED chain can be extended to six meters.

The above is merely preferred embodiments of the present invention but not limiting 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 scope of the present invention.

List of reference signs

1 PCB board

2 LED module

3 electrical lead

4 first housing part

5 second housing part

6 optical lens

7 potting material hole

8 exhaust hole

9 accommodating portion

10 hook

11 projection

Claims:

1. An LED module, having: a housing; a PCB board (1) provided in the housing; an LED chip (2) provided on the PCB board (1); and an electrical lead (3) connected to the PCB board (1), characterized in that, the housing comprises at least a first housing part (4) and a second housing part (5) that can be closely clamped to each other, the first housing part (4) is provided with an optical lens (6) and the second housing part (5) is provided with the potting material hole (7) through which a potting material is potted into the housing for envelopment.

2. The LED module according to Claim 1, characterized in that the potting material is capable of covering the PCB board (1), joint between the PCB board (1) and the electrical lead (3) and joint between the PCB board (1) and the LED chip (2).

3. The LED module according to Claim 1, characterized in that the first housing part (4) and the second housing part (5) are tightly clamped to each other by snap-fitting.

4. The LED module according to Claim 3, characterized in that an accommodating portions (9) are formed to closely coordinate with a circumferential profile of the electrical lead (3) when the first housing part (4) and the second housing part (5) are clamped to each other.

5. The LED module according to Claim 1, characterized in that the optical lens (6) and the first housing part (4) are formed integrally.

6. The LED module according to Claim 1, characterized in that an exhaust hole (8) is further provided on the second housing part (5).

7.. The LED module according to any one of Claims 1 to 6, characterized in that the potting material is one selected from a group consisting of epoxy potting material, silastic potting material, polyurethane potting material and thermally melting potting material.

8. An LED chain, , characterized in that the LED chain consists of LED modules according to any one of claims 1 to 7.

9. A method for manufacturing an LED module, characterized by including the following steps:

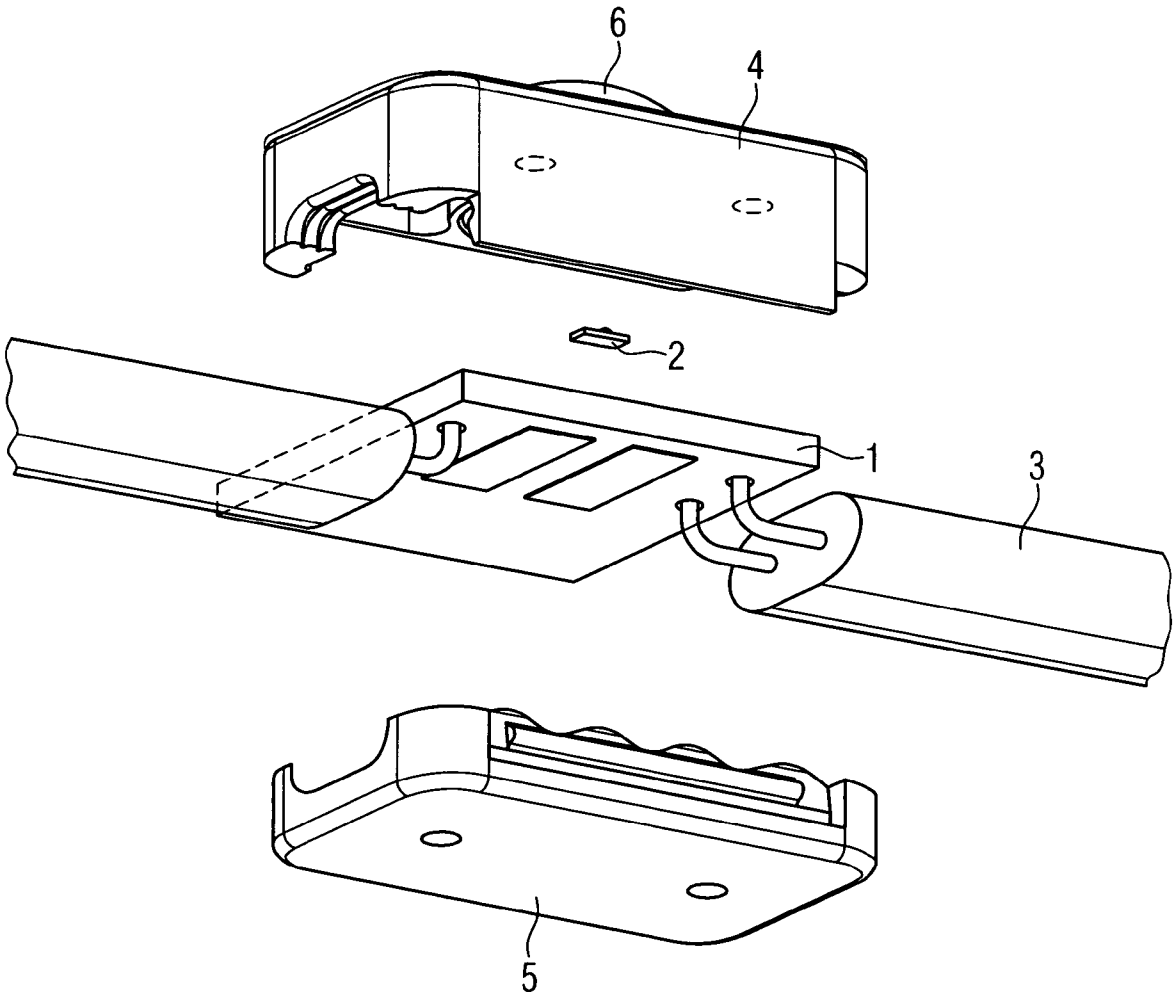
a) providing a PCB board (1);
b) providing an LED chip (2) onto the PCB board (1);
c) connecting an electrical lead (3) to the PCB board (1);
d) providing a first housing part (4) and a second housing part (5), wherein, the first housing part (4) has an optical lens (6), the PCB board (1) is placed into the second housing part (5), and the first housing part (4) and the second housing part (5) are tightly clamped together; and
e) potting a potting material though a potting material hole (7) on the second housing part (5).

10. The method according to Claim 9, characterized by, in step d), providing the first housing part (4) integrally formed with the optical lens (6) thereon.

11. The method according to Claim 9, characterized by, in step e), potting the potting material through the potting material hole (7) on the second housing part (5) until the potting material covers the PCB board (1), joint between the PCB board (1) and the electrical lead (3), and joint between the PCB board (1) and the LED chip (1).

12. The method according to Claim 9, characterized by, in step e), exhausting air through an exhaust hole (8) provided on the second housing part (5).

FIG 1



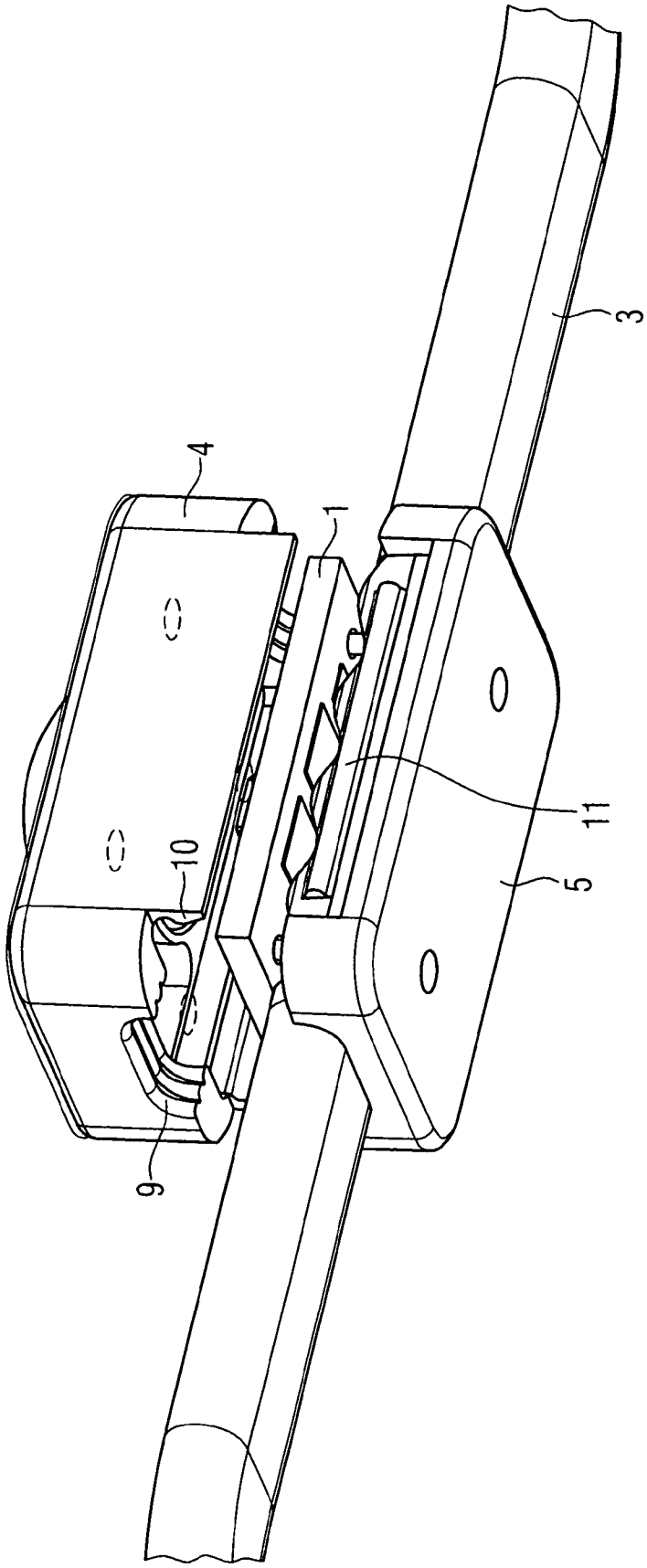


FIG 2

FIG 3

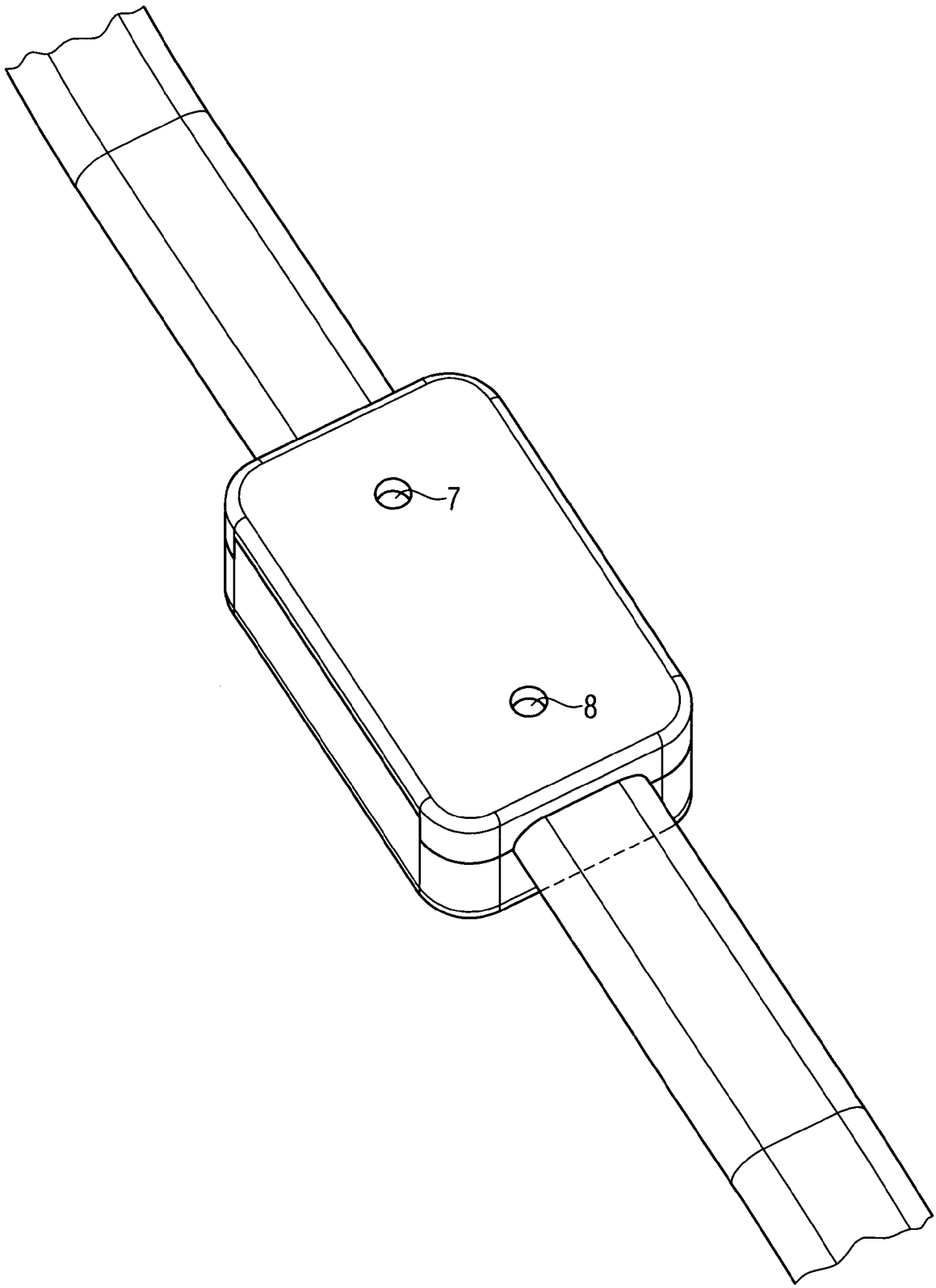
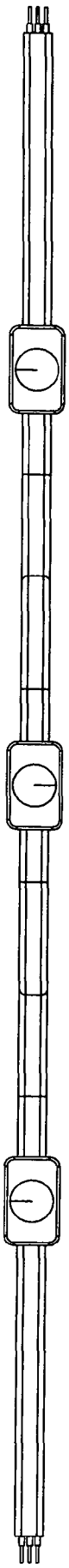


FIG 4



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. F21V31/04 F21S4/00 F21K99/00
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 F21K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005/139850 A1 (IKEDA MINORU [JP]) 30 June 2005 (2005-06-30) paragraph [0029] - paragraph [0048] figures 1-9 -----	1-12

☐ 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
PCT/EP2011/064307

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005139850 A1	30-06-2005	JP 4274935 B2	10-06-2009
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