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(54) LIGHTING DEVICE FOR MOTOR VEHICLE AND MANUFACTURING METHOD THEREOF

(57) A lighting device for a motor vehicle is disclosed. The lighting device includes a light source assembly (1), an optical deviation means (2) and an optical lens (4), wherein the lighting device further includes a supporting and reflecting assembly (6) configured to be in one piece. A manufacturing method of a lighting device for a motor vehicle is also disclosed. The method includes steps of: forming the light source assembly (1), the optical deviation means (2) and the optical lens (4); forming the supporting and reflecting assembly (6) in one piece; and assembling the light source assembly (1), the optical deviation means (2), the optical lens (4) and the supporting and reflecting assembly (6) together to form the lighting device. In the lighting device and the manufacturing method of the lighting device according to the present disclosure, the lighting device has relatively low manufacturing cost and an improved optical performance.

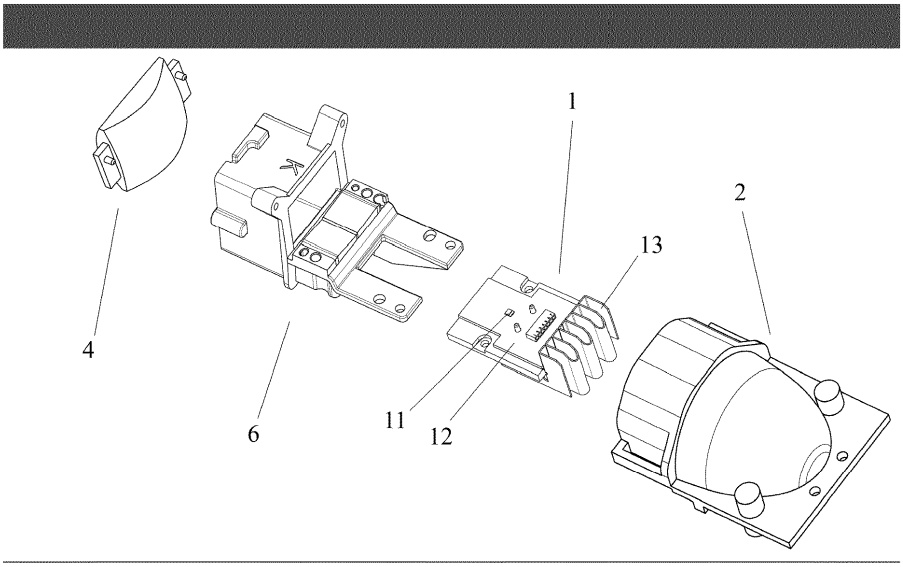

Fig. 2

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Description

BACKGROUND

Technical Field

[0001] The present disclosure relates to a field of lighting device, and more particularly, to a lighting device for a motor vehicle and a manufacturing method of a lighting device for a motor vehicle.

Description of the Related Art

[0002] Generally, a lighting device provides necessary lighting function for a motor vehicle. As a necessary component of the vehicle, the lighting device is more and more widely concerned in the design of the vehicle, in particular for a headlamp of the vehicle. It provides an improved visual field for travelling at night or in a condition of poor lighting, to ensure a safe driving.

[0003] Traffic regulations require the headlamp of the vehicle to provide a low beam lighting function and a high beam lighting function. A low beam lighting module generally includes a light source assembly 1, an optical deviation means 2 and an optical lens 4, as shown in Fig. 1. In order to improve lighting efficiency and produce a necessary lighting cut-off line, a reflective plate 3 is typically provided in the low beam lighting module. In a manufacturing process of a conventional lighting device having a low beam lighting module, the reflective plate 3 is constructed as a separate component independent of the light source assembly 1, the optical deviation means 2 and the optical lens 4, and is separately designed and manufactured, and then assembled with other components of the lighting device, which results in high manufacturing cost and assembling cost, and a complicated manufacturing process. Moreover, the conventional reflective plate 3 is typically made of metal material, and the material itself is costly.

[0004] In addition, the reflective plate is a key component in an optical propagation path, and plays an important role in a light distribution. For the above-mentioned lighting device, an optical error is likely to occur in assembling the reflective plate, resulting in an error in the light distribution. Further, since it needs a connecting member, for example a lens holder, to connect the reflective plate to the other components of the lighting device, the connecting member provided in the optical propagation path has an adverse effect on the propagation of the light, resulting in light loss and uneven light emission and degrading lighting quality.

[0005] In summary, it is necessary to improve the conventional lighting device for a motor vehicle in aspects of structure, manufacturing method and manufacturing process, as well as optical performance.

SUMMARY

[0006] In order to overcome the drawbacks in the prior art, the present disclosure provides a lighting device for a motor vehicle, which is cost effective.

[0007] The present disclosure further intends to provide a manufacturing method of a lighting device for a motor vehicle, which has a lower manufacturing cost.

[0008] The present disclosure further intends to provide a lighting device for a motor vehicle or a manufacturing method thereof such that the lighting device or the lighting device manufactured by the manufacturing method has an improved optical performance.

[0009] In order to achieve at least one of the above objectives, technical solutions of the present disclosure are provided as follows:

According to an aspect of the present disclosure, there is provided a lighting device for a motor vehicle, comprising a light source assembly, an optical deviation means and an optical lens, wherein the lighting device further comprises a supporting and reflecting assembly configured to be in one piece.

[0010] According to a preferred embodiment, the supporting and reflecting assembly comprises a lens supporting portion and a reflecting portion.

[0011] According to a preferred embodiment, the reflecting portion is an aluminized layer formed on at least one portion of the lens supporting portion.

[0012] According to a preferred embodiment, the reflecting portion comprises a step.

[0013] According to a preferred embodiment, the reflectivity of the reflecting portion is greater than 85%.

[0014] According to a preferred embodiment, the reflecting portion is configured to form a low beam cut-off or improve optical efficiency of a high beam.

[0015] According to a preferred embodiment, the light source assembly comprises a light source, a printed circuit board and a heatsink.

[0016] According to another aspect of the present disclosure, there is provided a manufacturing method of a lighting device for a motor vehicle, the lighting device comprising a light source assembly, an optical deviation means and an optical lens, wherein the lighting device further comprises a supporting and reflecting assembly, and the method comprises steps of:

forming the light source assembly, the optical deviation means and the optical lens;
forming the supporting and reflecting assembly in one piece; and
assembling the light source assembly, the optical deviation means, the optical lens and the supporting and reflecting assembly together to form the lighting device.

[0017] According to a preferred embodiment, the sup-

porting and reflecting assembly comprises a lens supporting portion and a reflecting portion, and the step of forming the supporting and reflecting assembly in one piece comprises steps of:

providing a mold for forming the lens supporting portion;
molding the lens supporting portion with the mold; and
forming the reflecting portion on the molded lens supporting portion integrally.

[0018] According to a preferred embodiment, the reflecting portion is formed on at least one portion of the molded lens supporting portion by an aluminizing process.

[0019] According to a preferred embodiment, the reflecting portion comprises a step, and a structure for forming the step of the reflecting portion is formed on the mold.

[0020] According to a preferred embodiment, the aluminizing process is controlled so that the reflectivity of the formed reflecting portion is greater than 85%.

[0021] According to a preferred embodiment, the reflecting portion is configured to form a low beam cut-off or improve optical efficiency of a high beam.

[0022] According to a preferred embodiment, the method further comprises: polishing a portion of the mold for forming the reflecting portion.

[0023] In the embodiments of the present disclosure, there are provided a lighting device for a motor vehicle and a manufacturing method of a lighting device for a motor vehicle, in which the reflecting portion and the lens supporting portion are formed in one piece. It can be seen that it structurally saves one component and saves an assembling process for the reflective plate, therefore, the technical solutions of the present disclosure have relatively low manufacturing cost and assembling cost. Moreover, the reflecting portion is manufactured using an aluminizing process. In this way, it saves material cost compared to the usage of pure metal materials in the prior art. Furthermore, since no assembling processes for the reflective plate are required, the reflecting portion may be accurately positioned with small optical error. In addition, there are no connecting members between the reflecting portion and the lens supporting portion, it avoids the effect of the connecting member on the optical path, and the light loss and the uneven light emission are reduced or eliminated, thereby the lighting device has improved lighting quality.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

Fig. 1 is a schematic view of a conventional lighting device having a low beam lighting module in the prior art;
Fig. 2 is an exploded view of a lighting device for a motor vehicle according to an embodiment of the present disclosure; and
Fig. 3 is an enlarged view of a supporting and reflecting assembly of the lighting device in Fig. 2.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0025] Exemplary embodiments of the present disclosure will be described in detail below with reference to the accompanying drawings in which the same or similar reference numerals represent the same or similar elements. In addition, in the following detailed description, numerous specific details are set forth in order to facilitate the explanation and provide a thorough understanding of the embodiments of the present disclosure. However, it will be apparent that the embodiment(s) may also be practiced without these specific details. In other cases, well-known structures and devices are schematically illustrated to simplify the drawings.

[0026] According to a general inventive concept of the present disclosure, there is provided a lighting device for a motor vehicle, comprising a light source assembly, an optical deviation means and an optical lens, wherein the lighting device further comprises a supporting and reflecting assembly configured to be in one piece.

[0027] Fig. 2 is an exploded view of a lighting device for a motor vehicle according to an embodiment of the present disclosure; Fig. 3 is an enlarged view of a supporting and reflecting assembly of the lighting device in Fig. 2. As shown in Figs. 2 and 3, the lighting device for the motor vehicle includes a light source assembly 1, an optical deviation means 2, a supporting and reflecting assembly 6 and an optical lens 4. The supporting and reflecting assembly 6 comprises a lens supporting portion 61 and a reflecting portion 62. The lens supporting portion 61 and the reflecting portion 62 are configured to be in one piece, as shown in Fig. 3. The light source assembly 1 is configured for emitting light rays. The light rays are deflected by the optical deviation means (reflector) 2, then a cut-off is formed by the reflecting portion 62, and a portion of light rays are reflected and redistributed by the reflecting portion 62 and are emitted through the optical lens 4.

[0028] According to an embodiment of the present disclosure, the reflecting portion 62 is constructed as an aluminized layer formed on at least one portion of the lens supporting portion 61 by an aluminizing process. As shown in Fig. 3, the aluminized layer is formed on a supporting surface of the lens supporting portion 61. In a non-limiting manner, the aluminized layer may totally cover the lens supporting portion 61, or alternatively, the aluminized layer may partially cover the lens supporting portion 61. The reflecting portion 62 is configured for redistributing the light rays deflected by the optical deviation means 2 and producing a necessary lighting cut-off. The reflecting portion 62 further includes a step 63 for generating a folding effect of light rays. In order to satisfy

the optical performances of the lighting device, preferably, the reflectivity of the reflecting portion 62 is set to be greater than 85%.

[0029] In the present disclosure, the lens supporting portion and the reflecting portion are constructed in one piece. It can be seen that it structurally saves one component and saves an assembling process for the reflective plate, therefore, the technical solutions of the present disclosure have relatively low manufacturing cost and assembling cost. Moreover, the reflecting portion is manufactured using an aluminizing process. In this way, it saves material cost compared to the usage of pure metal materials in the prior art. Furthermore, since no assembling processes for the reflective plate are required, the reflecting portion may be accurately positioned with small optical error. In addition, there are no connecting members between the reflecting portion and the lens supporting portion, it avoids the effect of the connecting member on the optical path, and the light loss and the uneven light emission are reduced or eliminated, thereby the lighting device has improved lighting quality.

[0030] According to an embodiment of the present disclosure, the light source assembly 1 includes a light source 11, a printed circuit board 12 and a heatsink 13, wherein the light source assembly 1 may include one or more light sources 11, the one or more light sources 11 are provided on the printed circuit board 12 and/or electrically connected to the printed circuit board 12. The optical deviation means 2 is configured for deflecting the light emitted by the light source assembly 1. The optical lens 4 is formed in front of the light source assembly 1 and configured to receive the light deflected by the optical deviation means 2. Optionally, the light source 11 is a tungsten lamp, a halogen lamp, a xenon lamp, a cold cathode fluorescent tube or an LED lamp.

[0031] In an assembling process of the lighting device, the light source assembly 1 is firstly assembled on the supporting and reflecting assembly 6, and the supporting and reflecting assembly 6 and the optical deviation means 2 are fixed to a substrate of the lighting device, then the optical lens 4 is mounted and fixed to the supporting and reflecting assembly 6. The light rays emitted from the light source 11 are reflected by the optical deviation means 2 toward the front of the motor vehicle, and then are redistributed by the reflecting portion 62, and then are emitted out of the optical lens 4.

[0032] In the present disclosure, there is further provided a manufacturing method of a lighting device for a motor vehicle, the lighting device comprising a light source assembly 1, an optical deviation means 2 and an optical lens 4, wherein the lighting device further comprises a supporting and reflecting assembly 6, and the method comprises steps of: forming the light source assembly 1, the optical deviation means 2 and the optical lens 4; forming the supporting and reflecting assembly 6 in one piece; and assembling the light source assembly 1, the optical deviation means 2, the optical lens 4 and the supporting and reflecting assembly 6 together to form the lighting device.

[0033] As described above, the supporting and reflecting assembly 6 comprises a lens supporting portion 61 and a reflecting portion 62, and the step of forming the supporting and reflecting assembly 6 in one piece comprises steps of: providing a mold for forming the lens supporting portion 61; molding the lens supporting portion 61 with the mold; and forming the reflecting portion 62 on the molded lens supporting portion 61 integrally. Preferably, the reflecting portion 62 is formed on at least one portion of the molded lens supporting portion 61 by an aluminizing process, thus the reflecting portion 62 is an aluminized layer. As shown in Fig. 3, the aluminized layer is formed on a supporting surface of the lens supporting portion 61. In a non-limiting manner, the aluminized layer may totally cover the lens supporting portion 61, or alternatively, the aluminized layer may partially cover the lens supporting portion 61. The reflecting portion 62 is configured for redistributing the light rays deflected by the optical deviation means 2 and producing a necessary lighting cut-off. The reflecting portion 62 further includes a step 63 for generating a folding effect of light rays. Accordingly, a structure for forming the step 63 of the reflecting portion 62 is formed on the mold. In order to satisfy the optical performances of the lighting device, preferably, the aluminizing process is controlled so that the reflectivity of the formed reflecting portion 62 is greater than 85%.

[0034] In the manufacturing method of the lighting device according to the present disclosure, the lens supporting portion and the reflecting portion are constructed in one piece. It can be seen that it structurally saves one component and saves an assembling process for the reflective plate, therefore, the technical solutions of the present disclosure have relatively low manufacturing cost and assembling cost. Moreover, the reflecting portion is manufactured using an aluminizing process. In this way, it saves material cost compared to the usage of pure metal materials in the prior art. Furthermore, since no assembling processes for the reflective plate are required, the reflecting portion may be accurately positioned with small optical error. In addition, there are no connecting members between the reflecting portion and the lens supporting portion, it avoids the effect of the connecting member on the optical path, and the light loss and the uneven light emission are reduced or eliminated, thereby the lighting device has improved lighting quality.

[0035] Next, an obtaining process of the lighting device for the motor vehicle will be described in detail. Firstly, a mold for forming a lens supporting portion is provided, a structure corresponding to the step of the reflecting portion is machined on the mold, and a portion of the mold for forming the reflecting portion is polished to form a high-gloss face, so as to satisfy the requirements on straightness and profile of the reflecting portion. Secondly, the lens supporting portion is formed with the mold by an injection molding process. Thirdly, a selected portion of the lens supporting portion is aluminized to form the

reflecting portion, and the aluminizing process is controlled to ensure that the reflectivity of the formed reflecting portion is greater than 85%, thereby the integrally formed supporting and reflecting assembly is obtained. Finally, the light source assembly, the optical deviation means, the supporting and reflecting assembly and the optical lens of the lighting device are assembled together to obtain the lighting device.

[0036] While the embodiments of the present disclosure have been shown and described, variations and modifications may be made to these embodiments by those skilled in the art without departing from the principles and spirit of the present disclosure. The scope of the present disclosure is defined by the appended claims and equivalents thereof.

Reference numeral list

[0037]

1	light source assembly
2	optical deviation means
3	reflective plate
4	optical lens
6	supporting and reflecting assembly
11	light source
12	printed circuit board
13	heatsink
61	lens supporting portion
62	reflecting portion
63	step

Claims

1. A lighting device for a motor vehicle, comprising a light source assembly (1), an optical deviation means (2) and an optical lens (4), wherein the lighting device further comprises a supporting and reflecting assembly (6) configured to be in one piece.

2. The lighting device according to claim 1, wherein the supporting and reflecting assembly (6) comprises a lens supporting portion (61) and a reflecting portion (62).

3. The lighting device according to claim 2, wherein the reflecting portion (62) is an aluminized layer formed on at least one portion of the lens supporting portion (61).

4. The lighting device according to any one of claims 2-3, wherein the reflecting portion (62) comprises a step (63).

5. The lighting device according to any one of claims 2-3, wherein the reflectivity of the reflecting portion (62) is greater than 85%.

6. The lighting device according to any one of claims 2-3, wherein the reflecting portion (62) is configured to form a low beam cut-off or improve optical efficiency of a high beam.

7. The lighting device according to any one of claims 2-3, wherein the light source assembly (1) comprises a light source (11), a printed circuit board (12) and a heatsink (13).

8. A manufacturing method of a lighting device for a motor vehicle, the lighting device comprising a light source assembly (1), an optical deviation means (2) and an optical lens (4), wherein the lighting device further comprises a supporting and reflecting assembly (6), and the method comprises steps of:

forming the light source assembly (1), the optical deviation means (2) and the optical lens (4);
forming the supporting and reflecting assembly (6) in one piece; and
assembling the light source assembly (1), the optical deviation means (2), the optical lens (4) and the supporting and reflecting assembly (6) together to form the lighting device.

9. The method according to claim 8, wherein the supporting and reflecting assembly (6) comprises a lens supporting portion (61) and a reflecting portion (62), and the step of forming the supporting and reflecting assembly (6) in one piece comprises steps of:

providing a mold for forming the lens supporting portion (61);
molding the lens supporting portion (61) with the mold; and
forming the reflecting portion (62) on the molded lens supporting portion (61) integrally.

10. The method according to claim 9, wherein the reflecting portion (62) is formed on at least one portion of the molded lens supporting portion (61) by an aluminizing process.

11. The method according to any one of claims 9-10, wherein the reflecting portion (62) comprises a step (63), and a structure for forming the step (63) of the reflecting portion (62) is formed on the mold.

12. The method according to claim 10, wherein the aluminizing process is controlled so that the reflectivity of the formed reflecting portion (62) is greater than 85%.

13. The method according to any one of claims 9-10, wherein the reflecting portion (62) is configured to form a low beam cut-off or improve optical efficiency of a high beam.

14. The method according to any one of claims 9-10, further comprising: polishing a portion of the mold for forming the reflecting portion (62).

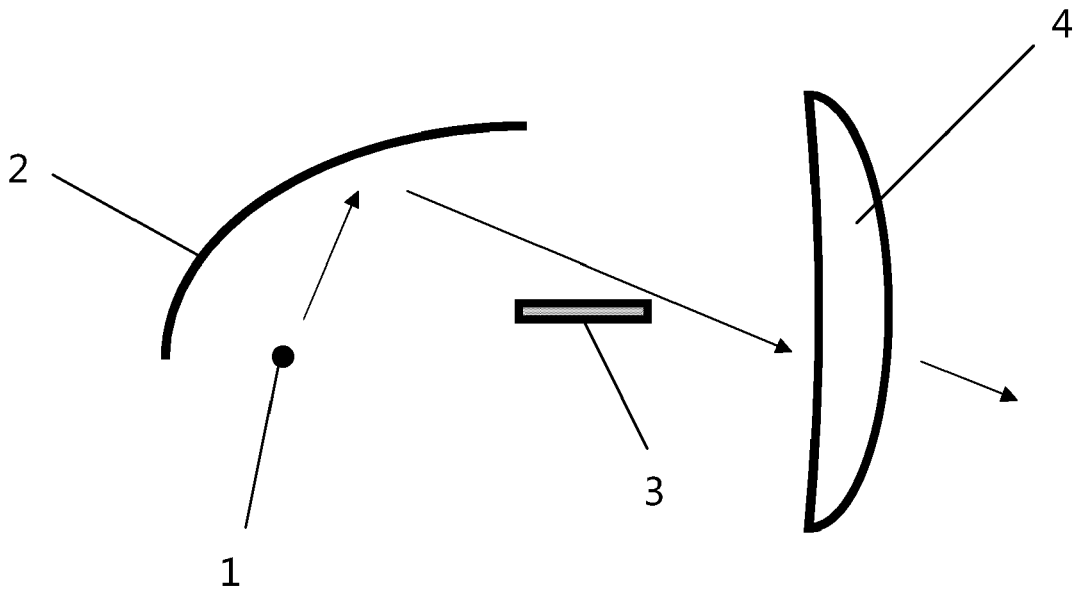

Fig. 1

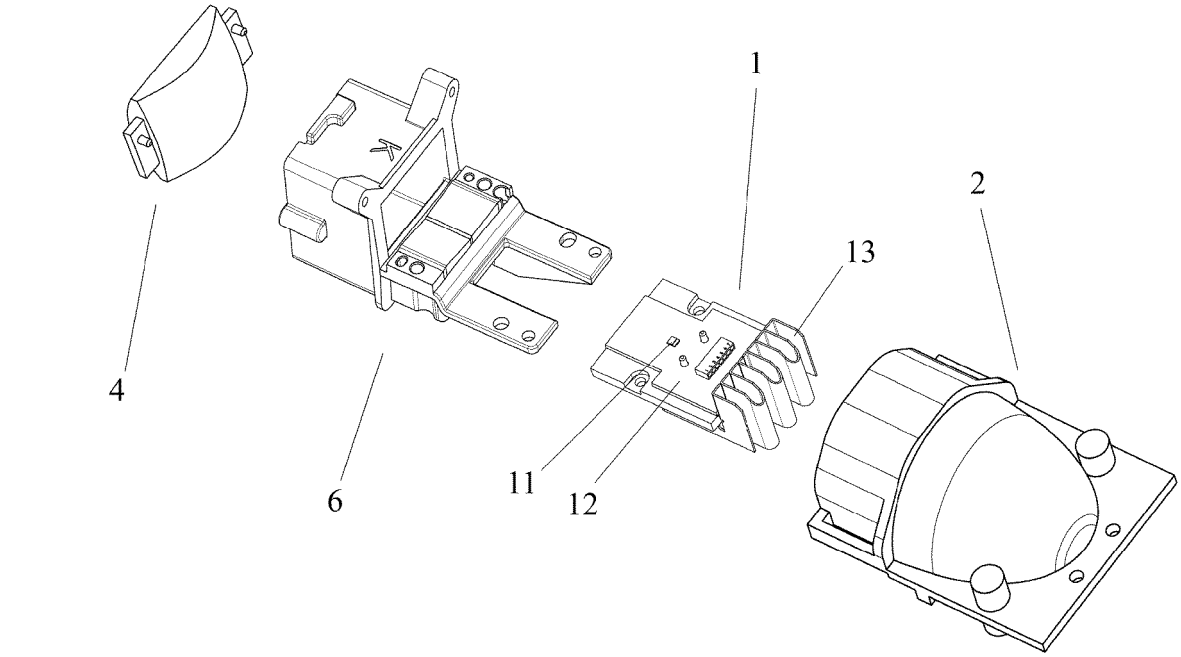

Fig. 2

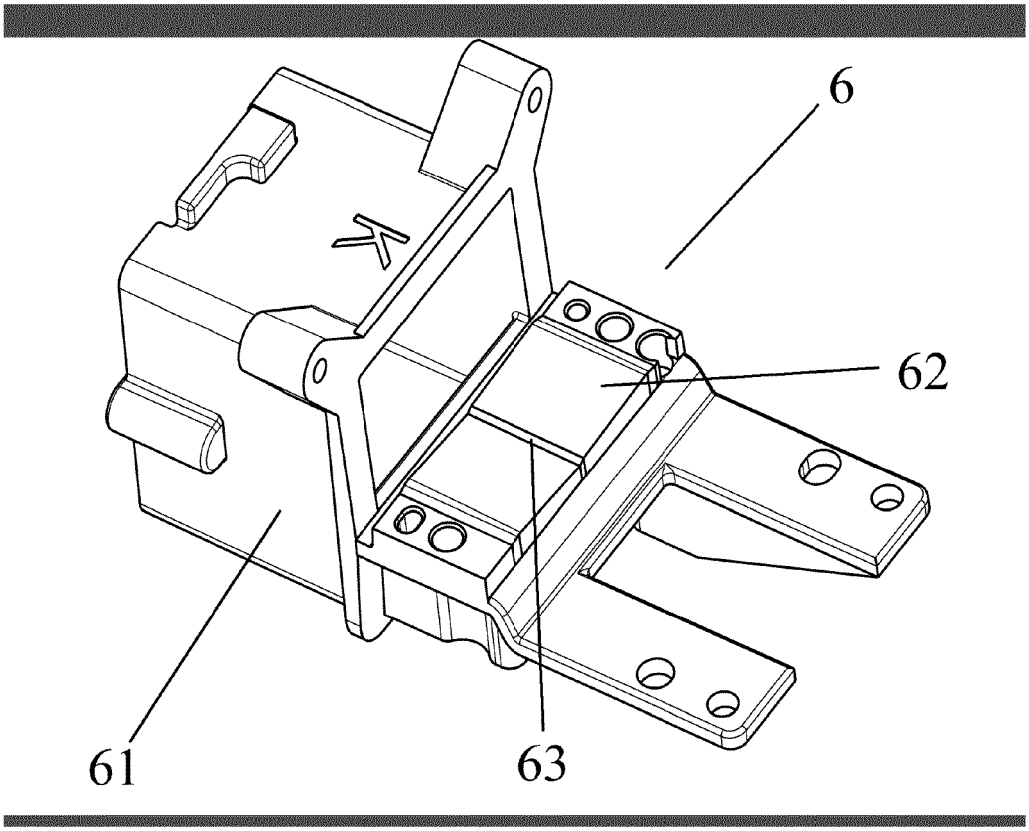

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 17 18 8779

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