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(54) **Automotive headlamp**

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a headlamp of a vehicle, and more particularly, to an automotive headlamp which is structured in a simple manner to secure a sufficient amount of light, emit light in different/various beam patterns, and improve heat dissipation efficiency.

2. Description of the Related Art

[0002] Vehicles are typically equipped with various automotive lamps having a lighting function and a signaling function, among others. That is, automotive lamps enable the driver of the vehicle to easily detect objects around and ahead of the vehicle while driving at night or in a dark area. They also inform other vehicles and road users of the vehicle's driving state. For example, a headlamp and a fog lamp are designed for providing light, and a direction indicator, a taillight, a brake light, and a side marker are designed for signaling.

[0003] Recently, many automotive lamp manufactures have begun to use halogen lamps or high-intensity discharge (HID) lamps as light sources. Additionally, light-emitting diodes (LEDs) have been used as light sources as well. LEDs have a color temperature of approximately 5500 K which is close to that of sunlight. Thus, LEDs cause the least eye fatigue. In addition, LEDs increase the freedom of lamp design due to their small size and are economical due to their semi-permanent lifespan.

[0004] LEDs, in particular, are being introduced to reduce lamp configuration complications and decrease the number of manufacturing processes required to produce a headlamp. In particular, attempts are being made to extend lamp life using characteristics of LEDs. Furthermore, since limited space is not an issue due to the small size of the LEDs, they may be utilized in a plethora of applications.

[0005] Of the various types of automotive lamps, a headlamps use more than one beam pattern unlike other types of lamps which typically use only one. For example, the headlamp may emit light in a beam pattern optimum for driving conditions of the vehicle such as travelling speed, travelling direction, road surface conditions, and ambient brightness. In so doing, the headlamp may ensure driver visibility without blinding other vehicle drivers on the road. Generally, one or more LEDs are used to emit light in each beam pattern while securing a sufficient amount of light. However, to emit light in different beam patterns, elements corresponding to each beam pattern are required.

[0006] Accordingly, this increases the number of parts, costs and space required. In addition, when LEDs are used as light sources of automotive lamps, the light emission efficiency of the LEDs rapidly deteriorate as the tem-

perature rises.

[0007] EP 2 366 941 A2 discloses a lighting module with two reflectors having different focal lengths. The module has a support for a light source, emitting light rays in a half space defined by a plane passing through the support. The light source is positioned at a level of a focal point. A first reflector reflects the light rays that are emitted by the light source in a lighting beam and crossed by the light source. A second reflector comprises a free edge that defines a reflective surface. The first reflector collects the rays emitted by the light source passing the edge.

[0008] EP2336634A1 discloses that a vehicle headlamp includes a first light source configured to emit first light that is projected to form a first irradiation region, a second light source configured to emit second light that is projected to form a second irradiation region joined to the first irradiation region to extend in a transverse direction with respect to an optical axis, a movable shade configured to move between a position at which light irradiation to a joined region of the first irradiation region and the second irradiation region is shielded, and a position at which the light irradiation to the joined region is permitted, and a controller configured to select one of light distribution patterns that are determined by combinations of turning on and off of the first light source, turning on and off of the second light source, and the positions of the movable shade.

[0009] Therefore, a solution that can emit light in various beam patterns, secure a sufficient amount of light, and prevent a temperature rise due to heat emitted from LEDs while reducing the number of parts, costs and space required to emit light in different beam patterns is required.

SUMMARY OF THE INVENTION

[0010] Aspects of the present invention provide an automotive headlamp in which a plurality of lamp modules, which use light-emitting diodes (LEDs) for emitting light in different beam patterns as light sources, are placed in different directions from an optical axis of the automotive headlamp to minimize the space required and emit light in various beam patterns

and in which a lamp module for emitting light in a predetermined beam pattern consists of a plurality of lamp modules to secure a sufficient amount of light.

[0011] Aspects of the present invention also provide an automotive headlamp in which heat sinks are installed to efficiently prevent a temperature rise due to heat emitted from LEDs.

[0012] However, aspects of the present invention are not restricted to the one set forth herein. The above and other aspects of the present invention will become more apparent

to one of ordinary skill in the art to which the present invention pertains by referencing the detailed description of the present invention given below.

[0013] According to the present invention, there is provided an automotive headlamp according to the features of claim 1.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The above and other aspects and features of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the attached drawings, in which:

FIG. 1 is a perspective view of an automotive headlamp according to a first exemplary embodiment of the present invention;

FIG. 2 is a schematic front view of a first lamp module and a second lamp module according to the first exemplary embodiment of the present invention;

FIG. 3 is a perspective view of an automotive headlamp according to a second exemplary embodiment of the present invention;

FIG. 4 is a schematic front view of a first lamp module and a second lamp module according to the second exemplary embodiment of the present invention;

FIG. 5 is a schematic diagram illustrating the direction in which light travels in the automotive headlamp of FIGS. 1 and 2;

FIGS. 6 and 7 are schematic views of heat sinks according to the first exemplary embodiment of the present invention;

FIG. 8 is a schematic view of heat pads according to an exemplary embodiment of the present invention;

FIG. 9 is a schematic view of heat sinks according to the second exemplary embodiment of the present invention;

FIGS. 10 and 11 are perspective views of an assembled automotive headlamp according to an exemplary embodiment of the present invention;

FIG. 12 is a plan view of the assembled automotive headlamp shown in FIGS. 10 and 11; and

FIG. 13 is a base view of the assembled automotive headlamp shown in FIGS. 10 and 11.

DETAILED DESCRIPTION OF THE INVENTION

[0015] Advantages and features of the present invention and methods of accomplishing the same may be understood more readily by reference to the following

detailed description of exemplary embodiments and the accompanying drawings. The present invention may, however, be embodied in many different forms and should not be construed as being limited to the exemplary embodiments set forth herein. Rather, these exemplary embodiments are provided so that this disclosure will be thorough and complete and will fully convey the concept of the invention to those skilled in the art, and the present invention will only be defined by the appended claims. Like reference numerals refer to like elements throughout the specification.

[0016] In some embodiments, well-known manufacturing processes, well-known structures and well-known technologies will not be specifically described in order to avoid ambiguous interpretation of the present invention.

[0017] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated elements, steps, and/or operations, but do not preclude the presence or addition of one or more other elements, steps, operations, and/or groups thereof. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0018] Embodiments of the invention are described herein with reference to perspective, cross-sectional, side, and/or schematic illustrations that are illustrations of idealized embodiments of the invention. As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. Thus, embodiments of the invention should not be construed as limited to the particular shapes of regions illustrated herein but are to include deviations in shapes that result, for example, from manufacturing. In the drawings, each element may be exaggerated or reduced for clarity.

[0019] Automotive headlamps according to embodiments of the present invention will now be described with reference to the attached drawings.

[0020] FIG. 1 is a perspective view of an automotive headlamp 1 according to a first exemplary embodiment of the present invention. FIG. 2 is a schematic front view of a first lamp module 100 and a second lamp module 200 according to the first exemplary embodiment of the present invention.

[0021] Referring to FIGS. 1 and 2, the automotive headlamp 1 according to the first exemplary embodiment may include the first lamp module 100, the second lamp module 200, a shield 300, and a projection lens 400. In the first embodiment of the present invention, the first lamp module 100 and the second lamp module 200 are disposed in different directions from an optical axis C of the projection lens 400 and used/configured to emit light in different beam patterns. In the first embodiment of the

present invention, the first lamp module 100 are disposed above the optical axis C and used to emit light in a low-beam pattern, and the second lamp module 200 are disposed below the optical axis C and used to emit light in a high-beam pattern.

[0022] In addition, the first lamp module 100 and the second lamp module 200 are used in the first embodiment of the present invention. However, the present invention is not limited thereto, and a lamp module can be added or removed according to beam patterns used.

[0023] The first lamp module 100 may include a first light source unit 110 which emits light downward and a first reflector 120 which reflects light emitted from the first light source unit 110 so that the light is directed toward a lower part of the projection lens 400. The first light source unit 110 may include a light source 111 and a substrate 112 on which the light source 111 is installed. The light source 111 is installed on a bottom surface of the substrate 112 to emit light downward. The first reflector 120 is disposed under the first light source unit 110 to reflect light emitted from the first light source unit 110 and may be shaped in the form of an oval or free curved surface having an open surface.

[0024] The second lamp module 200 may include a second light source unit 201 which emits light downward and a second reflector 202 which reflects light emitted from the second light source 201 such that the light travels toward an upper part of the projection lens 400. Like the first light source unit 110, the second light source unit 201 may include a light source 201a and a substrate 201b on which the light source 201a is installed. The light source 201a is installed on a bottom surface of the substrate 201b to emit light downward. Also like the first reflector 120, the second reflector 202 is disposed under the second light source unit 201 to reflect light emitted from the second light source unit 201 and may be shaped like an oval or free curved surface having an open surface.

[0025] In the first embodiment of the present invention, the light source 111 of the first light source unit 110 and the light source 201a of the second light source unit 201 may be, but are not limited to, light-emitting diodes (LEDs). In addition, the first reflector 120 and the second reflector 202 may be physically connected to each other or separated from each other. When the first reflector 120 and the second reflector 202 are disposed under the first light source unit 110 and the second light source unit 201, respectively, the entire first reflector 120 and the entire second reflector 202 may be disposed under the first light source unit 110 and the second light source unit 201, respectively, or part of the first reflector 120 and part of the second reflector 202 may be disposed under the first light source unit 110 and the second light source unit 201, respectively.

[0026] In the first embodiment of the present invention, light emitted from the first lamp module 100 may travel toward the lower part of the projection lens 400, and light emitted from the second lamp module 200 may travel

toward the upper part of the projection lens 400. To this end, the first reflector 120 may reflect the light emitted from the first lamp module 100 toward the lower part of the projection lens 400, and the second reflector 202 may reflect the light emitted from the second lamp module 200 toward the upper part of the projection lens 400. In addition, each of the first lamp module 100 and the second lamp module 200 may be placed at a predetermined angle to the optical axis C.

[0027] The shield 300 may be disposed in front of the first lamp module 100 and the second lamp module 200. The shield 300 may form a predetermined cut-offline by blocking part of light emitted from one or more of the first lamp module 100 and the second lamp module 200. The shield 300 may be shaped like a plate having a semicircular groove 310 at a side thereof. The shape of the groove 310 can vary, however, and is not limited to the illustrative embodiment of the present invention.

[0028] In the first exemplary embodiment of the present invention, the shield 300 may block or reflect part of light emitted from the first lamp module 100 in order to project the light in the low-beam pattern. To reflect part of light, a surface of the shield 300 may be coated with a reflective layer.

[0029] In FIGS. 1 and 2 described above, one lamp module is disposed above and below the optical axis C. However, this is merely an example used to help understand the present invention, and the present invention is not limited to this example. One or more of the first lamp module 100 and the second lamp module 200 may also consist of a plurality of lamp modules arranged in a particular direction.

[0030] FIG. 3 is a perspective view of an automotive headlamp 1 according to a second exemplary embodiment of the present invention. FIG. 4 is a schematic front view of a first lamp module 100 and a second lamp module 200 according to the second embodiment of the present invention. In FIGS. 3 and 4, the second lamp module 200 consists of a plurality of lamp modules. Referring to FIGS. 3 and 4, unlike the above-described automotive headlamp 1 of FIGS. 1 and 2, the automotive headlamp 1 according to the second embodiment of the present invention may include the second lamp module 200 which consists of a lamp module 210 and a lamp module 220 respectively disposed on both sides of an optical axis C. In the second embodiment of the present invention, the second lamp module 200 consists of two lamp modules. However, the number of lamp modules that constitute the second lamp module 200 can vary, and thus should not be limited hereto.

[0031] The first lamp module 100, a shield 300, and a projection lens 400 of FIGS. 3 and 4 are identical to those described above with reference to FIGS. 1 and 2, and thus a detailed description thereof will be omitted.

[0032] In the second embodiment of the present invention, the lamp module 210 and the lamp module 220 are respectively disposed on both sides of the optical axis C in an orientation which is horizontal to each other. How-

ever, the present invention is not limited thereto.

[0033] The lamp module 210 may include a light source unit 211 and a reflector 212, and the lamp module 220 may include a light source unit 221 and a reflector 222. The light source unit 211 and the light source unit 221 may include light sources 211a and 221a and substrates 211b and 221b on which the light sources 211a and 221a are installed, respectively. The light sources 211a and 221a may be disposed on bottom surfaces of the substrates 211b and 221b to emit light downward.

[0034] As in FIGS. 1 and 2, in FIGS. 3 and 4, the light source 211a of the light source unit 211 and the light source 221a of the light source unit 221 may be LEDs. The reflector 212 is disposed under the light source unit 211 to reflect light emitted from the light source unit 211, and the reflector 222 is disposed under the light source unit 221 to reflect light emitted from the light source unit 221. If the reflector 212 and the reflector 222 are disposed under the light source unit 211 and the light source unit 221, respectively, the whole of the reflector 212 and the whole of the reflector 222 may be disposed under the light source unit 211 and the light source unit 221, respectively, or part of the reflector 212 and part of the reflector 222 may be disposed under the light source unit 211 and the light source unit 221, respectively.

[0035] The reflector 212 and the reflector 222 may be physically connected to each other or independently attached. The light source unit 211 and the light source unit 221 may be situated at first focal points of the reflector 212 and the reflector 222, respectively. The reflector 212 and the reflector 222 may have identical or different second focal points behind the projection lens 400. If the second lamp module 200 consists of a plurality of lamp modules arranged in a particular direction as described above, a sufficient amount of light can be secured with relatively low power consumption.

[0036] FIG. 5 is a schematic diagram illustrating the direction in which light travels in the automotive headlamp 1 of FIGS. 1 and 2. The principle illustrated in FIG. 5 can also apply to the automotive headlamp 1 of FIGS. 3 and 4. Referring to FIG. 5, the first lamp module 100 is disposed above the optical axis C, and the second lamp module 200 may be disposed below the optical axis C. The shield 300 is disposed in front of the first lamp module 100 and the second lamp module 200.

[0037] The first light source unit 110 of the first lamp module 100 and the second light source unit 201 of the second lamp module 200 emit light downward. The light emitted from the first light source unit 110 and the light emitted from the second light source unit 201 may be reflected respectively by the first reflector 120 and the second reflector 202 to reach the projection lens 400 via the shield 300, as indicated by arrows in FIG. 5.

[0038] In FIG. 5, light is passing through the groove 310 of the shield 300 to reach the projection lens 400 is illustrated as an example. However, the present invention is not limited to this case. Part of the light can also be blocked or reflected by a surface of the shield 300 which

does not have the groove 310.

[0039] In the above-described embodiments of the present invention, LEDs are used as light sources. However, since LEDs are vulnerable to heat, their performance may deteriorate when the LEDs are exposed to heat. Therefore, heat sinks may be used to prevent a temperature increase due to heat emitted from the LEDs.

[0040] FIGS. 6 and 7 are schematic views of heat sinks 500 installed on lamp modules according to the first exemplary embodiment of the present invention. In FIGS. 6 and 7, an example heat sink 500 installed on each lamp module of the automotive headlamp 1 of FIGS. 1 and 2 is illustrated. Referring to FIGS. 6 and 7, the first lamp module 100 and the second lamp module 200 is disposed above and below the optical axis C of the projection lens 400. In this case, the heat sinks 500 are installed on the first lamp module 100 and the second lamp module 200, respectively.

[0041] Specifically, in the first embodiment of the present invention, the first reflector 120 is disposed under the first light source unit 110 in the first lamp module 100, and the second reflector 202 is disposed under the second light source unit 201 in the second lamp module 200. Therefore, the heat sinks 500 are installed on the first light source unit 110 and the second light source unit 201, respectively. That is, the heat sinks 500 are installed on a top surface of the substrate 112 of the first light source unit 110 and a top surface of the substrate 201b of the second light source unit 201, respectively.

[0042] Each substrate 112 of the first light source unit 110 and substrate 201b of the second light source unit 201 may extend in one direction along the length of a corresponding heat sink 500. For this reason, a relatively large-sized heat sink 500 can be installed. In addition, the shape of the substrate 112 of the first light source unit 110 and the shape of the substrate 201b of the second light source unit 201 can vary according to the shape of a corresponding heat sink 500.

[0043] In FIGS. 6 and 7, the heat sinks 500 are installed on the first light source unit 110 and the second light source unit 201 in order to efficiently dissipate heat. That is, since heat is concentrated in upper parts of the first lamp module 100 and the second lamp module 200 due to natural convection, the heat sinks 500 may be installed on the first light source unit 110 and the second light source unit 201, respectively. Heat pads 510 may also be formed between the substrates 112 and 201b and the heat sinks 500 as shown in FIG. 8 to make contact surfaces between the substrates 112 and 201b and the heat sinks 500 level and increase heat transfer efficiency accordingly.

[0044] In the first exemplary embodiment of the present invention, each of the heat sinks 500 includes a plurality of heat dissipating pins which extend upward from above a corresponding light source unit 110 or 201. However, this is merely an example used to help understand the present invention, and the present invention is not limited to this example. Each of the heat sinks 500

may also be a heat pipe or a heat spreader. For example, a side of the heat spreader may be bent in order to increase heat transfer area.

[0045] FIG. 9 is a schematic view of heat sinks 500 installed on lamp modules according to the second embodiment of the present invention. In FIG. 9, an example heat sink 500 installed on each lamp module of the automotive headlamp 1 of FIGS. 3 and 4 is illustrated. Referring to FIG. 9, the first lamp module 100 is installed above the optical axis C of the projection lens 400, and the lamp module 210 and the lamp module 220 that constitute the second lamp module 200 is disposed below the optical axis C to be horizontal to each other. In this case, the heat sinks 500 are disposed on the lamp modules 100, 210, and 220, respectively.

[0046] Specifically, in the second embodiment of the present invention, the first reflector 120 is disposed under the first light source unit 110 in the first lamp module 100, and the reflector 212 and the reflector 222 are disposed under the light source unit 211 and the light source unit 221 in the lamp module 210 and the lamp module 220, respectively. Therefore, the heat sinks 500 are disposed on the first light source unit 110, the light source unit 211 and the light source unit 221, respectively. That is, the heat sinks 500 are installed on a top surface of the substrate 112 of the first light source unit 110 and top surfaces of the substrates 211b and 221b of the light source unit 211 and the light source unit 221, respectively.

[0047] In the second exemplary embodiment of the present invention, a single heat sink 500 may extend over the top surfaces of the light source unit 211 and the light source unit 221. However, the present invention is not limited thereto. Separate heat sinks 500 can also be installed on the top surfaces of the substrates 211b and 221b of the light source unit 211 and the light source unit 221, respectively.

[0048] The substrate 112 of the first light source unit 110 and the substrates 211b and 221b of the light source unit 211 and the light source unit 221 may extend in one direction along the length of a corresponding heat sink 500. For this reason, a relatively large-sized heat sink 500 can be installed. In addition, the shape of the substrate 112 of the first light source unit 110 and the shapes of the substrates 211b and 221b of the light source unit 211 and the light source unit 221 can vary according to the shape of a corresponding heat sink 500.

[0049] In FIG. 9, the heat sink 500 is installed on each light source unit 110, 211 or 221 to provide efficient heat dissipation. That is, since heat is concentrated in an upper part of each lamp module 100, 210 or 220 due to natural convection, the heat sink 500 may be installed on each light source unit 110, 211 or 221 accordingly to dissipate this heat. Although not shown in FIG. 9, heat pads may also be formed between the substrates 112, 211b and 221b and the heat sinks 500 as shown in FIG. 8 to make contact surfaces between the substrates 112, 211b and 221b and the heat sinks 500 level and increase heat transfer efficiency.

[0050] FIGS. 10 and 11 are perspective views of an assembled automotive headlamp 1 according to an embodiment of the present invention. FIG. 12 is a plan view of the assembled automotive headlamp 1 shown in FIGS. 10 and 11. FIG. 13 is a base view of the assembled automotive headlamp 1 shown in FIGS. 10 and 11. In FIGS. 10 through 13, the assembled structure of the automotive headlamp 1 of FIGS. 3, 4 and 9 is illustrated as an example. The same structure may also apply to the automotive headlamp 1 of FIGS. 1 and 2. For simplicity, reference numerals for some elements are omitted. However, elements substantially identical to those of FIGS. 3, 4 and 9 are indicated by like reference numerals.

[0051] Referring to FIGS. 10 through 13, in the automotive headlamp 1 according to the current embodiment, a first lamp module 100 is installed above an optical axis C of a projection lens 400, and a second lamp module 200 is installed below the optical axis C. In addition, a lamp module 210 and a lamp module 220 of a second lamp module 200 may be disposed in a horizontal orientation to each other.

[0052] In the first lamp module 100, a first light source unit 110 is formed on a bottom surface of a heat sink 500, and a first reflector 120 may be coupled to the heat sink 500 by first coupling members 710 (e.g., first set of screws). In addition, in the lamp module 210 and the lamp module 220, a light source unit 211 and a light source unit 221 is formed on a bottom surface of a heat sink 500, and a reflector 212 and a reflector 222 may be coupled to the heat sink 500 by second coupling members 720 (e.g., a second set of screws).

[0053] In addition, at least one of the heat sinks 500 installed on the first lamp module 100, the lamp module 210 and the lamp module 220 may be integrally connected to a lens holder 410 which supports the projection lens 400 by connecting portions 600. In the current embodiment of the present invention, the heat sink 500 installed on the lamp module 210 and the lamp module 220 may be connected to the lens holder 410 by the connecting portions 600. In the current embodiment of the present invention, the lens holder 410 is connected to at least one of the heat sinks 500 installed on the first lamp module 100, the lamp module 210 and the lamp module 220. However, the present invention is not limited thereto. The lens holder 410 can also be connected to any one of the elements included in each lamp module 100, 210 or 220.

[0054] A shield 300 may include an extension portion 320 formed by extending a front end of the shield 300 located near a focus behind the projection lens 400 backward. In the exemplary embodiment of the present invention, the extension portion 320 may be mounted on the connecting portions 600. In addition, the front end of the shield 300 may be curved so that it is gradually displaced toward both sides of the projection lens 400 along a focal plane behind the projection lens 400.

[0055] Coupling portions 130 may be formed on one side of the heat sink 500 installed on the first lamp module

100 and may be coupled to a surface of the extension portion 320 which extends backward from the shield 300. Coupling members 131 (e.g., a third set of screws) may be inserted into the coupling portions 130, thereby coupling the coupling portions 130, the extension portion 320 and the connecting portions 600 to each other. In the embodiment of the present invention, the extension portion 320 and the coupling portions 130 are flat plate-shaped portions, and a surface of the extension portion 320 is coupled to respective surfaces of the coupling portions 130 by the coupling members 131. However, the present invention is not limited thereto, and the extension portion 320 and the coupling portions 130 can also be coupled to each other using various coupling methods such as hook coupling and sliding coupling.

[0056] In the current embodiment of the present invention, the heat sink 500 installed on the first lamp module 100 is coupled to a surface of the extension portion 320. However, this is merely an example used to help understand the present invention, and the present invention is not limited to this example. At least one of the heat sinks 500 formed on the first lamp module 100 and the lamp module 210 and the lamp module 220 may be coupled to a surface of the extension portion 320 of the shield 300 according to the position or direction of the extension portion 320 which extends from the shield 300.

[0057] Advantageously, the above described lamp modules which use LEDs as light sources are placed in different directions from an optical axis of the headlamp, and the other elements are placed so that they can be shared by the lamp modules. Therefore, the space required can be minimized while light can be emitted in various beam patterns. In addition, since a plurality of lamp modules are installed in a predetermined direction from the optical axis of the headlamp, a sufficient amount of light can be secured. Furthermore, heat sinks are installed on top surfaces of the light source units to efficiently prevent a temperature increases due to heat emitted from the LEDs.

[0058] However, the effects of the present invention are not restricted to the one set forth herein. The above and other effects of the present invention will become more apparent to one of daily skill in the art to which the present invention pertains by referencing the claims.

[0059] While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the present invention as defined by the following claims. The exemplary embodiments should be considered in a descriptive sense only and not for purposes of limitation. The scope of the present invention is defined by the following claims, rather than by the above-described detailed description.

Claims

1. An automotive headlamp comprising:

5 a plurality of lamp modules (100, 200) disposed in different directions from an optical axis (C) of the automotive headlamp;
a projection lens (400) projecting light emitted from one or more of the lamp modules (100, 200), wherein each of the lamp modules (100, 200) includes:

10 a light source unit (110, 201) emitting light downward; and
a reflector (120, 202) disposed under the light source unit (110, 201) and configured to reflect light emitted from the light source unit (110, 201); and
a shield (300) disposed in front of the lamp modules (100, 200), wherein the shield (300) forms a low-beam pattern by blocking part of light emitted from one or more of the lamp modules (100, 200) and is disposed adjacent to an optical axis (C) of the projection lens (400),

25 **characterized in that** heat sinks (500) are installed on top surfaces of the light source units (110, 201) of the lamp modules (100, 200), respectively;
lamp modules (100, 200) comprise a first lamp module (100) disposed above the optical axis (C) and a second lamp module (200) disposed below the optical axis (C); and
at least one of the heat sinks (500) installed on the top surfaces of the light source units (110, 201) is coupled to a surface of an extension portion (320) which extends backward from a shield placed in front of the lamp modules (100, 200).

30 **2.** The headlamp of claim 1, wherein the first lamp module (100) is used to emit light in a low-beam pattern, and the second lamp module (200) is used to emit light in a high-beam pattern.

35 **3.** The headlamp of claim 1, wherein one or more of the lamp modules (100, 200) include a plurality of lamp modules arranged in a particular direction.

40 **4.** The headlamp of claim 1, wherein the light source unit (110, 201) comprises a light source and a substrate having the light source installed on a bottom surface thereof.

45 **5.** The headlamp of claim 4, wherein the light source (110, 201) is a light-emitting diode (LED).

6. The headlamp of claim 1, wherein the extension por-

tion (320) is coupled to coupling portions (130) which extend from at least one of the heat sinks (500) installed on the top surfaces of the light source units (110, 201).

7. The headlamp of claim 1, wherein the extension portion (320) is mounted on respective surfaces of connecting portions (600) which connect at least one of the lamp modules (100, 200) to a lens holder (410) which supports the projection lens (400).
8. The headlamp of claim 7, wherein the connecting portions (600) are connected between at least one of the heat sinks (500) installed on the light source units (110, 201) and the lens holder (410).
9. The headlamp one of claims 1 - 8, wherein heat pads (510) are formed in contact surfaces between the light source units (110, 201) and the heat sinks (500), respectively.
10. The headlamp one of claims 1 - 8, wherein each of the heat sinks (500) is a heat spreader or a heat pipe.
11. The headlamp of claim 1, wherein the light source unit (110, 201) is placed at a predetermined angle to the optical axis (C) according to a beam pattern, and the reflector (120, 202) is placed according to the angle of the light source unit (110, 201).
12. The headlamp one of claims 1 - 11, wherein each of the heat sinks (500) comprises a plurality of dissipating pins which extend upward above a corresponding light source unit (110,201).

Patentansprüche

1. Kraftfahrzeugscheinwerfer, umfassend:

- eine Mehrzahl von Lampenmodulen (100, 200), die in unterschiedlichen Richtungen von einer optischen Achse (C) des Fahrzeugscheinwerfers angeordnet sind;

- eine Projektionslinse (400), die von einem oder mehreren der Lampenmodule (100, 200) emittiertes Licht projiziert, wobei jedes der Lampenmodule (100, 200) umfasst:

- eine Lichtquelleneinheit (110, 201), die Licht nach unten emittiert; und

- einen Reflektor (120, 202), der unter der Lichtquelleneinheit (110, 201) angeordnet ist, und eingerichtet ist, um das von der Lichtquelleneinheit (110, 201) emittierte Licht zu reflektieren; und

- eine Abschirmung (300), die vor den Lampenmodulen (100, 200) angeordnet ist, wo-

bei die Abschirmung (300) ein Abblendlichtmuster durch Blockieren eines Teils des von einem oder mehreren der Lampenmodule (100, 200) emittierten Lichts bildet und benachbart zu einer optischen Achse (C) der Projektionslinse (400) angeordnet ist,

- **dadurch gekennzeichnet, dass** Wärmesenken (500) jeweils auf oberen Flächen der Lichtquelleneinheiten (110, 201) der Lampenmodule (100, 200) installiert sind;

- Lampenmodule (100, 200) ein erstes Lampenmodul (100), das oberhalb der optischen Achse (C) angeordnet ist, und ein zweites Lampenmodul (200), das unterhalb der optischen Achse (C) angeordnet ist, aufweisen; und

- zumindest eine der Wärmesenken (500), die auf den oberen Flächen der Lichtquelleneinheiten (110, 201) installiert ist, mit einer Fläche eines Verlängerungsabschnitts (320) verbunden ist, der sich von einer vor den Lampenmodulen (100, 200) angeordneten Abschirmung nach hinten erstreckt.

2. Scheinwerfer nach Anspruch 1, wobei das erste Lampenmodul (100) verwendet wird, um Licht in einem Abblendlichtmuster zu emittieren, und das zweite Lampenmodul (200) verwendet wird, um Licht in einem Fernlichtmuster zu emittieren.

3. Scheinwerfer nach Anspruch 1, wobei eins oder mehrere der Lampenmodule (100, 200) eine Mehrzahl von Lampenmodulen umfassen, die in einer bestimmten Richtung angeordnet sind.

4. Scheinwerfer nach Anspruch 1, wobei die Lichtquelleneinheit (110, 201) eine Lichtquelle und ein Substrat mit der Lichtquelle aufweist, die auf dessen Bodenfläche installiert ist.

5. Scheinwerfer nach Anspruch 4, wobei die Lichtquelle (110, 201) eine Leuchtdiode (LED) ist.

6. Scheinwerfer nach Anspruch 1, wobei der Verlängerungsabschnitt (320) mit Verbindungsabschnitten (130) verbunden ist, die sich von zumindest einer der Wärmesenken (500) erstrecken, die auf den oberen Flächen der Lichtquelleneinheiten (110, 201) installiert sind.

7. Scheinwerfer nach Anspruch 1, wobei der Verlängerungsabschnitt (320) an jeweiligen Flächen von Verbindungsabschnitten (600) montiert ist, die zumindest eins der Lampenmodule (100, 200) mit einem Linsenhalter (410) verbinden, der die Projektionslinse (400) abstützt.

8. Scheinwerfer nach Anspruch 7, wobei die Verbindungsabschnitte (600) jeweils einen Winkel von

dungsabschnitte (600) mit zumindest einer der Wärmesenken (500), die an den Lichtquelleneinheiten (110, 201) installiert sind, und dem Linsenhalter (410) verbunden sind.

9. Scheinwerfer nach einem der Ansprüche 1 bis 8, wobei Wärmepads (510) in Kontaktflächen zwischen den Lichtquelleneinheiten (110, 201) bzw. den Wärmesenken (500) ausgebildet sind.
10. Scheinwerfer nach einem der Ansprüche 1 bis 8, wobei jede der Wärmesenken (500) ein Wärmeverteiler oder ein Wärmerohr ist.
11. Scheinwerfer nach Anspruch 1, wobei die Lichtquelleneinheit (110, 201) in einem vorbestimmten Winkel zur optischen Achse (C) gemäß einem Strahlungsmuster angeordnet ist, und der Reflektor (120, 202) gemäß dem Winkel der Lichtquelleneinheit (110, 201) angeordnet ist.
12. Scheinwerfer nach einem der Ansprüche 1 bis 11, wobei jede der Wärmesenken (500) eine Mehrzahl von Ableitstiften aufweist, die sich über einer entsprechenden Lichtquelleneinheit (110, 201) nach oben erstrecken.

Revendications

1. Phare d'automobile comprenant :

une pluralité de modules de lampe (100, 200) disposés dans différentes directions à partir d'un axe optique (C) du phare d'automobile ;
une lentille de projection (400) projetant la lumière émise à partir d'un ou de plusieurs des modules de lampe (100, 200), où chacun des modules de lampe (100, 200) comporte :

une unité de source de lumière (110, 201) émettant de la lumière vers le bas ; et
un réflecteur (120, 202) disposé sous l'unité de source de lumière (110, 201) et configuré pour réfléchir la lumière émise à partir de l'unité de source de lumière (110, 201) ; et
un élément de protection (300) disposé devant les modules de lampe (100, 200), où l'élément de protection (300) forme un motif de feu de croisement en bloquant une partie de la lumière émise à partir d'un ou de plusieurs des modules de lampe (100, 200) et est disposé de manière adjacente à un axe optique (C) de la lentille de projection (400),

caractérisé en ce que des dissipateurs thermiques (500) sont installés sur les surfaces supérieures des unités de source de lumière (110,

201) des modules de lampe (100, 200), respectivement ;

des modules de lampe (100, 200) comprennent un premier module de lampe (100) disposé au-dessus de l'axe optique (C) et un deuxième module de lampe (200) disposé en dessous de l'axe optique (C) ; et

au moins l'un des dissipateurs thermiques (500) installés sur les surfaces supérieures des unités de source de lumière (110, 201) est couplé à une surface d'une partie d'extension (320) qui s'étend vers l'arrière à partir d'un élément de protection placé devant les modules de lampe (100, 200).

2. Phare de la revendication 1, dans lequel le premier module de lampe (100) est utilisé pour émettre de la lumière selon un motif de feu de croisement, et le deuxième module de lampe (200) est utilisé pour émettre de la lumière selon un motif de feu de route.
3. Phare de la revendication 1, dans lequel un ou plusieurs des modules de lampe (100, 200) comporte/comportent une pluralité de modules de lampe agencés dans une direction particulière.
4. Phare de la revendication 1, dans lequel l'unité de source de lumière (110, 201) comprend une source de lumière et un substrat ayant la source de lumière installée sur une surface inférieure de celui-ci.
5. Phare de la revendication 4, dans lequel la source de lumière (110, 201) est une diode électroluminescente (LED).
6. Phare de la revendication 1, dans lequel la partie d'extension (320) est couplée à des parties d'accouplement (130) qui s'étendent à partir d'au moins l'un des dissipateurs thermiques (500) installés sur les surfaces supérieures des unités de source de lumière (110, 201).
7. Phare de la revendication 1, dans lequel la partie d'extension (320) est montée sur des surfaces respectives de parties de liaison (600) qui relient au moins l'un des modules de lampe (100, 200) à un porte-lentille (410) qui supporte la lentille de projection (400).
8. Phare de la revendication 7, dans lequel les parties de liaison (600) sont reliées entre au moins l'un des dissipateurs thermiques (500) installés sur les unités de source de lumière (110, 201) et le porte-lentille (410).
9. Phare de l'une des revendications 1 à 8, dans lequel des coussinets thermiques (510) sont formés dans des surfaces de contact entre les unités de source

de lumière (110, 201) et les dissipateurs thermiques (500), respectivement.

10. Phare de l'une des revendications 1 à 8, dans lequel chacun des dissipateurs thermiques (500) est un dissipateur thermique ou un caloduc. 5
11. Phare de la revendication 1, dans lequel l'unité de source de lumière (110, 201) est placée à un angle prédéterminé par rapport à l'axe optique (C) selon un motif de faisceau, et le réflecteur (120, 202) est placé selon l'angle de l'unité de source de lumière (110, 201). 10
12. Phare de l'une des revendications 1 à 11, dans lequel chacun des dissipateurs thermiques (500) comprend une pluralité de broches de dissipation qui s'étendent vers le haut au-dessus d'une unité de source de lumière correspondante (110, 201). 15

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FIG. 1

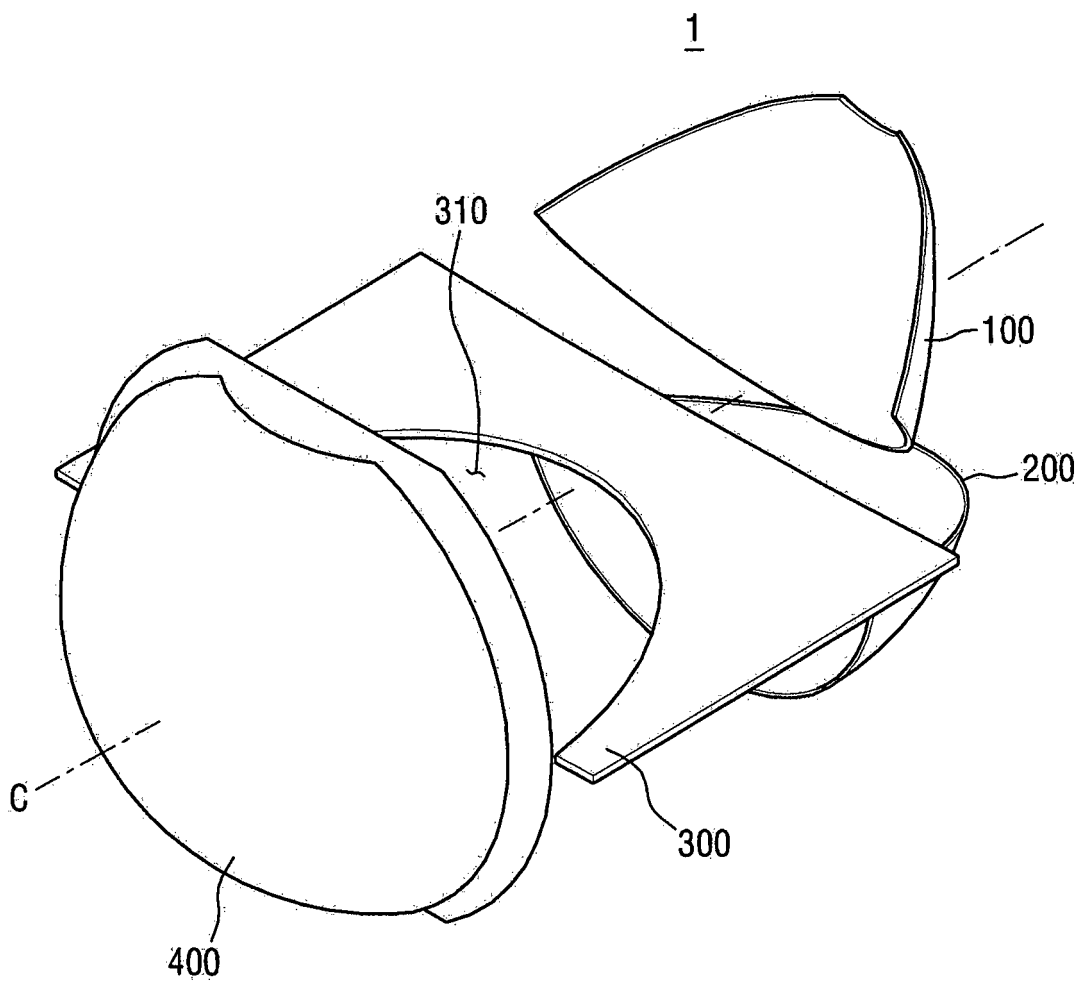


FIG. 2

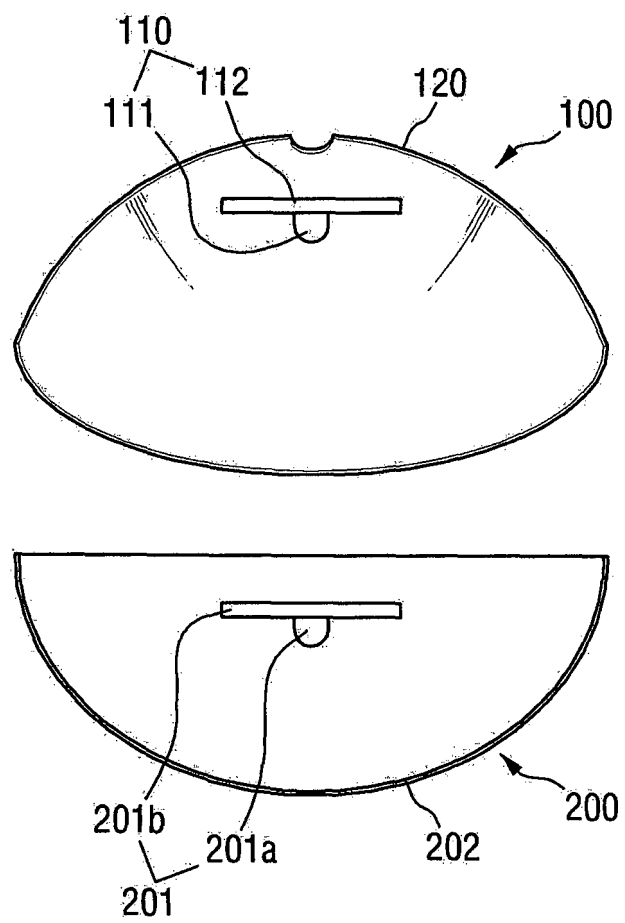


FIG. 3

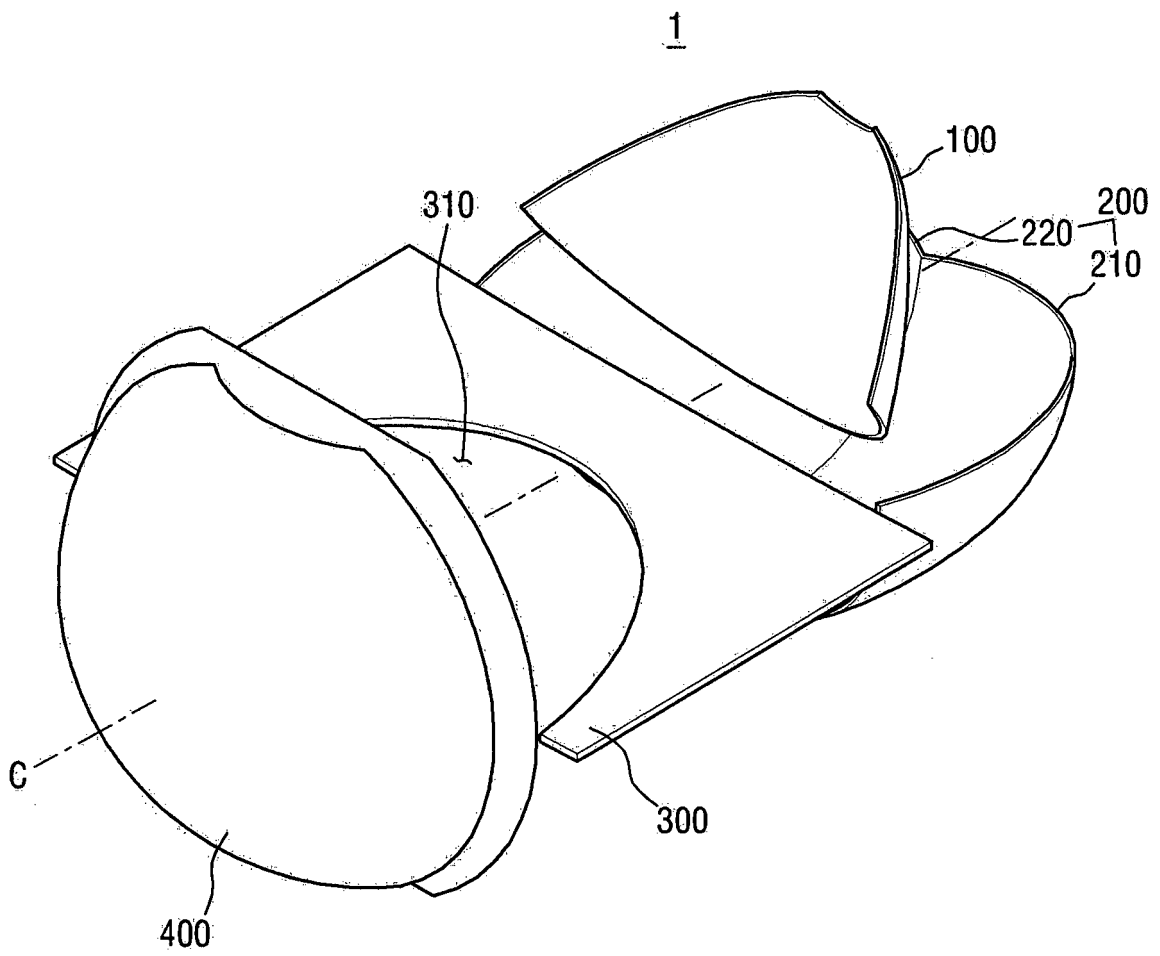


FIG. 4

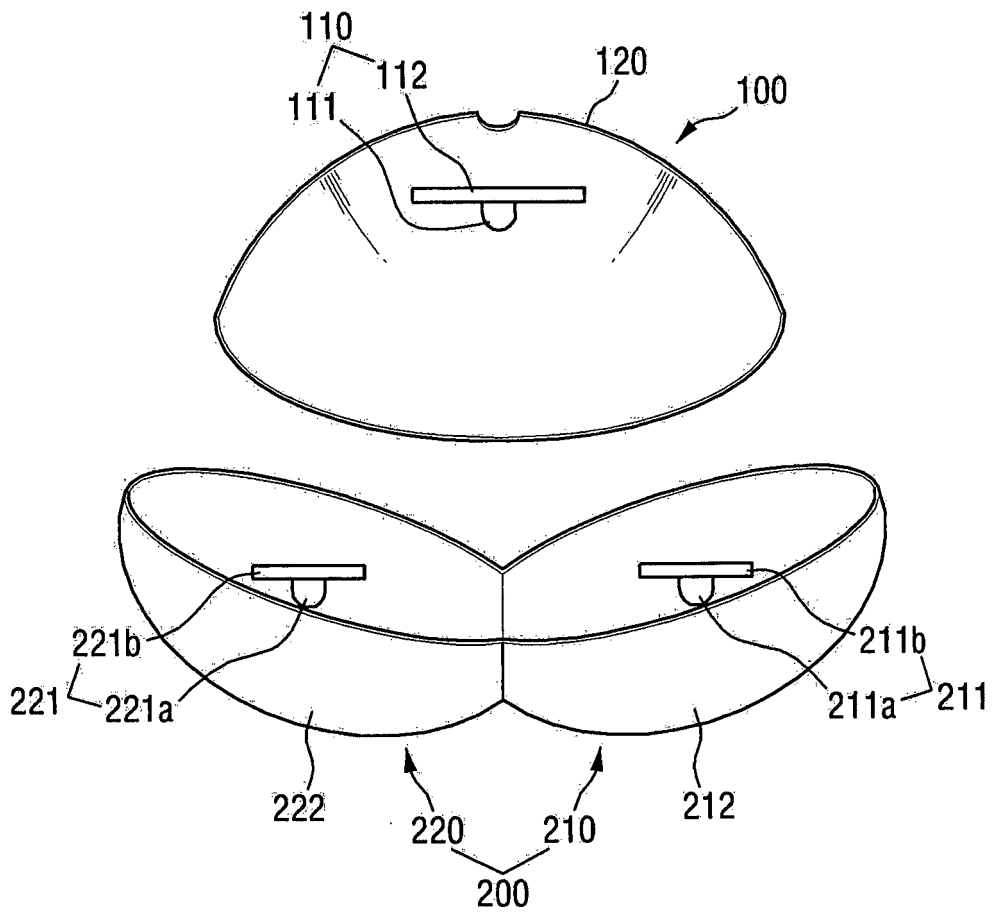


FIG. 5

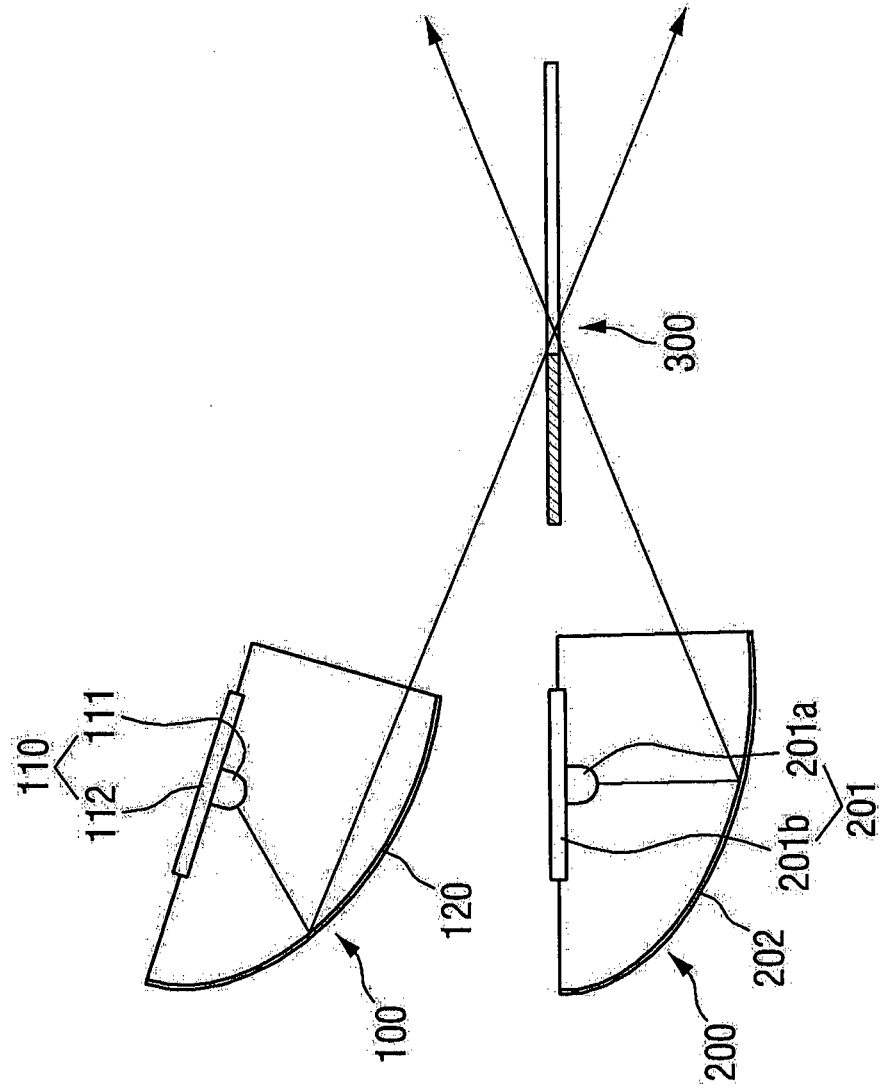


FIG. 6

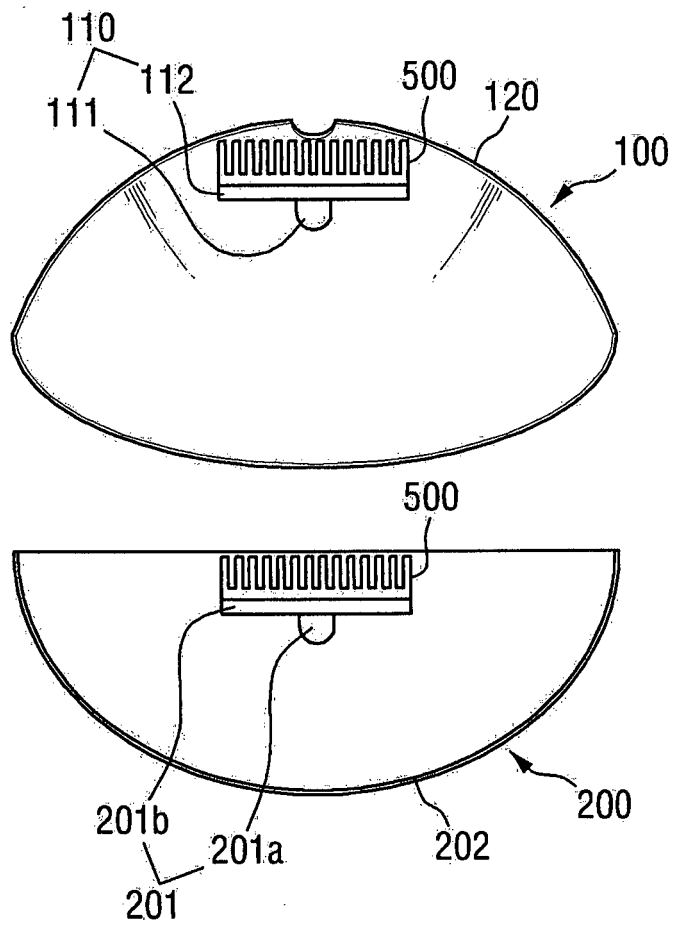


FIG. 7

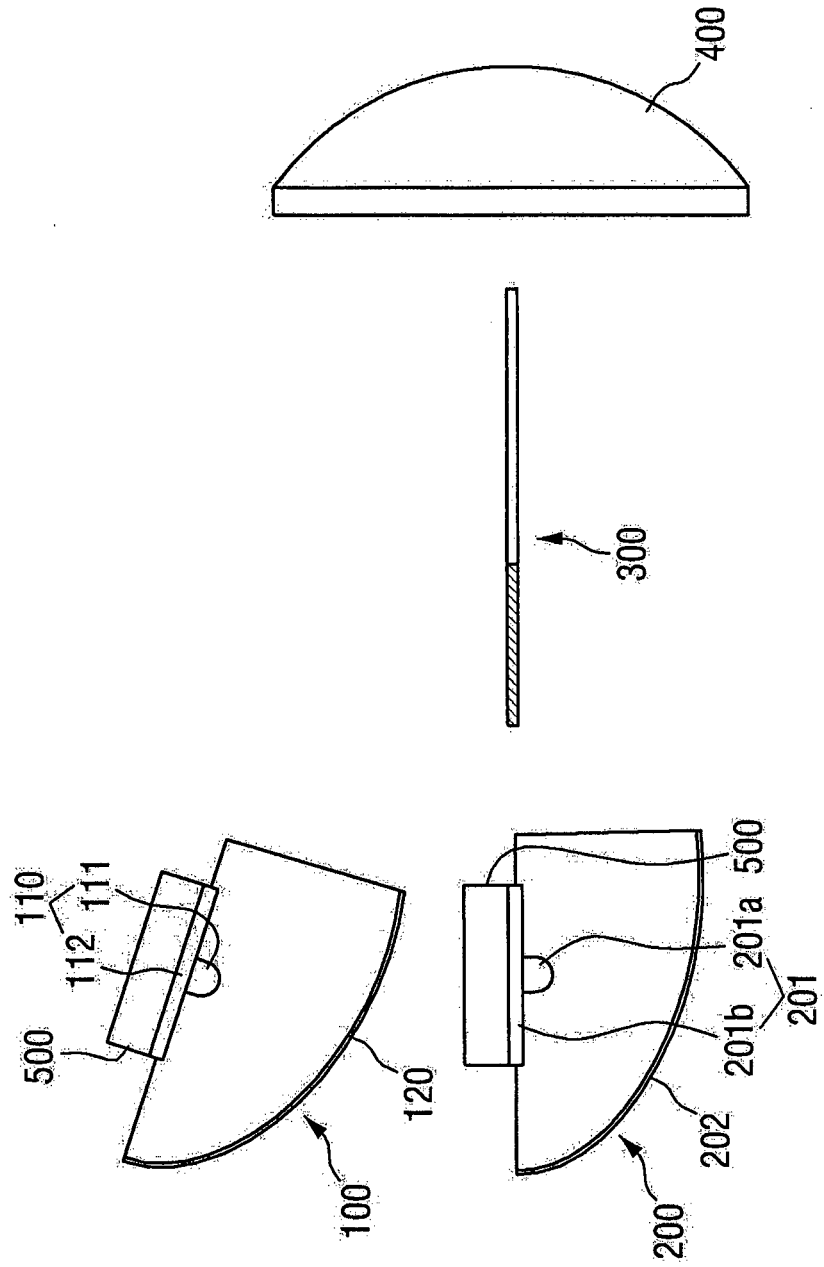


FIG. 8

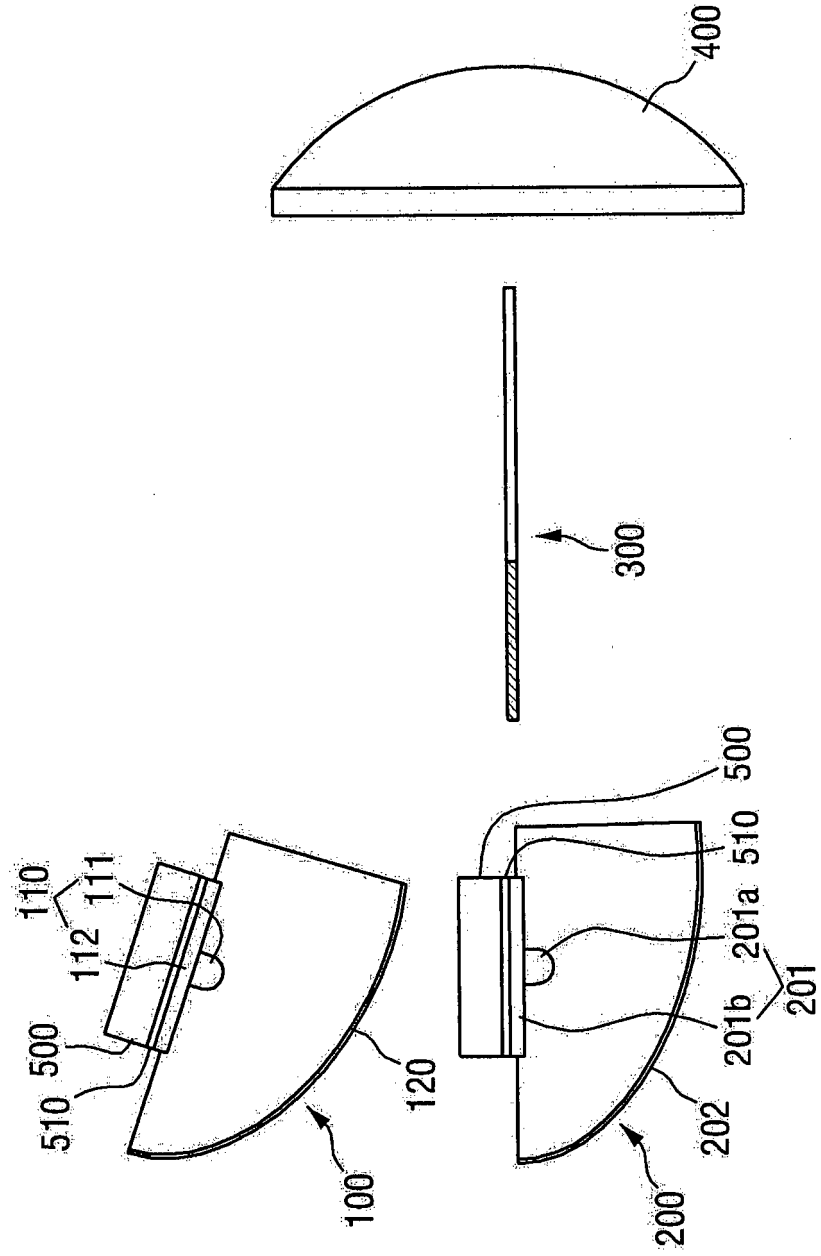


FIG. 9

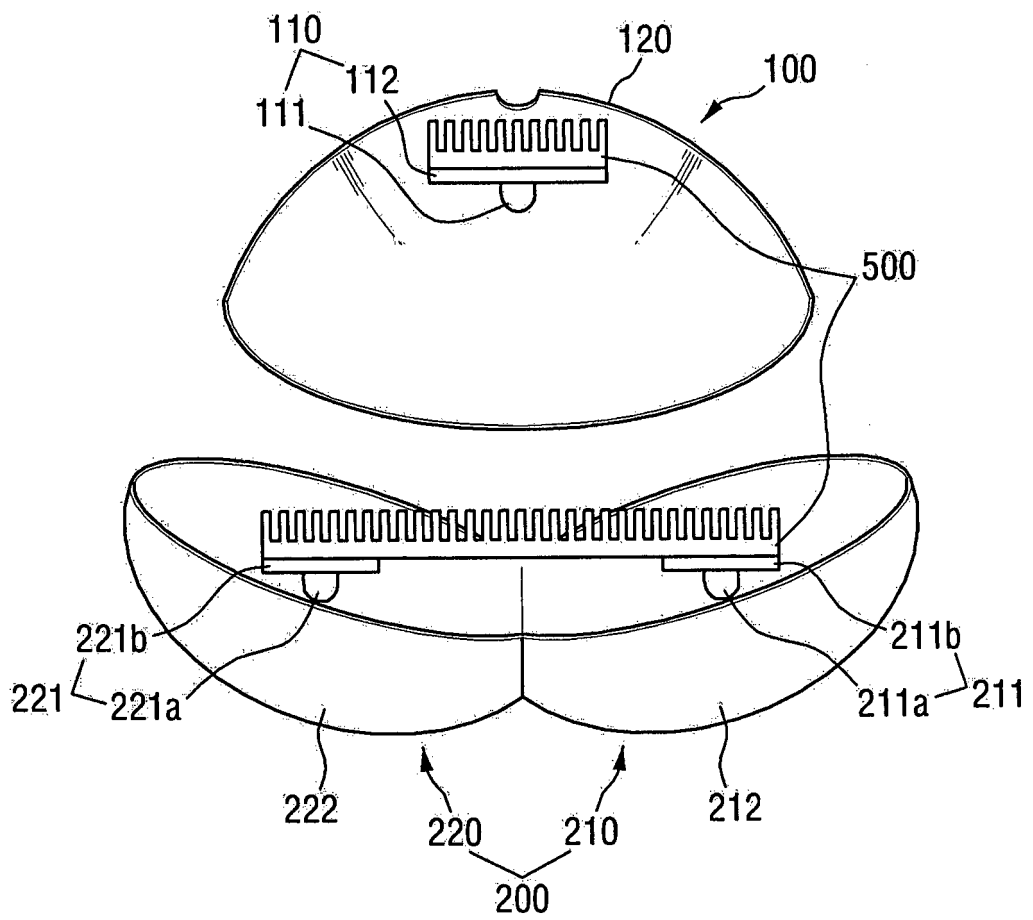


FIG. 10

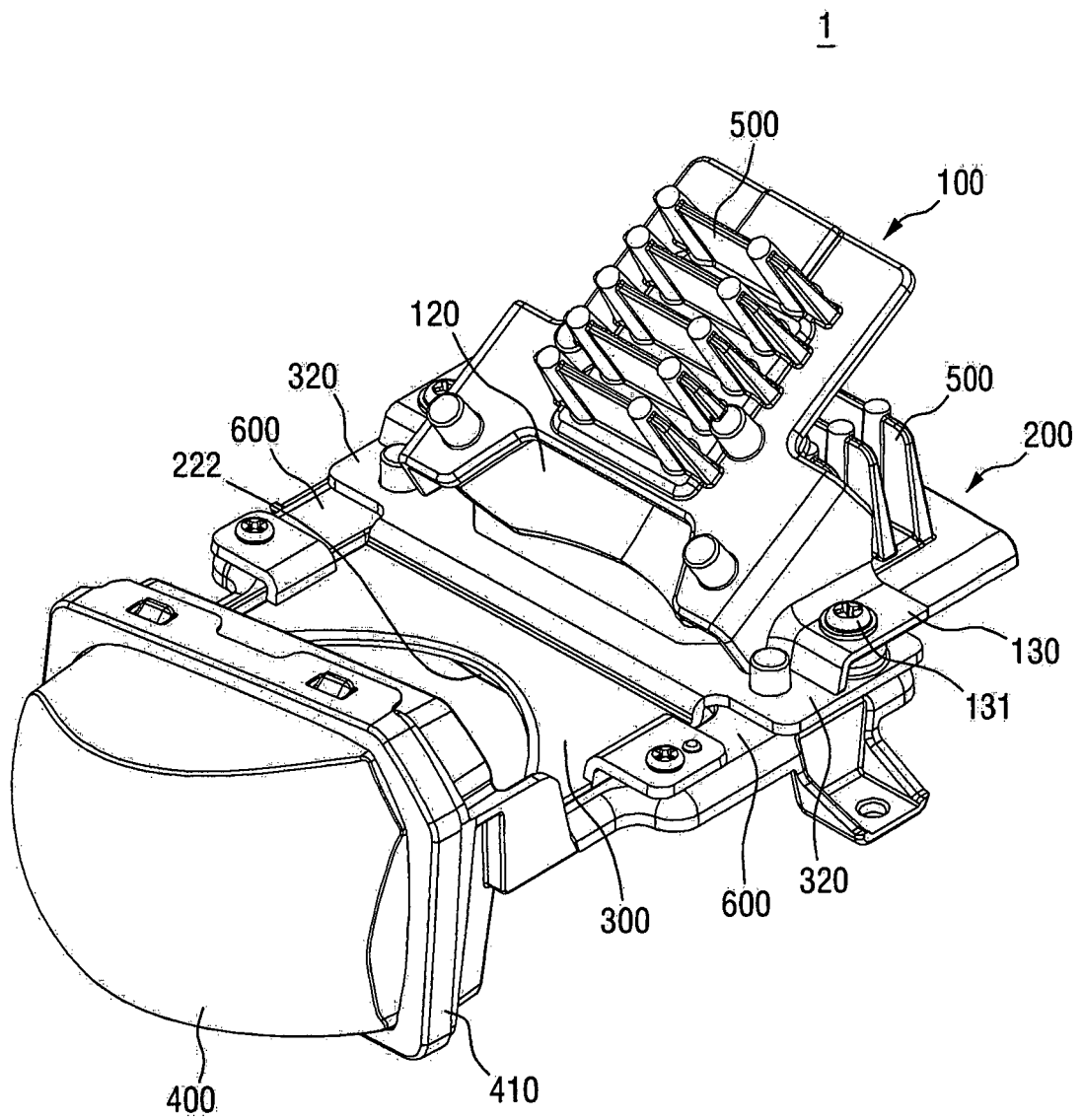


FIG. 11

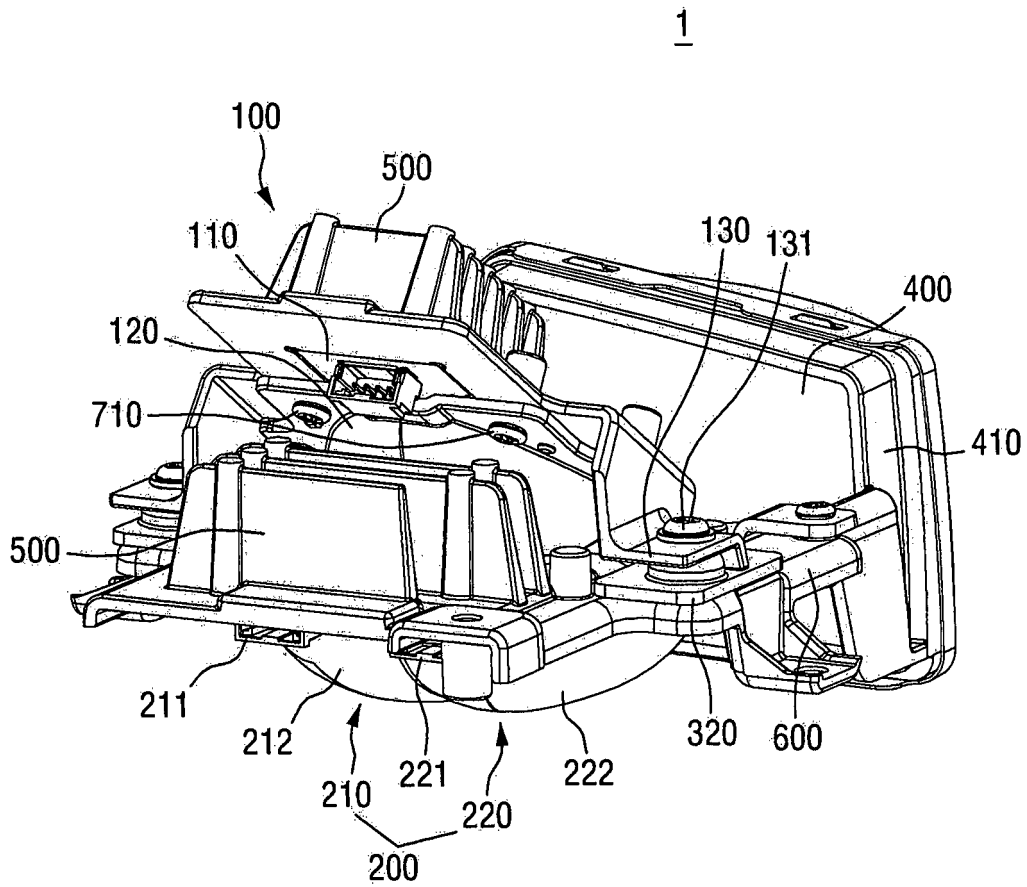


FIG. 12

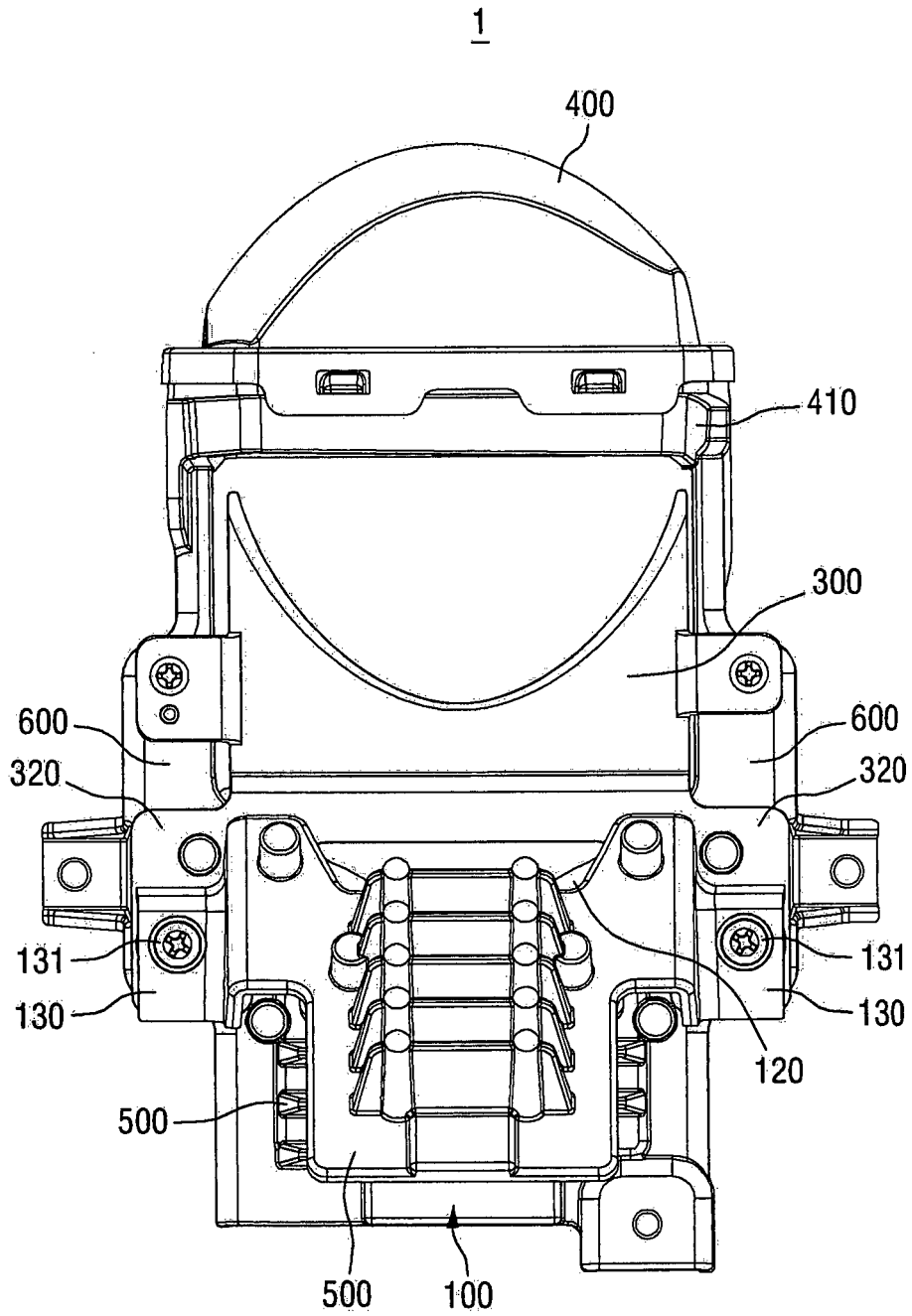
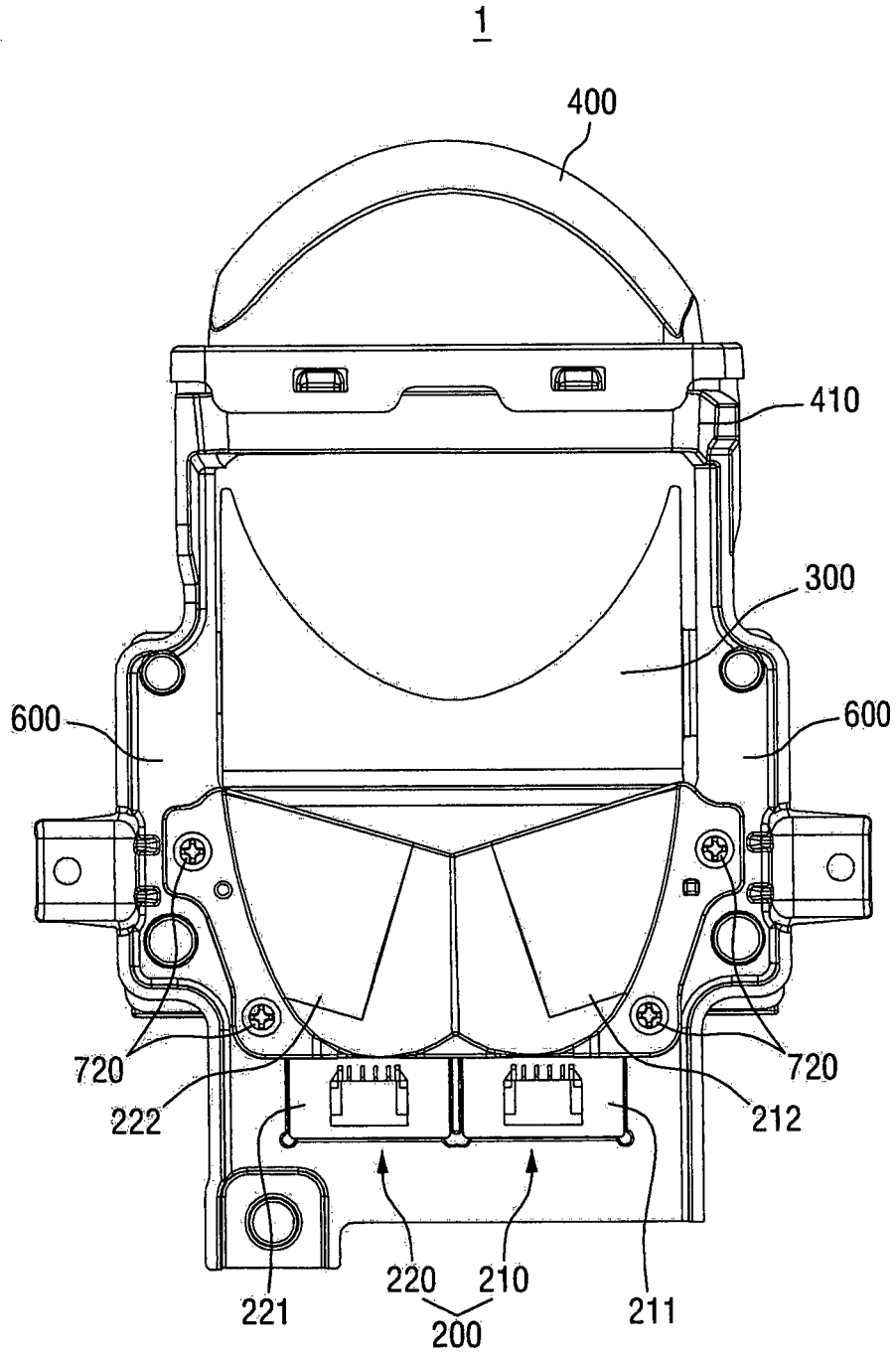


FIG. 13



REFERENCES CITED IN THE DESCRIPTION

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