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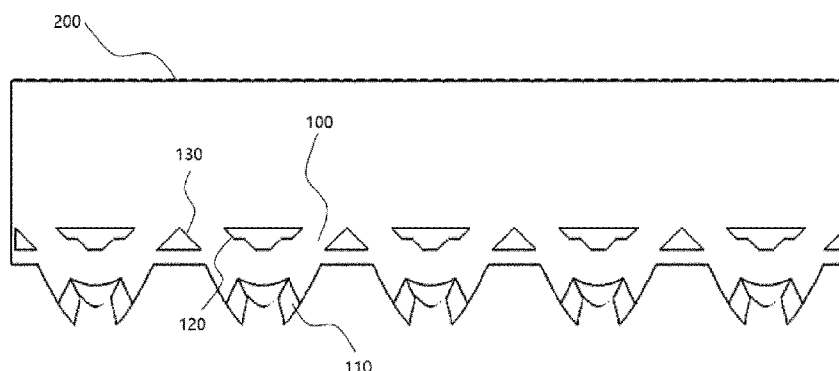


Fig. 1

(57) Abstract: One problem solved by the present invention is how to make the lighting effect more uniform. The present invention provides an optical structure, a corresponding vehicle lamp and vehicle. The optical structure according to the present invention comprises: an adjustment part and a light exit part; the adjustment part comprising: at least one collimating part, the collimating part being configured to collimate a light beam to obtain a collimated light beam; a first reflecting part corresponding to the collimating part, configured to reflect a light beam coming from the collimating part to a second reflecting part; the second reflecting part being configured to reflect a light beam coming from the first reflecting part, so that it is parallel to the collimated light beam. The present invention has the following advantage: by using two reflecting parts, it is possible to effectively expand a light source illumination region, which was originally limited to the collimating part, to the second reflecting part, thereby increasing the energy efficiency of the light source.

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Description

Optical structure, corresponding vehicle lamp and vehicle

5 The present invention relates to the technical field of optics, in particular to an optical structure, a corresponding vehicle lamp and vehicle.

 In optical structures which generally use multiple collimators to adjust light rays, light source illumination ranges are generally limited by collimator edges, hence a certain dark zone is often present between two collimators,
10 resulting in an insufficiently uniform lighting effect.

 In view of the above, one problem solved by an embodiment of the present invention is how to make the lighting effect more uniform.

 According to one aspect of the present invention, an optical structure is disclosed, wherein the optical structure comprises:

15 an adjustment part and a light exit part, wherein the adjustment part comprises:

 at least one collimating part, the collimating part being configured to collimate a light beam to obtain a collimated light beam;

 a first reflecting part corresponding to the collimating part being
20 configured to reflect a light beam coming from the collimating part to a second reflecting part;

 the second reflecting part being configured to reflect a light beam coming from the first reflecting part, so that it is parallel to the collimated light beam.

 Through the use of the first reflecting part and the second reflecting part,
25 an illumination range of a light source can be expanded from an edge of the collimating part to an edge of the second reflecting part.

 In the optical structure according to an embodiment of the present invention, the first reflecting part comprises at least one first reflecting surface.

 According to the solution of this embodiment, the first reflecting part may

have one or more reflecting surfaces to reflect a portion of light beams of the light source to the second reflecting part, thereby expanding the illumination range of the light source.

In the optical structure according to an embodiment of the present invention, the first reflecting part comprises multiple said first reflecting surfaces, and the first reflecting surfaces are connected by a transmitting surface therebetween.

According to the solution of this embodiment, in which multiple first reflecting surfaces are used and connected by transmitting surface, the proportion of light source light beams which are reflected can be adjusted, to obtain better uniformity.

In the optical structure according to an embodiment of the present invention, the second reflecting part comprises at least one second reflecting surface.

According to the solution of this embodiment, by using the second reflecting surface, a lighting range of a single light source can be expanded effectively.

In the optical structure according to an embodiment of the present invention, an angle between the at least one first reflecting surface and an optical axis of the collimating part is 45 degrees; an angle between the at least one second reflecting surface and the optical axis of the collimating part is 45 degrees; and the at least one first reflecting surface is opposite the at least one second reflecting surface.

According to the solution of this embodiment, when the first reflecting surface and the second reflecting surface both form an angle of 45 degrees with the optical axis, the reflection effect is optimal, and optimal utilization efficiency can be achieved.

In the optical structure according to an embodiment of the present invention, the adjustment part and the light exit part have a certain angle; the

optical structure further comprises a total reflection part; the total reflection part is configured to receive and reflect light coming from the adjustment part, so that the light reaches the light exit part perpendicular to an inner surface of the light exit part.

5 Due to the use of the design structure in which an angle is formed between the adjustment part and the light exit part, the optical structure according to the present invention can be used in a larger range of scenarios; in particular, in the case where a lamp structure has limited space, the required beam pattern can be obtained in the limited space effectively.

10 In the optical structure according to an embodiment of the present invention, the adjustment part forms an angle of 90 degrees with the light exit part.

By using the arrangement in which an angle of 90 degrees is formed, it is possible to more effectively reduce the amount of space needed by the optical
15 structure, such that the optical structure can be used in various types of lamp more flexibly.

The optical structure according to an embodiment of the present invention further comprises at least one light source located at a focus of the collimating
part.

20 The optical structure according to the present invention has at least one light source respectively corresponding to the collimating part; by positioning the light source at the focus, the light utilization efficiency can be improved effectively.

According to one aspect of the present invention, a vehicle lamp is further
25 provided, wherein the vehicle lamp comprises the optical structure.

According to one aspect of the present invention, a vehicle is further provided, the vehicle comprising the vehicle lamp.

Compared with the prior art, the present invention has the following advantage: by using two reflecting parts, it is possible to effectively expand a

light source illumination region, which was originally limited to the collimating part, to the second reflecting part, thereby increasing the efficiency of the light source. Moreover, the adjustment part and light exit part may form a certain angle, thereby expanding the range of application scenarios, with higher flexibility when matching to lamp structures.

Other features, objects and advantages of the present invention will become more obvious through perusal of a detailed description of non-limiting embodiments which makes reference to the accompanying drawings below:

Fig. 1 shows a schematic drawing of the front of an optical structure according to an embodiment of the present invention.

Fig. 2 shows a three-dimensional structural schematic drawing of an optical structure according to an embodiment of the present invention.

Fig. 3 shows a schematic light path diagram of an optical structure according to an embodiment of the present invention.

Fig. 4 shows a three-dimensional structural schematic drawing of an optical structure according to another embodiment of the present invention.

Fig. 5 shows another three-dimensional structural schematic drawing of an optical structure according to another embodiment of the present invention.

Fig. 6 shows a schematic light path diagram of the front of an optical structure according to another embodiment of the present invention.

Fig. 7 shows a schematic light path diagram of a side of an optical structure according to another embodiment of the present invention.

Fig. 8 shows a structural schematic drawing of a repeating unit of an optical structure according to another embodiment of the present invention.

List of reference signs:

100	Adjustment part	200	Light exit part
300	Total reflection part	110	Collimating part
120	First reflecting part	130	Second reflecting part
121	First reflecting surface	122	First transmitting surface

131	Second reflecting surface		
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Preferred embodiments of the present invention are described in greater detail below with reference to the accompanying drawings. Although preferred embodiments of the present invention are shown in the drawings, it should be understood that the present invention may be realized in various forms, and should not be restricted by the embodiments expounded here. On the contrary, these embodiments are provided in order to make the present invention more thorough and complete, and to enable the scope of the present invention to be conveyed to those skilled in the art in a complete fashion.

According to embodiments of the present invention, an optical structure and a corresponding vehicle lamp and vehicle are disclosed.

According to a preferred embodiment of the present invention, the vehicle lamp according to the present invention is a signal indicator vehicle lamp, such as a direction indicator lamp, a high-mount stop lamp or a position indicator lamp.

Preferably, referring to figs. 1 – 3, the optical structure according to the present invention comprises an adjustment part 100 and a light exit part 200.

The adjustment part 100 is configured to adjust a light beam from a light source to form a collimated light beam suitable for outgoing; the light exit part 200 is configured to allow the exit of the adjusted light beam therethrough.

The adjustment part 100 comprises at least one collimating part 110, a first reflecting part 120 and a second reflecting part 130.

The collimating part 110 is configured to collimate a light beam to obtain a collimated light beam; the first reflecting part 120 is configured to reflect a light beam coming from the collimating part 110 to the second reflecting part 130; the second reflecting part 130 is configured to reflect a light beam coming from the first reflecting part 120, such that it is parallel to an optical axis of the collimating part 110.

Specifically, the first reflecting part 120 comprises at least one first

reflecting surface 121.

Preferably, the first reflecting part 120 may comprise one first reflecting surface 121; or the first reflecting part 120 may comprise multiple reflecting surfaces 121.

5 According to a preferred solution of this embodiment, the first reflecting part 120 comprises multiple first reflecting surfaces 121, which are connected by a transmitting surface 122 therebetween.

The transmitting surface 122 is configured to enable a light beam perpendicularly incident on the surface to be emitted directly without changing
10 a light path thereof.

Referring to fig. 3, in the embodiment shown in fig. 3, the first reflecting part is symmetric with respect to the optical axis OE of the collimating part 110; thus, in fig. 3, reference signs are only assigned to those parts of one repeating unit of the optical structure which are located at one side of the
15 optical axis OE. At the same time, fig. 3 also shows a light path schematic diagram of one repeating unit of the adjustment part 100 of the optical structure.

Referring to the embodiment shown in fig. 3, the first reflecting part 120 at one side of the optical axis OE comprises two first reflecting surfaces 121,
20 which are connected by a first transmitting surface 122 therebetween. Moreover, the two first reflecting surfaces 121 are both opposite at least one second reflecting surface 131 of the second reflecting part 130.

At the same time, the first reflecting surfaces 121 at two sides of the optical axis OE are also connected by a first transmitting surface 122 therebetween.

25 Preferably, the first transmitting surface 122 is perpendicular to the optical axis OE of the collimating part 110, so that a light beam coming from the collimating part 110 can be transmitted through the first transmitting surface 122 directly.

Similarly, the second reflecting part 130 may comprise at least one second

reflecting surface 131.

Specifically, the second reflecting part 130 may comprise one second reflecting surface 131, or the second reflecting part 130 may comprise multiple second reflecting surfaces 131.

5 Preferably, when the second reflecting part 130 comprises multiple second reflecting surfaces 131, the multiple second reflecting surfaces 131 are also connected by a second transmitting surface therebetween.

Preferably, the second transmitting surface is also perpendicular to the direction of the optical axis OE of the collimating part 110.

10 Preferably, each first reflecting surface 121 forms an angle α with the optical axis OE, and each second reflecting surface 131 forms an angle β with the optical axis OE.

The angle α and angle β are matched to each other, so that a reflected light beam from the first reflecting surface 121 can, after being reflected by the
15 second reflecting surface 131, be emitted from a surface of the second reflecting surface 131 at an angle parallel to the optical axis OE.

According to a preferred embodiment of the present invention, the angle α between at least one first reflecting surface 121 and the optical axis OE of the collimating part 110 is 45 degrees; the angle β between at least one second
20 reflecting surface 131 and the optical axis OE of the collimating part 110 is 45 degrees; and the at least one first reflecting surface 121 is opposite the at least one second reflecting surface 131.

According to a preferred solution of this embodiment, in one repeating unit, the first reflecting parts 120 located at two sides of the optical axis OE may be
25 an asymmetric structure; correspondingly, the second reflecting parts 130 located at two sides of the optical axis OE may also be an asymmetric structure, corresponding to the first reflecting parts 120.

Preferably, two repeating units are directly adjacent to each other in the adjustment part 100, i.e. second reflecting parts 130 in the two repeating units

are directly adjacent to each other. Specifically, respective ends of the two second reflecting parts 130 are connected, forming two sides and one vertex of a triangle. More preferably, respective second reflecting parts of two repeating units are connected to form a hollow triangle (see figs. 1 – 7), with
5 an air region inside the triangle. In this way, a dark zone between the two repeating units is eliminated.

According to another preferred embodiment of the present invention, referring to figs. 4 – 7, the adjustment part 100 and the light exit part 200 have a certain angle; the optical structure further comprises a total reflection part
10 300; the total reflection part 300 is configured to receive and reflect light coming from the adjustment part 100, so that the light reaches the light exit part 200 perpendicular to an inner surface of the light exit part 200.

Preferably, the adjustment part 100 forms an angle of 90 degrees with the light exit part 200.

15 Specifically, the direction of light from the adjustment part 100 forms an angle of 90 degrees with the direction of a light ray reaching the inner surface of the light exit part 200.

According to another preferred solution of this embodiment, the optical structure according to the present invention further comprises various light
20 sources corresponding to at least a part of the collimating part 110, the various light sources being respectively located at a focus of the collimating part 110 corresponding thereto.

It can be seen with reference to figs. 4 and 6 that according to the solution of this embodiment, an illumination region of the light source can be expanded
25 effectively; in the embodiment as shown in fig. 4, an illumination range of the light source is expanded from h to H, and in the embodiment as shown in fig. 6, the illumination range of the light source is expanded from h' to H'.

Clearly, through the use of the optical structure of the present invention, by using two reflecting parts, it is possible to effectively expand the light

source illumination region, which was originally limited to the collimating part, to the second reflecting part, thereby increasing the energy efficiency of the light source. Moreover, the adjustment part and light exit part may form a certain angle, thereby expanding the range of application scenarios, with
5 higher flexibility when matching to lamp structures.

To a person skilled in the art, it is obvious that the present invention is not limited to the details of the demonstrative embodiments above, and could be implemented in other specific forms without deviating from the spirit or fundamental features of the present invention. Thus, regardless of which
10 viewpoint is taken, the embodiments should be regarded as being demonstrative and non-limiting; the scope of the present invention is defined by the attached claims and not by the explanation above, hence it is intended that all changes falling within the meaning and scope of equivalent key elements of the claims be included in the present invention. No reference
15 labels in the claims should be regarded as limiting the claims concerned. In addition, it is obvious that the word “comprises” does not exclude other units or steps, and the singular does not exclude the plural. Multiple units or apparatuses presented in system claims may also be realized by one unit or apparatus by means of software or hardware. Words such as first and second
20 are used to indicate designations, and do not indicate any specific order.

Claims

1. Optical structure, wherein the optical structure comprises:

an adjustment part (100) and a light exit part (200);

the adjustment part (100) comprising:

5 at least one collimating part (110), the collimating part (110) being configured to collimate a light beam to obtain a collimated light beam;

a first reflecting part (120) being configured to reflect a light beam coming from the collimating part (110) to a second reflecting part (130);

10 the second reflecting part (130) being configured to reflect a light beam coming from the first reflecting part (120), so that it is parallel to the collimated light beam.

2. Optical structure according to Claim 1, wherein the first reflecting part (120) comprises at least one first reflecting surface (121).

15 3. Optical structure according to Claim 2, wherein the first reflecting part (120) comprises multiple said first reflecting surfaces (121), and the first reflecting surfaces (121) are connected by a transmitting surface (122) therebetween.

4. Optical structure according to Claim 1, wherein the second reflecting part (130) comprises at least one second reflecting surface (131).

20 5. Optical structure according to Claim 2 or 3, wherein the second reflecting part (130) comprises at least one second reflecting surface (131).

6. Optical structure according to Claim 5, wherein an angle between the at least one first reflecting surface (121) and an optical axis of the collimating part (110) is 45 degrees; an angle between the at least one second reflecting surface (131) and the optical axis of the collimating part (110) is 45 degrees; and the at least one first reflecting surface (121) is opposite the at least one second reflecting surface (131).

7. Optical structure according to any one of Claims 1 - 6, wherein the

adjustment part (100) and the light exit part (200) have an angle; the optical structure further comprises a total reflection part (300); the total reflection part (300) is configured to receive and reflect light coming from the adjustment part (100), so that the light reaches the light exit part (200) perpendicular to an inner surface of the light exit part (200).

8. Optical structure according to Claim 7, wherein the adjustment part (100) forms an angle of 90 degrees with the light exit part (200).

9. Optical structure according to any one of Claims 1 - 3, wherein the optical structure further comprises at least one light source located at a focus of the collimating part (110).

10. Vehicle lamp, wherein the vehicle lamp comprises the optical structure according to any one of Claims 1 - 9.

11. Vehicle, wherein the vehicle comprises the vehicle lamp according to Claim 10.

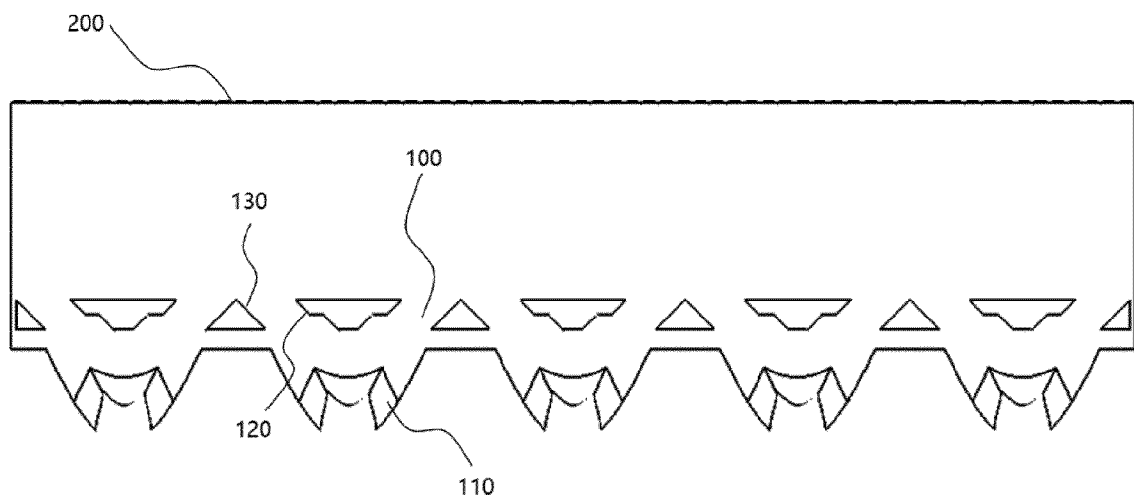


Fig. 1

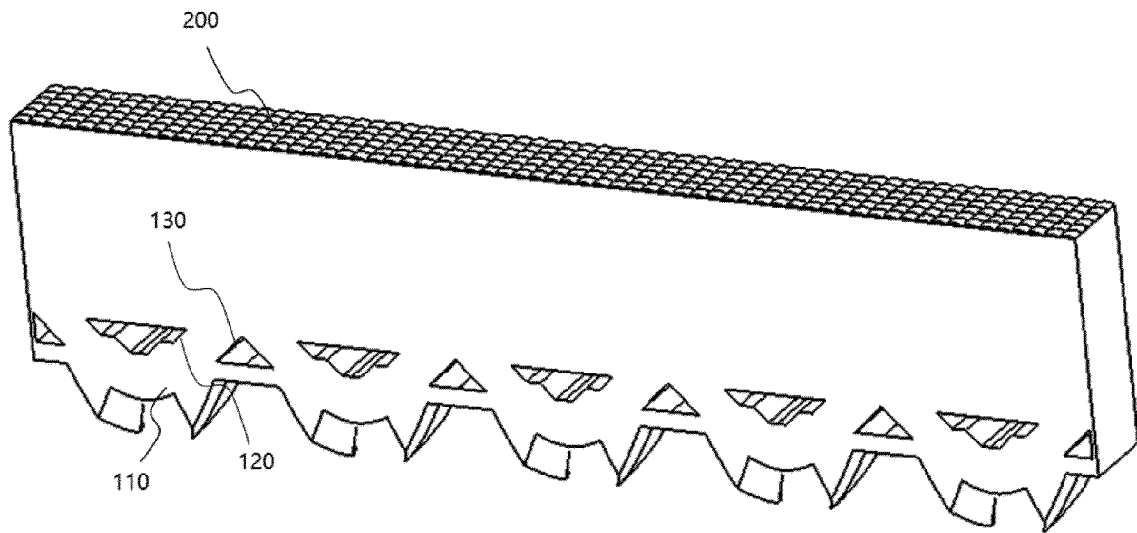


Fig. 2

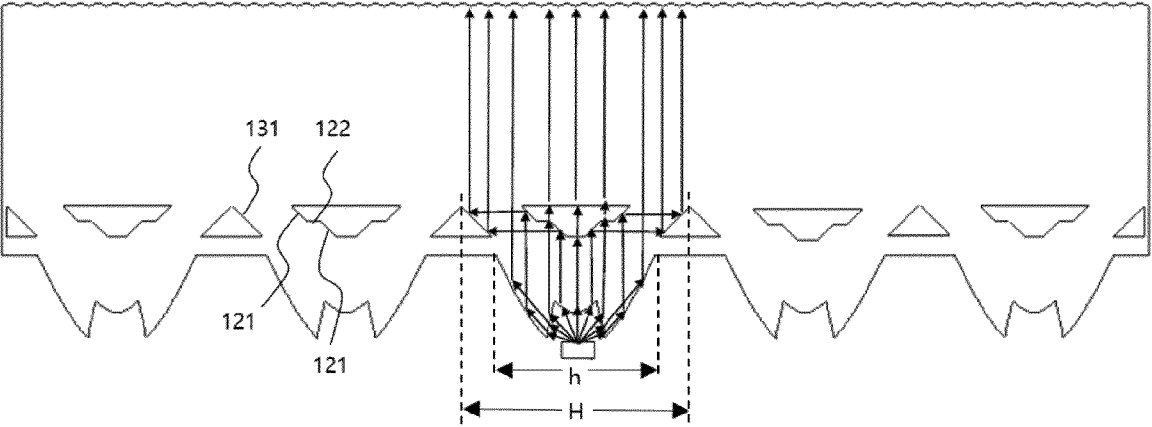


Fig. 3

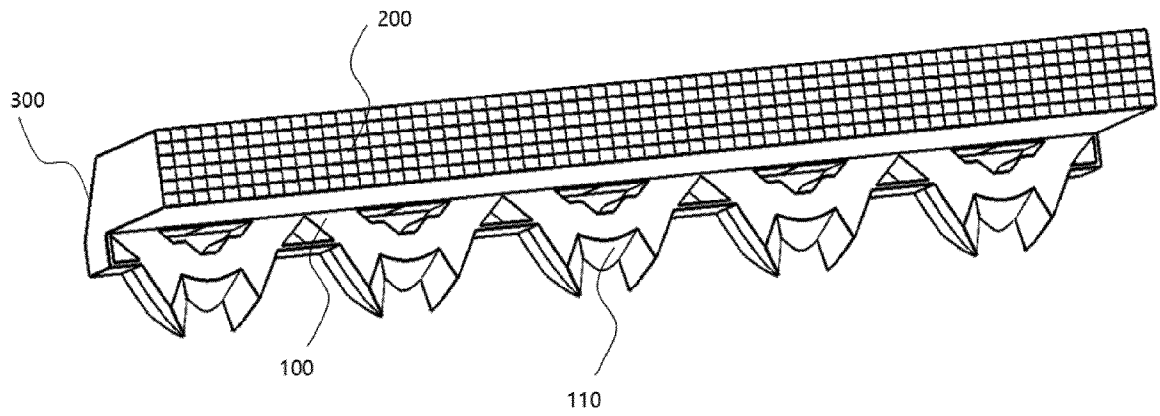


Fig. 4

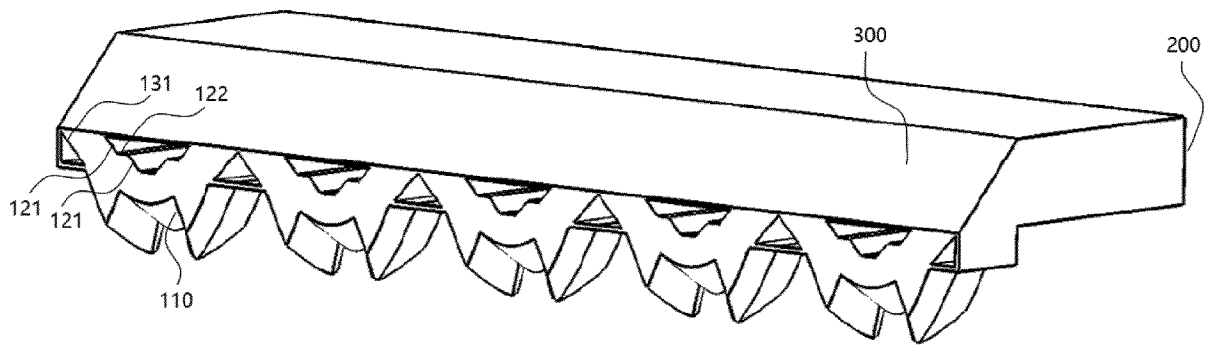


Fig. 5

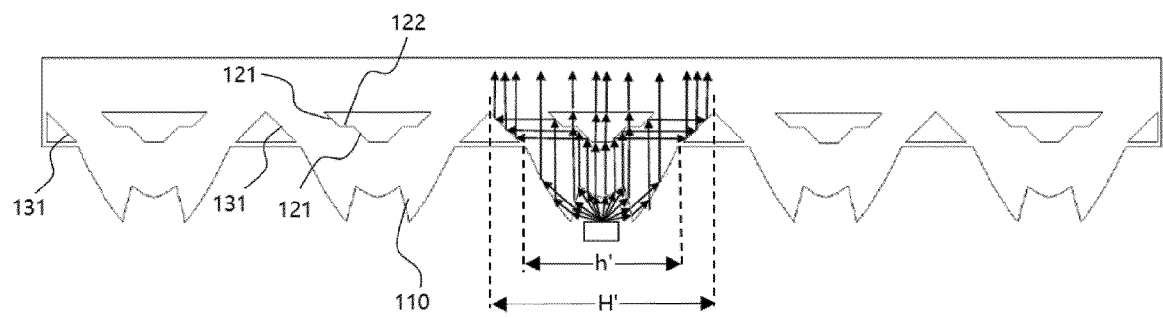


Fig. 6

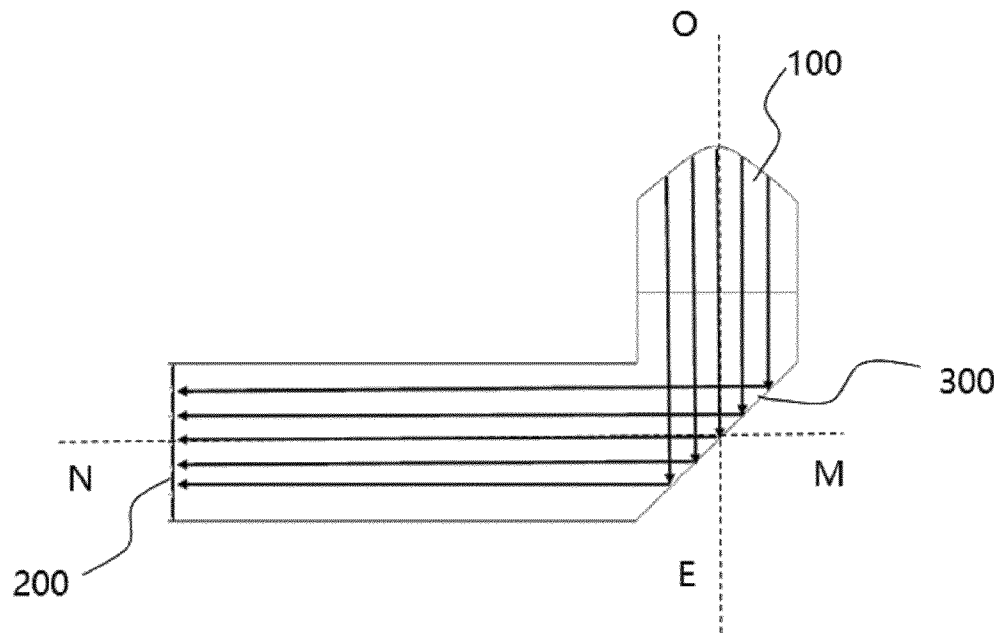


Fig. 7

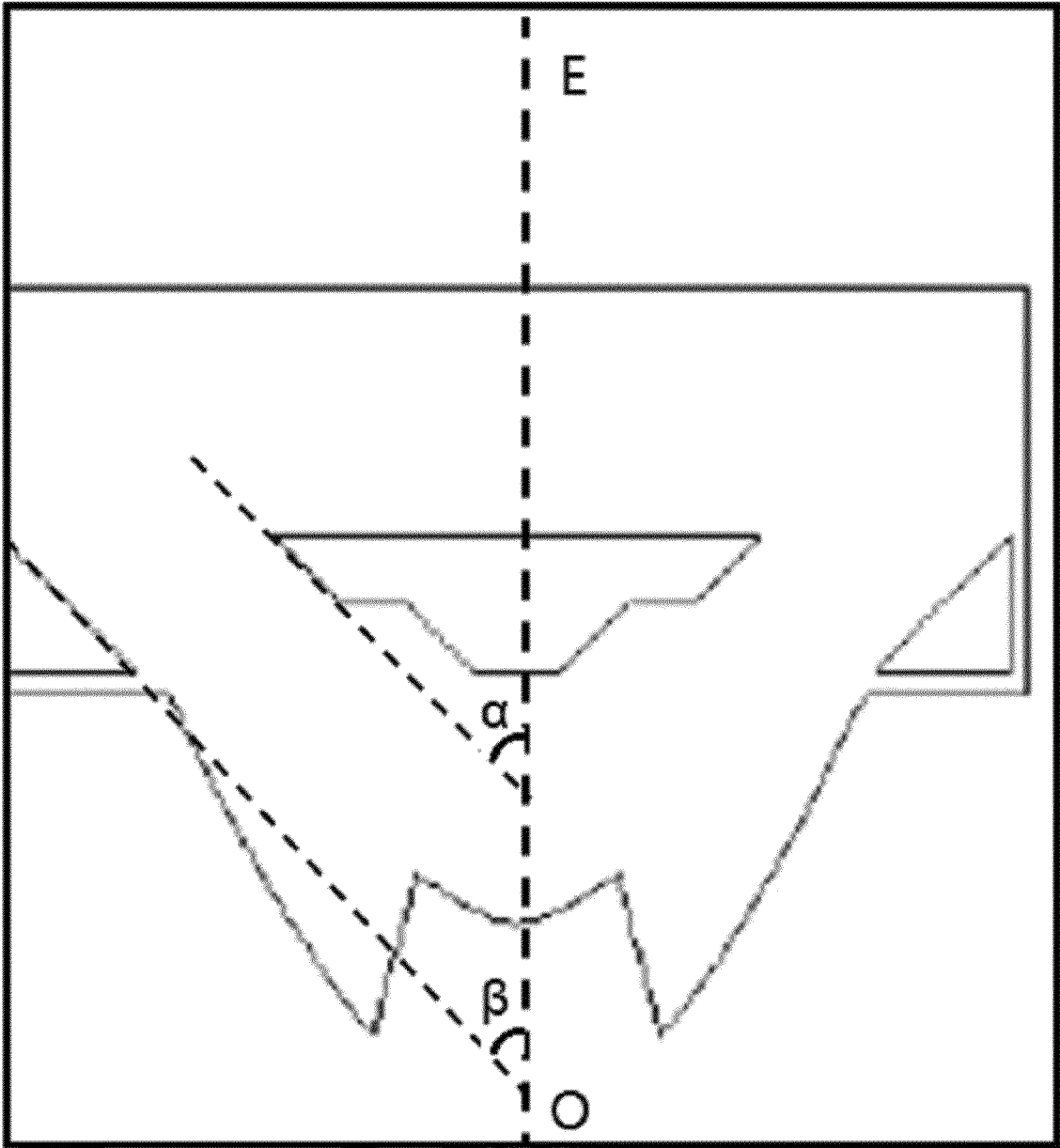


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2020/063102

A. CLASSIFICATION OF SUBJECT MATTER INV. F21S43/239 F21S43/241 F21S43/243 F21S43/249 ADD.		
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) F21S		
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	US 7 431 481 B2 (STEFANOV EMIL [DE]) 7 October 2008 (2008-10-07) figures 1,9 column 2, line 1 - line 10 -----	1-11
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "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 27 July 2020		Date of mailing of the international search report 10/08/2020
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Dinkla, Remko

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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