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(54) **REFRACTOR ASSEMBLY, LIGHTING OR SIGNALING DEVICE AND MOTOR VEHICLE**

(57) The present disclosure provides a light guide assembly, a lighting or signaling device and a motor vehicle. The light guide assembly (100) comprises a plurality of first light guide elements (110), a second light guide element (120) spaced apart from the first light guide elements (110) in a first direction (X), and a support frame (130), the plurality of first light guide elements are spaced apart from one another in a second direction (Y) perpendicular to the first direction (X), and configured to receive and guide light from light sources such that the light is uniformly distributed in a plane perpendicular to the first direction, the second light guide element is configured to

receive the light from the first light guide elements and to guide light entering the second light guide element to exit in a predetermined direction, and the support frame connects and supports the first light guide elements and the second light guide element and comprises an engagement part connected with the second light guide element such that when viewed in the first direction, the engagement part overlaps with a portion of the second light guide element and is configured to guide light entering the engagement part to be incident in the first direction into the portion of the second light guide element overlapping with the engagement part.

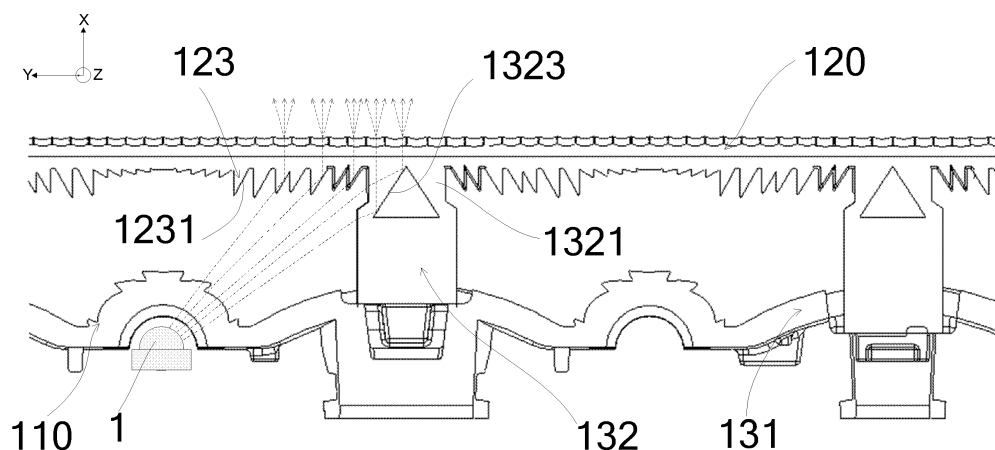


Figure 4

Description

Technical Field

[0001] The present disclosure generally relates to the lighting and/or signaling field, and particularly, to a light guide assembly, and a lighting or signaling device comprising the light guide assembly and a motor vehicle.

Description of the Related Art

[0002] Various lighting and/or signaling devices are used to provide light for lighting and/or optical indication and widely applied in many fields, for example, a lighting device or signaling device such as a vehicle lamp is utilized in a motor vehicle for ensuing safety traffic. The motor vehicle is generally provided with various kinds of vehicle lamps for achieving different functions, such as a fog lamp, a direction indicator lamp, a tail lamp, a stop lamp and the like. In conventional lighting or signaling devices, a light guide is generally lighted by a light emitting element and guides light from the light emitting element to be emitted outwardly. In some cases, light guided by the light guide is not uniformly distributed due to restriction in configuration, for example, a light outgoing direction or position is changed by a structure supporting the light guide, so the lighting or signaling device will have a dark region in the light outgoing direction, resulting in a poor lighting effect and even possibly in confusion or mistake in lighting or signaling, which is disadvantageous to the safety traffic of the motor vehicle.

SUMMARY

[0003] An object of the present disclosure is to overcome or alleviate at least one aspect of the above mentioned and other disadvantages or problems in prior arts.

[0004] The present disclosure provides a light guide assembly comprising a plurality of first light guide elements, a second light guide element spaced apart from the first light guide elements in a first direction, and a support frame, the plurality of first light guide elements are spaced apart from one another in a second direction perpendicular to the first direction, and configured to receive and guide light from light sources such that the light is uniformly distributed in a plane perpendicular to the first direction; the second light guide element is configured to receive the light from the first light guide elements and to guide light entering the second light guide element to exit in a predetermined direction; and the support frame connects and supports the first light guide elements and the second light guide element, and the support frame comprises an engagement part connected with the second light guide element such that when viewed in the first direction, the engagement part overlaps with a portion of the second light guide element and is configured to guide light entering the engagement part to be incident in the first direction into the portion of the second light guide

element overlapping with the engagement part.

[0005] In one embodiment, the engagement part further comprises at least one wall face in contact with air, the at least one wall face being configured to guide, in a total reflection way, light entering the engagement part and reaching the at least one wall face to be incident into the second light guide element in the first direction.

[0006] In one embodiment, the engagement part further comprises a hollowed-out structure penetrating through the engagement part in a third direction perpendicular to the first direction and the second direction, the hollowed-out structure comprising or defining the at least one wall face.

[0007] In one embodiment, the hollowed-out structure has two said wall faces forming a substantially inverted-V shape having a vertex directed to the second light guide element.

[0008] In one embodiment, each engagement part comprises one said wall face.

[0009] In one embodiment, the wall face is defined by an outer side surface of each engagement part.

[0010] In one embodiment, the at least one wall face is inclined relative to the first direction so as to reflect, in the first direction, light entering the engagement part and reaching the at least one wall face.

[0011] In one embodiment, a surface of the second light guide element facing the first light guide elements is provided with a plurality of corrugated structures each comprising an inclined surface configured to guide light from the first light guide elements to be reflected in the first direction.

[0012] In one embodiment, the corrugated structures include sawtooth-shaped structures.

[0013] In one embodiment, a width of the engagement part in a third direction perpendicular to both the first direction and the second direction is smaller than a width of the second light guide element, such that when viewed in the third direction, the inclined surface and the wall face, which are adjacent to each other in the third direction, are at least partly aligned with each other.

[0014] In one embodiment, the support frame comprises: a first connection section connecting and supporting adjacent ones of the first light guide elements; and a second connection section connected between the first connection section and the second light guide element and supporting the second light guide element, the second connection section comprising the engagement part.

[0015] In one embodiment, at least one of the second light guide element and the first light guide elements includes a Fresnel lens.

[0016] In one embodiment, the first light guide elements, the second light guide element and the support frame are formed into one piece.

[0017] The present disclosure further provides a lighting or signaling device, comprising a plurality of light sources and the light guide assembly described in any of the embodiments of the present disclosure, each of the first light guide elements of the light guide assembly

being configured to receive light from a corresponding one of the light sources.

[0018] The present disclosure also provides a motor vehicle, comprising the lighting or signaling device described in any of the embodiments of the present disclosure.

[0019] Other objects and advantages of the present disclosure will become apparent from the following description of the present disclosure taken in conjunction with the accompanying drawings, and may give a comprehensive understanding of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The above and other aspects, features and advantages of the present disclosure will become more apparent by describing in detail exemplary embodiments thereof with reference to the accompanying drawings, in which:

Figure 1 is a perspective rear view schematically showing a structure of a light guide assembly according to an exemplary embodiment of the present disclosure;

Figure 2 is a perspective front view schematically showing a partial structure of a light guide assembly according to an exemplary embodiment of the present disclosure;

Figure 3 is an enlarged perspective view schematically showing a structure of a portion indicated by a dashed circle shown in Figure 1;

Figure 4 is a rear view schematically showing a partial structure of a light guide assembly according to an exemplary embodiment of the present disclosure;

Figure 5 is a front view schematically showing a partial structure of a light guide assembly according to an exemplary embodiment of the present disclosure;

Figure 6 is an enlarged front view schematically showing a partial structure of a light guide assembly according to an exemplary embodiment of the present disclosure; and

Figure 7 is an enlarged front view schematically showing a partial structure of a light guide assembly according to another exemplary embodiment of the present disclosure.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0021] Exemplary embodiments of the present disclosure will be described hereinafter in detail with reference to the attached drawings, wherein the like reference numerals refer to the like elements. The present disclosure may, however, be embodied in many different forms and should not be construed as being limited to the embodiment set forth herein; rather, these embodiments are provided so that the present disclosure will be thorough and complete, and will fully convey the concept of the

disclosure to those skilled in the art.

[0022] In the following detailed description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are schematically shown in order to simplify the drawing.

[0023] Structures of light guide assemblies according to exemplary embodiments of the present disclosure are schematically shown in the drawings. The light guide assemblies may be utilized in various kinds of lighting and/or signaling devices, for example in a motor vehicle, for guiding light from a light source to exit from the lighting and/or signaling device in a desired direction.

[0024] As shown in Figure 1, a light guide assembly 100 mainly comprises a plurality of (for example two or more) first light guide elements 110, a second light guide element 120 spaced apart from the first light guide elements 110 in a first direction X, and a support frame 130. There may be provided two or more first light guide elements 110, which are spaced apart from one another in a second direction Y perpendicular to the first direction X, and configured to receive and guide light from light sources 1 such that the light are uniformly distributed in a plane (for example, a YZ plane) perpendicular to the first direction X. In some examples, each of the first light guide elements 110 of the light guide assembly 100 is arranged to receive light from at least one light source; for example, one or more light sources are located at a light incidence side of a same one first light guide element.

[0025] The second light guide element 120 is spaced apart from the first light guide elements 110 by a distance in the first direction X, and configured to receive the light from the first light guide elements 110 and to guide light entering the second light guide element 120 to exit in a predetermined direction. The support frame 130 is configured to connect and support the first light guide elements 110 and the second light guide element 120, such that the first light guide elements 110, the second light guide element 120 and the support frame 130 are formed into an assembly which will be easily mounted. Exemplarily, all or a portion of the support frame is made of a same material as the first light guide elements and/or the second light guide elements, for example, the support frame, the first light guide elements and the second light guide elements are formed into one piece.

[0026] In this text, for convenience of description, a case in which the light guide assembly is configured to guide light from the light source to exit in a fore-and-aft direction of a motor vehicle will be taken as an example for description, but apparently, embodiments of the present disclosure are not limited to this, and depending on specific application situations, the light guide assembly may guide light from the light source to exit in other directions. In the figures of the present application, the

X direction indicates a first direction in which the first light guide elements and the second light guide elements are spaced apart from one another, and which represents a fore-and-aft direction of a motor vehicle, for example a positive X direction points to the front of the motor vehicle while a negative X direction points to the rear of the motor vehicle; the Y direction indicates a second direction perpendicular to the first direction, for example, a horizontal, transversal direction of the motor vehicle; and the Z direction indicates a third direction perpendicular to the first and second directions, for example a height direction of the motor vehicle. The predetermined direction in which the light guide assembly guides light from the light source to exit may include the first direction, for example, the light guide assembly guides light from the light source to exit or disperse in one or more directions, where some of the light may exit in the first direction. In some examples, as shown in the Figures, a light outgoing surface of the second light guide element 120 may be provided with a light distribution structure configured to guide light entering the second light guide element to exit in a desired or predetermined direction and/or in a desired pattern.

[0027] In illustrated embodiments, the support frame 130 comprises a first connection section 131 and a second connection section 132. The first connection section 131 connects and supports adjacent first light guide elements 110. The second connection section 132 is connected with and supports the second light guide element 120. In some examples, the second connection section 132 is provided between the first connection section 131 and the second light guide element 120, and one or more second connection section may be disposed between the second light guide element and one first connection section. As shown in the Figures, the first connection section has a substantially arch or arc shape. It is noted that the first connection section may have other shape, as long as it is not arranged in a light path of light emitted from the first light guide elements 110 and entering the second light guide element 120.

[0028] As shown in Figures 3 to 7, the second connection section 132 comprises an engagement part 1321 connected with the second light guide element 120, such that when viewed in the first direction X, the engagement part 1321 overlaps with a portion of the second light guide element 120 and is configured to guide light entering the engagement part 1321 to be incident in the first direction X into the portion of the second light guide element 120 overlapping with the engagement part 1321 and finally to exit from the second light guide element 120 in the predetermined direction, while portions of the second light guide element 120 not overlapping with the second connection section 132 will normally guide light from the first light guide elements 110 to exit in the predetermined direction, thus it can be avoided that no light would exit from the overlapping portion due to a connection section or structure in a conventional design guiding light emitted toward the overlapping portion to other positions of the second light guide element, and thereby a dark region

can be avoided at a light outgoing side of the light guide assembly or of a lighting and/or signaling device equipped with the light guide assembly, improving lighting effect of the lighting and/or signaling device.

[0029] In some embodiments, at least one of the second light guide element and the first light guide element may include a Fresnel lens. For example, as shown in Figures 1 to 5, the first light guide element 110 is a semi-cylindrically shaped Fresnel lens, a surface (that is, a light outgoing surface) of which faces away from the light source 1, is formed with a plurality of corrugated structures, such as sawtooth-shaped structures, which are configured to guide light from the light source 1 to be uniformly distributed in a plane substantially perpendicular to the first direction X, so as to lighten the second light guide element 120. In the illustrated embodiments, the second light guide element 120 is a linear Fresnel lens having a length extending in the second direction Y and a width W2 extending in the third direction Z, as shown in Figures 1 to 3. In some examples, a width W1 of the engagement part 1321 extending in the third direction Z is smaller than the width W2 of the second light guide element 120 extending in the third direction Z, as shown in Figures 2 to 3; that is, the second light guide element 120 is only partly overlapped with the engagement part 1321 of the second connection section 132 in the third direction Z, thereby the light path from the first light guide elements to the second light guide element will be affected or interfered by the second connection section as less as possible while the second connection section provides sufficient support and connect functions for the first light guide elements and the second light guide element.

[0030] A surface (that is, a light incidence surface) of the second light guide element 120 facing the first light guide elements 110 is formed with a plurality of corrugated structures 123, such as sawtooth-shaped structures, which are configured to guide light from the first light guide elements 110 to enter the second light guide element and then travel in the first direction, as shown in Figures 4 and 5. In some examples, the corrugated structures 123 of the linear second light guide element 120 may extend within the range of the width W2 in the third direction Z. Exemplarily, the corrugated structures 123 each comprise an inclined surface 1231, and respective inclined surfaces are inclined at different angles relative to the first direction X, such that each inclined surface can reflect light entering the corresponding corrugated structure and reaching the inclined surface towards the first direction X. Inclined angle and direction of the inclined surface 1231 may be determined according to a position of the inclined surface 1231 relative to the light source, such that most of the light entering the corresponding corrugated structure and reaching the inclined surface are reflected towards the first direction X, and preferably, reflected in a total reflection way towards the first direction X.

[0031] In some embodiments, as shown in Figures 3

to 7, the engagement part 1321 comprises at least one wall face 1323 in contact with air, and the at least one wall face 1323 is configured or arranged to guide, in a reflection way and preferably in a total reflection way, light entering the engagement part and reaching the wall face to be incident into or enter the second light guide element 120 in the first direction X from the portion of the second light guide element 120 overlapping with the engagement part 1321, thus it can be avoided that the light from the first light guide elements 110 is otherwise guided by the engagement part 1321 to other positions of the second light guide element 120 to cause no light exiting from the overlapping portion, and thereby a dark region can be avoided at a light outgoing side of the light guide assembly or of a lighting and/or signaling device equipped with the light guide assembly, improving lighting effect of the lighting and/or signaling device.

[0032] In the embodiments shown in Figures 3 to 6, the engagement part 1321 further comprises a hollowed-out structure 1322 penetrating through the engagement part 1321 in the third direction Z, thereby the hollowed-out structure 1322 comprises or defines the wall face 1323. As shown in the Figures, the hollowed-out structure 1322 comprises two inner wall faces 1323 inclined in different directions with respect to the first direction X, for example, the wall face 1323 at the left side in the Figures is inclined leftwards relative to the first direction X so as to reflect, in substantially the first direction X, light entering the engagement part 1321 and reaching the wall face from the left light source 1 or the left first light guide element 110, while the wall face 1323 at the right side in the Figures is inclined rightwards relative to the first direction X so as to reflect, in substantially the first direction X, light incident into the engagement part 1321 and reaching the wall face from the right light source 1 or the right first light guide element 110. In Figures 3 to 6, the two wall faces 1323 of each hollowed-out structure form a substantially inverted-V shape having a vertex directed to the second light guide element 120 or to the first direction X. For example, the hollowed-out structure 1322 may have a substantially triangular section shape, but embodiments of the present disclosure are not limited to this, and the hollowed-out structure may also have other section shape, which comprises one or more wall faces configured to guide (for example, reflect) light entering the engagement part towards the first direction X.

[0033] In other embodiments, the engagement part may not have the above hollowed-out structure, and instead, the above wall face is defined by an outer surface. As shown in Figure 7, two or more second connection sections 132' spaced apart from one another may be disposed between the second light guide element 120 and one first connection section 131, and each second connection section 132' may have the above the engagement part 1321, or may have the engagement part 1321' shown in Figure 7, an outer side surface of the engagement part 1321' defines a wall face 1323, which is inclined relative to the first direction X so as to reflect, in the first

direction X, light entering the engagement part 1321' and reaching the wall face from the light source 1 or from the first light guide element 110. Two or more second connection sections 132' may be spaced apart from one another in the second direction Y, or may also be spaced apart from one another in the third direction Z. In some examples, the second connection sections 132' are spaced apart from one another in the second direction Y, such that the wall faces 1323 of two adjacent second connection sections 132' may be inclined in different directions with respect to the first direction X so as to form a substantially inverted-V shape, as shown in Figure 7.

[0034] In some embodiments of the present disclosure, as shown in Figures 5 to 7, when viewed in the third direction, the wall face 1323 and the inclined surface 1231, which are adjacent to each other in the third direction Z, are aligned or flush with each other, thereby the engagement part 1321 having the wall face 1323 can have the same or similar light guiding function as the second light guide element 120 or other corrugated structures 123, so as to prevent a normal light path from being otherwise adversely affected or interfered by structures for supporting and connecting the light guide elements in the conventional designs, such that light will exit from various positions (including a position where the second light guide element overlaps with the support and connection structure such as the second connection section) on the light outgoing surface of the second light guide element, thereby a dark region can be avoided at the light outgoing side of the light guide assembly or of a lighting and/or signaling device equipped with the light guide assembly, improving lighting effect of the lighting and/or signaling device.

[0035] An embodiment of the present disclosure further provides a lighting or signaling device, comprising a plurality of light sources and the light guide assembly described in any of the above embodiments, each of the first light guide elements of the light guide assembly being configured to receive light from at least one of the light sources.

[0036] The lighting and/or signaling device described in embodiments of the present disclosure may include any kind of lighting lamp and/or signaling lamp for a motor vehicle, for example, a central high mount stop lamp, a direction indicator lamp, a position lamp, a tail stop lamp and the like.

[0037] An embodiment of the present disclosure further provides a motor vehicle comprising the above-described lighting and/or signaling device.

[0038] Although the present disclosure has been described with reference to the accompanying drawings, the embodiments disclosed in the attached drawings are intended to illustrate the preferred embodiment of the disclosure and should not be construed as being limitative to the disclosure. Scales in the figures are only illustrative and should not be construed as being limitative to the disclosure.

[0039] Although some embodiments of the general

concept of the disclosure have been described and illustrated with reference to the accompanying drawings, it would be appreciated by those ordinary skilled in the art that various changes or modifications may be made to these embodiments without departing from principle and spirit the disclosure. The scope of the present invention is solely defined by the appended claims and their equivalents.

Claims

1. A light guide assembly (100) comprising a plurality of first light guide elements (110), a second light guide element (120) spaced apart from the first light guide elements (110) in a first direction (X), and a support frame (130), wherein, the plurality of first light guide elements (110) are spaced apart from one another in a second direction (Y) perpendicular to the first direction (X), and configured to receive and guide light from light sources (1) such that the light is uniformly distributed in a plane perpendicular to the first direction (X); the second light guide element (120) is configured to receive the light from the first light guide elements (110) and to guide light entering the second light guide element (120) to exit in a predetermined direction; and the support frame (130) connects and supports the first light guide elements (110) and the second light guide element (120), and the support frame (130) comprises an engagement part (1321,1321') connected with the second light guide element (120) such that when viewed in the first direction (X), the engagement part (1321,1321') overlaps with a portion of the second light guide element (120) and is configured to guide light entering the engagement part (1321,1321') to be incident in the first direction (X) into the portion of the second light guide element (120) overlapping with the engagement part (1321,1321').
2. The light guide assembly (100) according to claim 1, wherein the engagement part (1321,1321') comprises at least one wall face (1323) in contact with air, the at least one wall face (1323) being configured to guide, in a total reflection way, light entering the engagement part and reaching the at least one wall face (1323) to be incident into the second light guide element (120) in the first direction (X).
3. The light guide assembly (100) according to claim 2, wherein the engagement part (1321,1321') further comprises a hollowed-out structure (1322) penetrating through the engagement part (1321,1321') in a third direction (Z) perpendicular to the first direction (X) and the second direction (Y), the hollowed-out structure (1322) comprising or defining the at least one wall face (1323).
4. The light guide assembly (100) according to claim 3, wherein the hollowed-out structure (1322) has two said wall faces (1323) forming a substantially inverted-V shape having a vertex directed to the second light guide element (120).
5. The light guide assembly (100) according to claim 2, wherein each engagement part (1321') comprises one said wall face (1323).
6. The light guide assembly (100) according to claim 5, wherein the wall face (1323) is defined by an outer side surface of each engagement part (1321').
7. The light guide assembly (100) according to any one of claims 2 to 6, wherein the at least one wall face (1323) is inclined relative to the first direction (X) so as to reflect, in the first direction (X), light entering the engagement part (1321,1321') and reaching the at least one wall face (1323).
8. The light guide assembly (100) according to any one of claims 2 to 6, wherein a surface of the second light guide element (120) facing the first light guide elements (110) is provided with a plurality of corrugated structures (123) each comprising an inclined surface (1231) configured to guide light from the first light guide elements (110) to be reflected in the first direction (X).
9. The light guide assembly (100) according to claim 8, wherein the corrugated structures (123) include sawtooth-shaped structures.
10. The light guide assembly (100) according to claim 8, wherein a width (W1) of the engagement part (1321,1321') in a third direction (Z) perpendicular to both the first direction (X) and the second direction (Y) is smaller than a width (W2) of the second light guide element (120), such that when viewed in the third direction (Z), the inclined surface and the wall face (1323), which are adjacent to each other in the third direction (Z), are at least partly aligned with each other.
11. The light guide assembly (100) according to any one of claims 1 to 6, wherein the support frame (130) comprises:
 - a first connection section (131) connecting and supporting adjacent ones of the first light guide elements (110); and
 - a second connection section (132) connected between the first connection section (131) and the second light guide element (120) and supporting the second light guide element (120), the

second connection section (132) comprising the engagement part (1321,1321').

12. The light guide assembly (100) according to any one of claims 1 to 6, wherein at least one of the second light guide element (120) and the first light guide elements (110) includes a Fresnel lens. 5
13. The light guide assembly (100) according to any one of claims 1 to 6, wherein the first light guide elements (110), the second light guide element (120) and the support frame (130) are formed into one piece. 10
14. A lighting or signaling device, comprising: 15
- a plurality of light sources (1); and
the light guide assembly (100) of any one of claims 1 to 13, each of the first light guide elements (110) of the light guide assembly (100) being configured to receive light from a corresponding one of the light sources (1). 20
15. A motor vehicle, comprising the lighting or signaling device of claim 14. 25

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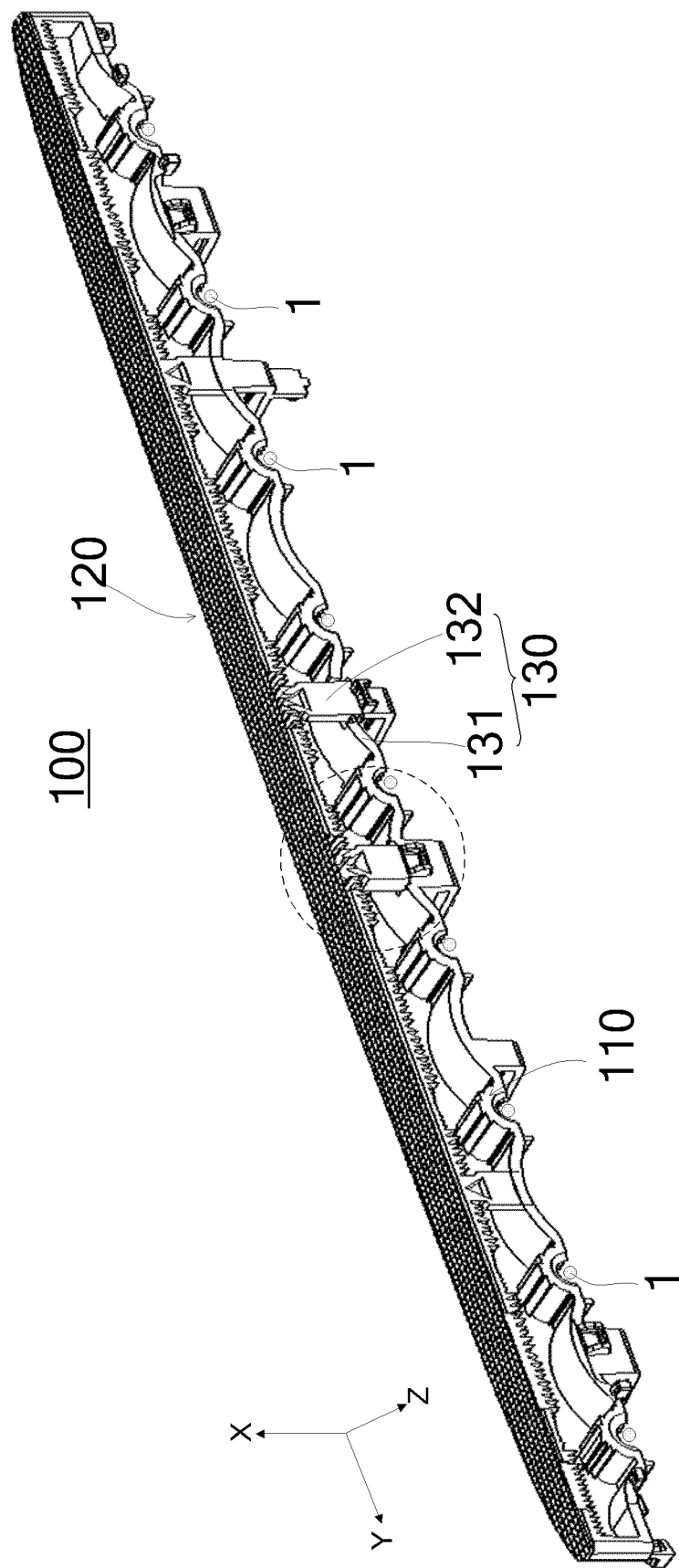


Figure 1

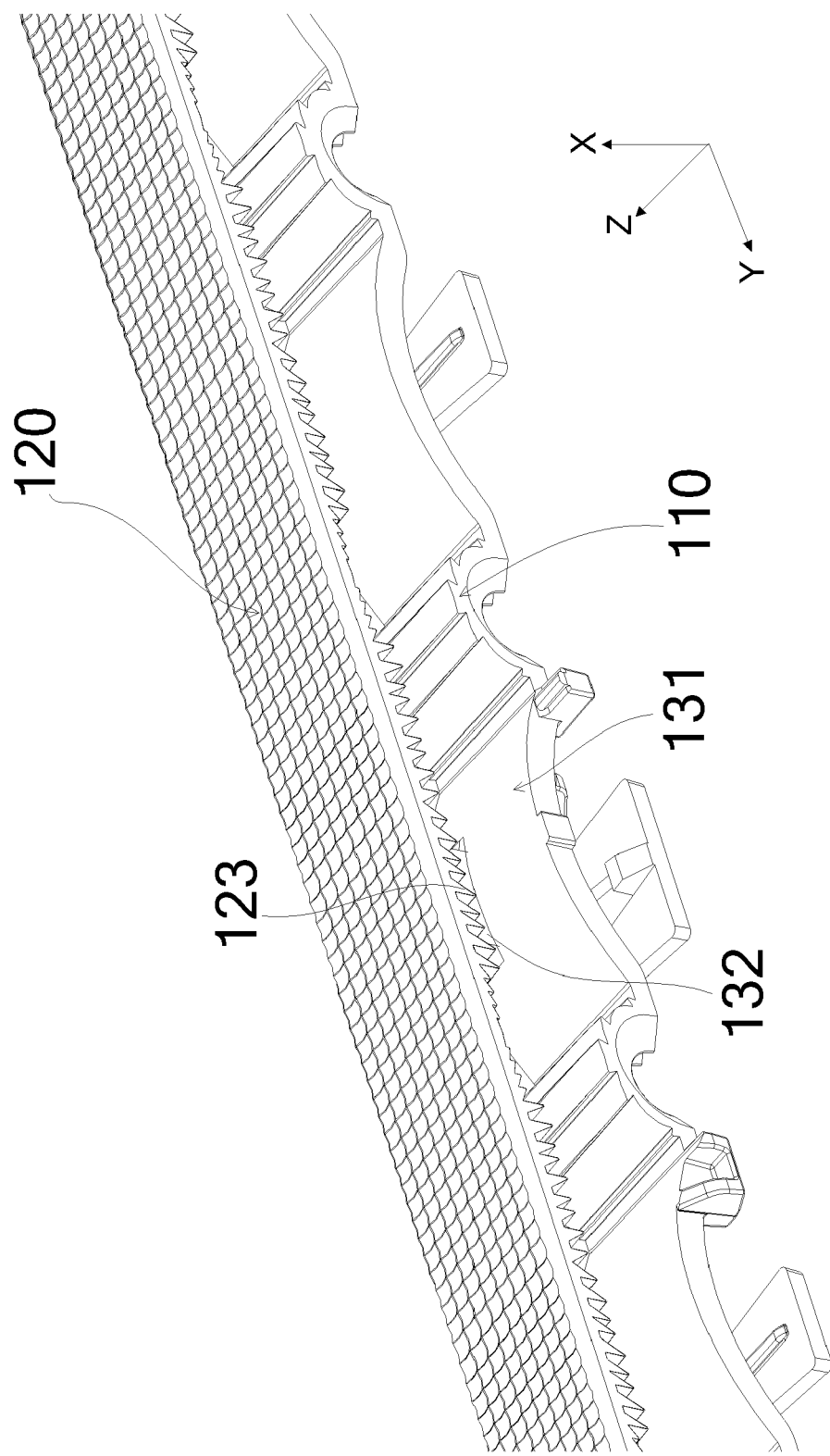


Figure 2

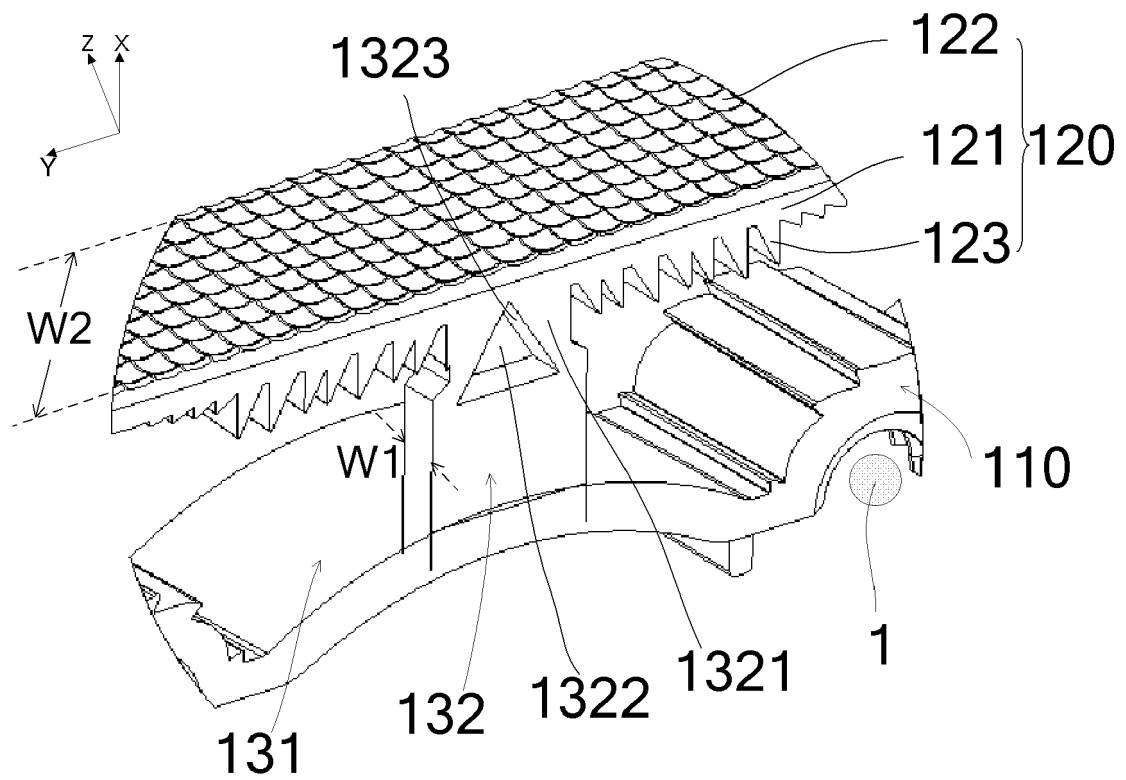


Figure 3

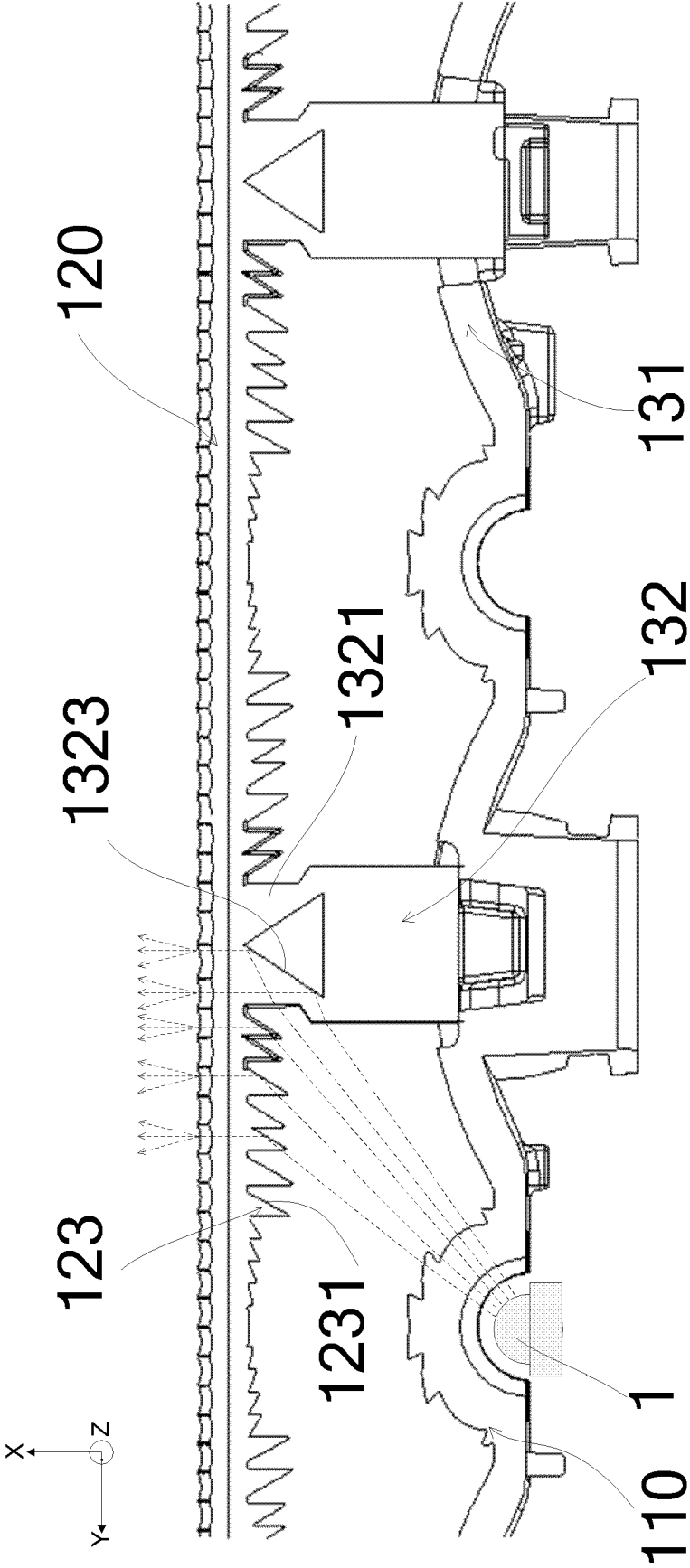


Figure 4

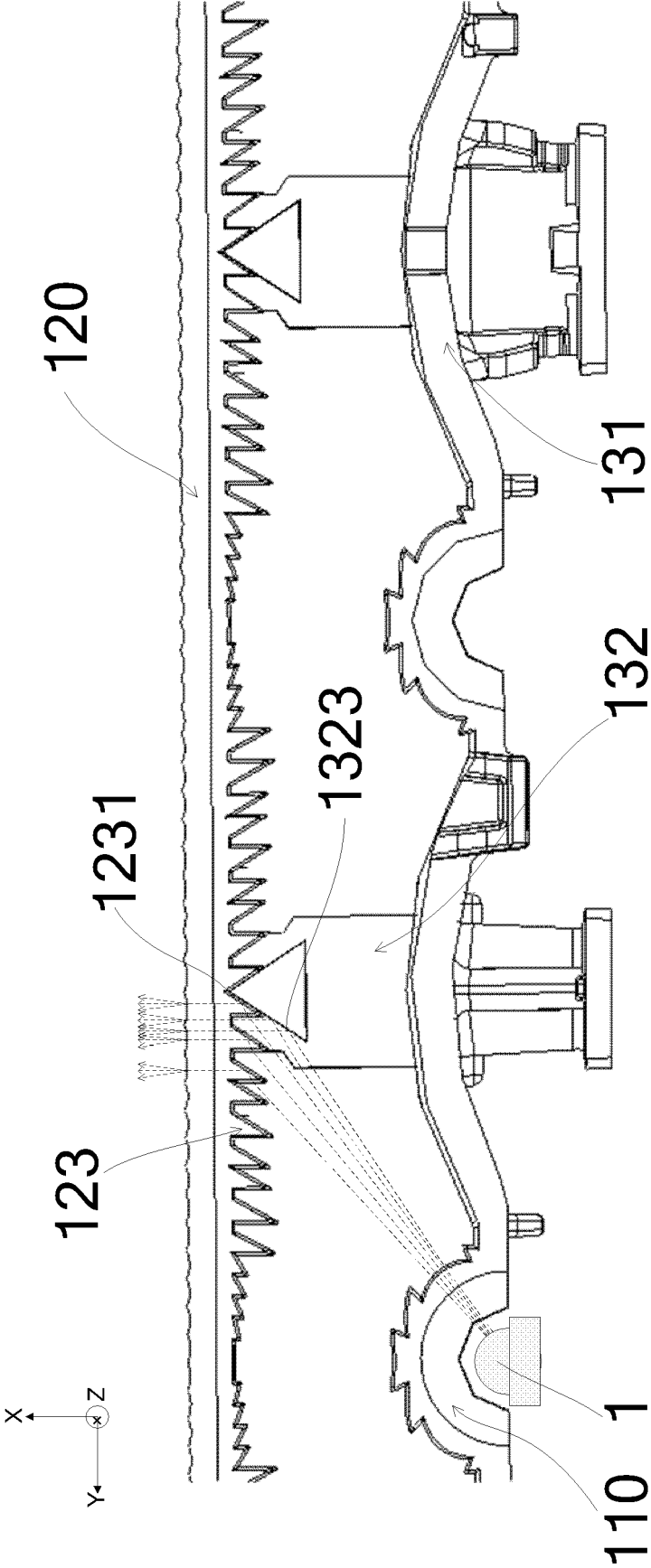


Figure 5

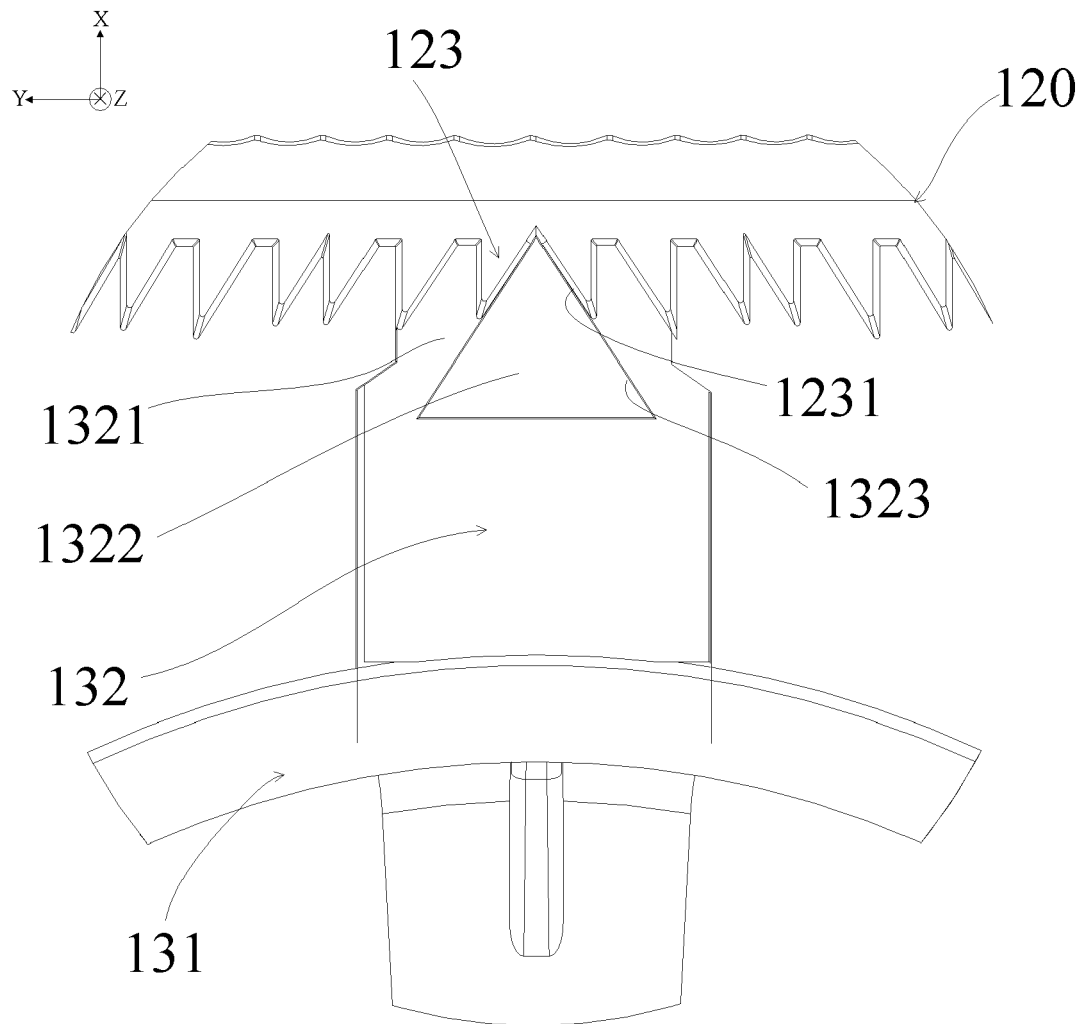


Figure 6

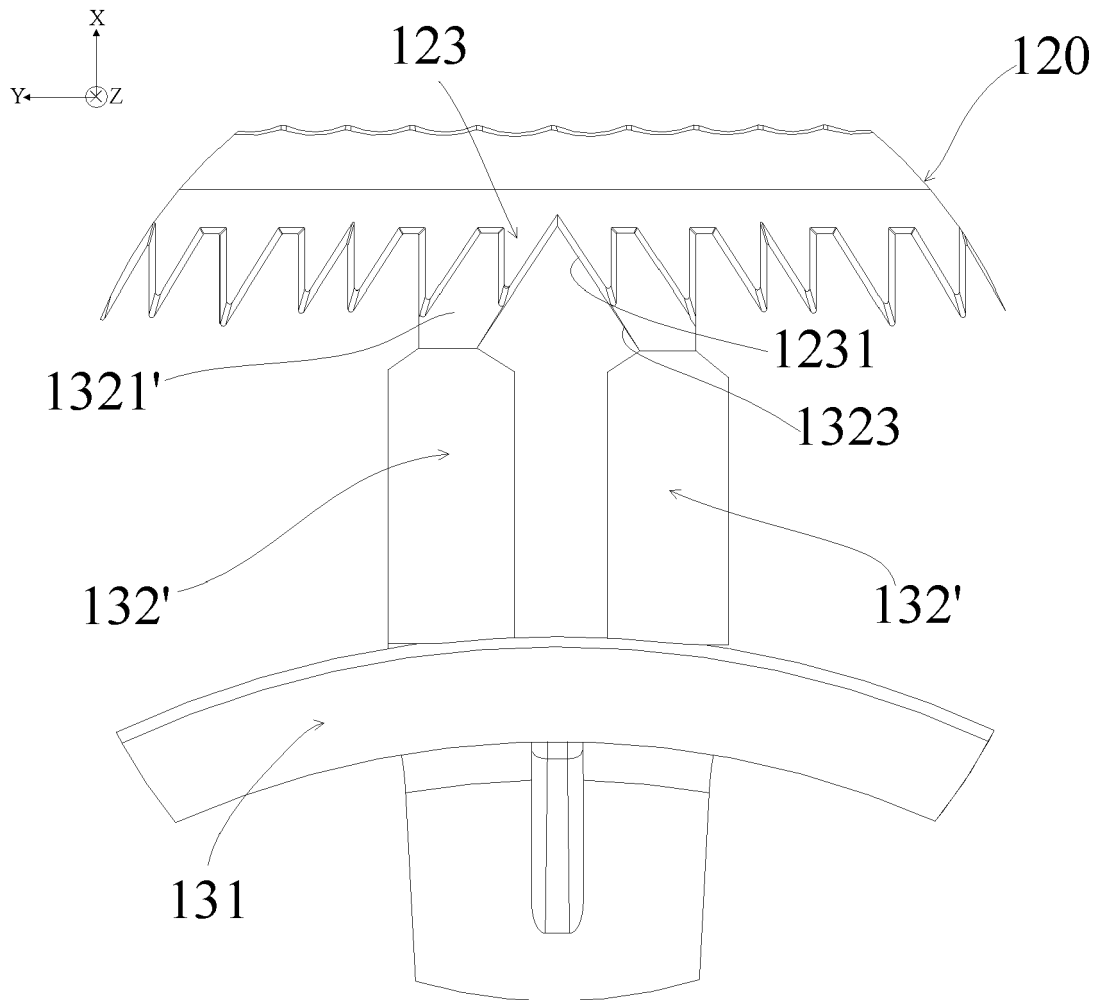


Figure 7



EUROPEAN SEARCH REPORT

Application Number
EP 19 16 0147

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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A	* paragraphs [0030] - [0054]; figures 1-3 *	2-10	F21S43/239 F21S43/241 F21S43/243
A	WO 2017/103267 A1 (VALEO VISION BELGIQUE [BE]) 22 June 2017 (2017-06-22) * abstract; figures *	1-15	F21S43/249 F21S43/14 F21S43/27 B60Q1/00
A	EP 2 317 214 A1 (VALEO VISION [FR]) 4 May 2011 (2011-05-04) * abstract; figures *	1-15	F21S43/20 F21S43/15
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A	US 2013/021815 A1 (KOIZUMI HIROYA [JP]) 24 January 2013 (2013-01-24) * abstract; figures *	1-15	TECHNICAL FIELDS SEARCHED (IPC) F21S B60Q
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 July 2019	Examiner Panatsas, Adam
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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