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(54) **ARRAY LIGHT CURTAIN VEHICLE LAMP**

(57) An array light curtain vehicle lamp, comprising: a base support (301), an LED assembly (302), a light curtain inner lens (303), an optimization inner lens (304), and an external decorative ring (305). The base support (301) is mounted on a vehicle me body structure. The LED assembly (302) is mounted on the base support (301), and comprises a circuit board (321) and LED light sources (322). The light curtain inner lens (303) is mounted in front of the base support (301), and converts light emitted by the LED light sources (322) into light curtain-shaped, uniform, horizontal light. The optimization inner lens (304) is mounted in front of the light curtain

inner lens (303), and an optical optimization structure is formed thereon, the optical optimization structure optimizing the uniformity of the light and forming an optical form. The external decorative ring (305) is mounted in front of the optimization inner lens (304), and an optical shading structure is provided thereon, the optical shading structure blocking a portion of the light in order to enhance the optical form. The present array light curtain vehicle lamp features convenient assembly and disassembly, and achieves a light curtain effect using a compact structure, and is able to flexibly implement dotmatrix optical display and forming effects.

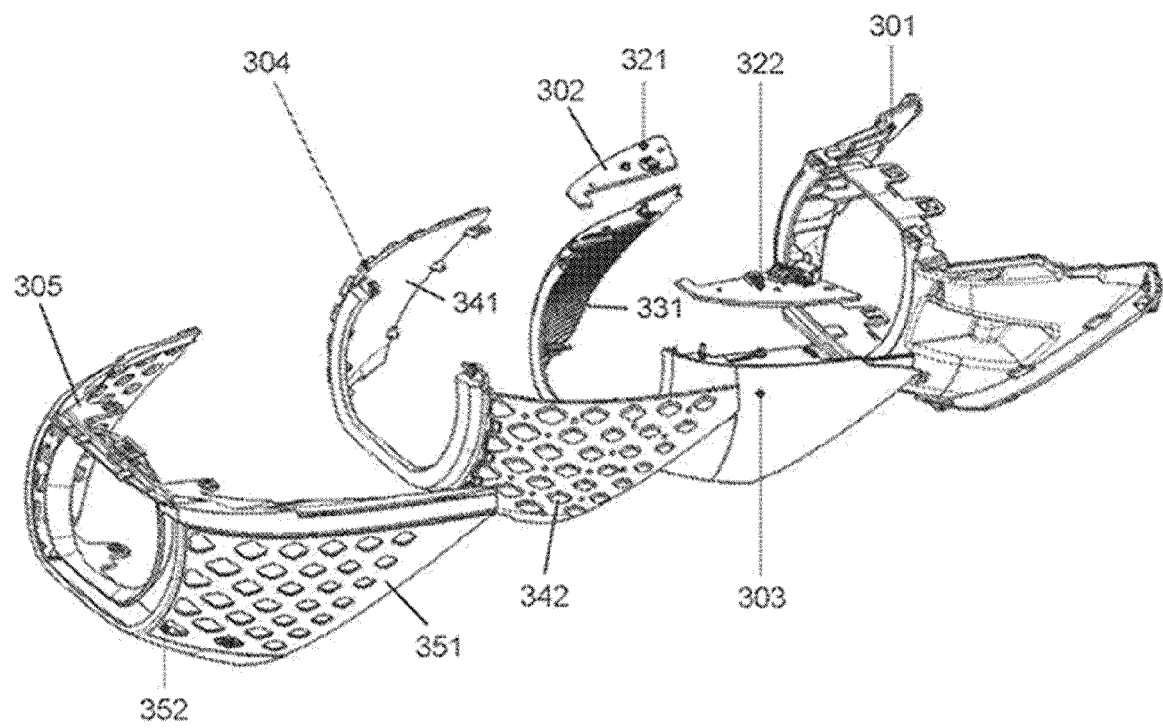


Fig.3

Description

Technical field

[0001] The present invention relates to the field of motor vehicle manufacture, in particular to a motor vehicle lighting assembly.

Background art

[0002] The composition of the headlamp of a motor vehicle generally includes a high beam lamp, a low beam lamp, a turn signal lamp, a daytime running lamp, a corner lamp and a position lamp. Of these, the high beam lamp, low beam lamp, turn signal lamp and corner lamp are functional lamps, mainly for road surface illumination, turning and auxiliary turning, etc. The daytime running lamp and position lamp are an ornamental lamp and an indicating lamp. Functional lamps such as the high beam lamp, low beam lamp, turn signal lamp and corner lamp are switched on when they need to be used, and ordinarily remain switched off. Ornamental lamps and indicating lamps such as the daytime running lamp and position lamp will all be switched on when the vehicle is started, and are very identifiable and ornamental. Daytime running lamps and position lamps have gradually become an important component part of the design of a vehicle's appearance, and are playing an ever more prominent role in brand promotion and model identification, so are receiving a lot of attention from vehicle manufacturers everywhere.

[0003] At present, LEDs are usually used as light sources for ornamental lamps and indicating lamps. The light effect is mainly achieved in the following two ways: The first way is a solution in which an LED light source cooperates with a reflector. Figs. 1a and 1b show schematic drawings of a structure used in the prior art in which an LED light source cooperates with a reflector, wherein Fig. 1b is a sectional drawing of Fig. 1a in direction A-A. As shown in Figs. 1a and 1b, in this solution, an LED assembly 101 is mounted at the top. The LED assembly 101 consists of a circuit board (PCB) and an LED light source mounted on the PCB. A reflecting bowl 102 is arranged at a rear part of a lamp body. Light rays emitted by the LED light source are reflected by the reflecting bowl 102 straight ahead, i.e. ahead of the vehicle lamp. If it is desired to achieve an array or point array optical effect, it will be necessary to arrange an LED light source in the form of an array inside the light body, and carry out precise design and processing of the shape, dimensions and position of the reflecting bowl, to obtain a display effect of the reflected array light source. This solution requires a large space to arrange the LED array and the reflecting bowl, with the result that the overall volume of the lamp body is large, making cost control and space utilization difficult. Furthermore, the optical effect formed directly by reflection by the reflection bowl is unstable, and assembly errors are difficult to avoid during process-

ing and installation of the reflecting bowl; consequently, the final actual optical effect is often different from the design effect.

[0004] The second way is a solution in which an LED light source cooperates with a light guide. Figs. 2a and 2b show schematic drawings of a structure used in the prior art in which an LED light source cooperates with a light guide, wherein Fig. 2b is a sectional drawing of Fig. 2a in direction A-A. As shown in Figs. 2a and 2b, in this solution, an LED light source is arranged at one end of a light guide 201, the light guide 201 being fixed at the required position on a lamp body by means of light guide supports 202, 203. When the LED light source lights up, light rays are transmitted through the light guide, and all of the positions where the light guide is located will emit light, thereby achieving a strip-like optical effect. The light guide has a good flexibility characteristic, and can be designed to have various line shapes such as arc shapes, straight lines and polylines; moreover, the light guide will homogenize the light rays, so that the optical effect displayed is more uniform. However, there are also very significant drawbacks associated with using the light guide solution. Firstly, the cost is high; to install a light guide, it is first necessary to install light guide supports, and the material costs and work costs associated with this are both high, so light guides can only be used in high-end models. Secondly, light guides are mainly used for linetype optical effects, being unable to achieve point array optical effects, so have considerable limitations with regard to optical styling.

[0005] In summary, ornamental lamps and indicating lamps with LEDs as light sources in the prior art have certain limitations with regard to implementation cost and optical styling flexibility, so are unable to fully meet market demands.

Summary of the invention

[0006] The aim of the present invention is to propose a structurally simple array light curtain vehicle lamp with a low implementation cost.

[0007] According to an embodiment of the present invention, an array light curtain vehicle lamp is proposed, comprising: a base support an LED assembly, a built-in light curtain lens, a built-in optimizing lens and an outer trim ring. The base support is mounted on a vehicle body structure. The LED assembly is mounted on the base support, and the LED assembly comprises a circuit board and an LED light source. The built-in light curtain lens is mounted in front of the base support, the built-in light curtain lens converting light emitted by the LED light source to uniform horizontal light in the form of a light curtain. The built-in optimizing lens is mounted in front of the built-in light curtain lens, with an optical optimization structure formed on the built-in optimizing lens, the optical optimization structure optimizing the uniformity of light and forming an optical design. The outer trim ring is mounted in front of the built-in optimizing lens, with an

optical shielding structure provided on the outer trim ring, the optical shielding structure blocking a portion of light to enhance the optical design.

[0008] In one embodiment, the array light curtain vehicle lamp is arranged around a headlamp, with the base support, the built-in light curtain lens, the built-in optimizing lens and the outer trim ring being assembled in a sequentially nested manner; the base support, the built-in light curtain lens, the built-in optimizing lens and the outer trim ring all have a middle opening and two arc-shaped wings extending from the middle opening to two sides, and the position of the middle opening corresponds to the position of the headlamp.

[0009] In one embodiment, the LED assembly is mounted at the top of the base support, and multiple LED light sources are arranged on the circuit board, the multiple LED light sources producing vertical light rays shining downward.

[0010] In one embodiment, an optical pattern is formed on an inner side of the built-in light curtain lens, the optical pattern converting vertical light rays to horizontal light rays.

[0011] In one embodiment, the optical pattern is uniformly distributed horizontal stripes, distributed on the built-in light curtain lens at inner sides of the two arc-shaped wings, and the optical pattern converts vertical light rays to uniformly distributed horizontal light rays, presenting a light curtain form.

[0012] In one embodiment, the optical optimization structure on the built-in optimizing lens comprises an arc-shaped light-transmitting plate and a light-transmitting protrusion; the arc-shaped light-transmitting plate optimizes the uniformity of light, and the light-transmitting protrusion forms the optical design.

[0013] In one embodiment, the arc-shaped light-transmitting plate of the built-in optimizing lens forms two arc-shaped wings, and the light-transmitting protrusion is formed on the arc-shaped light-transmitting plate; the quantity, shape, size and position of the light-transmitting protrusion are determined according to the required optical design.

[0014] In one embodiment, the shielding structure of the outer trim ring is an arc-shaped plate with a light-transmitting hole, the arc-shaped plate does not transmit light, the arc-shaped plate forms two arc-shaped wings, the light-transmitting hole is matched to the light-transmitting protrusion on the built-in optimizing lens, and the arc-shaped plate and light-transmitting hole enhance the optical design.

[0015] In one embodiment, the quantity, shape, size and position of the light-transmitting hole are in one-to-one correspondence with those of the light-transmitting protrusion on the built-in optimizing lens.

[0016] The array light curtain vehicle lamp of the present invention is formed of multiple components stacked in sequence one in front of another, so assembly and disassembly are convenient. The direction of light rays is changed and light rays are homogenized by

means of two sets of lenses, so a light curtain effect is achieved using a compact structure. As the optical design is achieved by means of the light-transmitting protrusion and the optical shielding structure, point-array optical display and design effects can be achieved flexibly according to requirements.

Brief description of the drawings

[0017] The above and other features, properties and advantages of the present invention will become clearer through the following description with reference to the drawings and embodiments; in the drawings, identical reference labels always indicate identical features, wherein:

Figs. 1a and 1b show schematic drawings of a structure used in the prior art in which an LED light source cooperates with a reflector, wherein Fig. 1b is a sectional drawing of Fig. 1a in direction A-A.

Figs. 2a and 2b show schematic drawings of a structure used in the prior art in which an LED light source cooperates with a light guide, wherein Fig. 2b is a sectional drawing of Fig. 2a in direction A-A.

Fig. 3 shows an exploded structural drawing of an array light curtain vehicle lamp according to an embodiment of the present invention.

Fig. 4 shows a longitudinal sectional structural drawing of an array light curtain vehicle lamp according to an embodiment of the present invention.

Fig. 5 shows a transverse sectional structural drawing of an array light curtain vehicle lamp according to an embodiment of the present invention.

Fig. 6 shows a structural drawing of an array light curtain vehicle lamp according to an embodiment of the present invention in assembled form.

Detailed description of the invention

[0018] Referring to Figs. 3 - 6, Figs. 3 - 6 show a structural drawing of an array light curtain vehicle lamp according to an embodiment of the present invention. Fig. 3 shows an exploded structural drawing of the array light curtain vehicle lamp, Fig. 4 and Fig. 5 are respectively longitudinal and transverse sectional structural drawings of the array light curtain vehicle lamp, and Fig. 6 is a structural drawing of the array light curtain vehicle lamp in assembled form.

[0019] As shown in the figures, the array light curtain vehicle lamp comprises: a base support 301, an LED assembly 302, a built-in light curtain lens 303, a built-in optimizing lens 304 and an outer trim ring 305. The base support 301 is mounted on a vehicle body structure. The LED assembly 302 is mounted on the base support 301, and the LED assembly 302 comprises a circuit board 321 and an LED light source 322. The built-in light curtain lens 303 is mounted in front of the base support 301, and the built-in light curtain lens 303 converts light emitted

by the LED light source 302 to uniform horizontal light in the form of a light curtain. The built-in optimizing lens 304 is mounted in front of the built-in light curtain lens 303, and an optical optimization structure is formed on the built-in optimizing lens 304; the optical optimization structure optimizes the uniformity of light and forms an optical design. The outer trim ring 305 is mounted in front of the built-in optimizing lens 304, and an optical shielding structure is provided on the outer trim ring 305; the optical shielding structure blocks a portion of light to enhance the optical design. In the embodiment shown in Fig. 3, the array light curtain vehicle lamp is arranged around a headlamp, with the base support 301, the built-in light curtain lens 303, the built-in optimizing lens 304 and the outer trim ring 305 being assembled in a sequentially nested manner; the base support 301, the built-in light curtain lens 303, the built-in optimizing lens 304 and the outer trim ring 305 all have a middle opening and two arc-shaped wings extending from the middle opening to two sides. The styling dimensions of the base support 301, the built-in light curtain lens 303, the built-in optimizing lens 304 and the outer trim ring 305 are all matched to each other, and for this reason the base support 301, the built-in light curtain lens 303, the built-in optimizing lens 304 and the outer trim ring 305 are able to be assembled by being stacked in sequence, one in front of another. The positions of the middle openings of the base support 301, the built-in light curtain lens 303, the built-in optimizing lens 304 and the outer trim ring 305 correspond to the position of the headlamp, such that after fitting, the array light curtain vehicle lamp can surround the headlamp.

[0020] Referring to Figs. 3 and 4, the LED assembly 302 is mounted at the top of the base support 301, and multiple LED light sources 322 are arranged on the circuit board 321. The multiple LED light sources 322 produce vertical light rays shining downward. In the embodiment shown, the light rays produced by the multiple LED light sources 322 shine vertically downward to an inner side of the built-in light curtain lens 303.

[0021] The main function of the built-in light curtain lens 303 is to change the direction of light and homogenize the light rays, to obtain a light curtain effect. In one embodiment, an optical pattern is formed on the inner side of the built-in light curtain lens 303, and the optical pattern converts vertical light rays to horizontal light rays. In the embodiment shown, the optical pattern 331 formed on the inner side of the built-in light curtain lens 303 is uniformly distributed horizontal stripes, distributed on the built-in light curtain lens at inner sides of the two arc-shaped wings; the optical pattern 331 converts vertical light rays to uniformly distributed horizontal light rays, presenting a light curtain form.

[0022] The main function of the built-in optimizing lens 304 is to further optimize the uniformity of light and form an optical design. In one embodiment, the optical optimization structure on the built-in optimizing lens 304 comprises an arc-shaped light-transmitting plate 341 and

light-transmitting protrusions 342. The arc-shaped light-transmitting plate 341 optimizes the uniformity of light; the light-transmitting protrusions 342 form the optical design. In the embodiment shown, the arc-shaped light-transmitting plate 341 of the built-in optimizing lens 304 forms two arc-shaped wings, and the light-transmitting protrusions 342 are formed on the arc-shaped light-transmitting plate 341. The quantity, shapes, sizes and positions of the light-transmitting protrusions 342 are determined according to the required optical design. In the embodiment shown, the required optical design is point-array light dots arranged in an array, so light-transmitting protrusions 342 arranged in an array are formed on the arc-shaped light-transmitting plate 341. Due to the arc-shaped structure of the arc-shaped light-transmitting plate 341, the light-transmitting protrusions 342 arranged on the arc-shaped light-transmitting plate 341 are distributed along an arc-shaped surface in space. In order to obtain, from the front, an optical effect of point-array light dots arranged in an array, the sizes, shapes and positions of the light-transmitting protrusions 342 arranged on the arc-shaped light-transmitting plate 341 are adjusted slightly to obtain the required optical design.

[0023] The outer trim ring 305 is arranged in front of the built-in optimizing lens 304, and the main function of the outer trim ring 305 is to block a portion of light by means of the optical shielding structure, to enhance the display effect of the optical design. In the embodiment shown, the shielding structure of the outer trim ring 305 is an arc-shaped plate 351 with light-transmitting holes 352. The arc-shaped plate 351 does not itself transmit light; the arc-shaped plate 351 forms two arc-shaped wings of the outer trim ring 305, and the light-transmitting holes 352 are matched to the light-transmitting protrusions 342 on the built-in optimizing lens 304. The non-light-transmitting arc-shaped plate 351 and the light-transmitting holes 352 cooperate with the light-transmitting protrusions 342 to jointly enhance the optical design. In the embodiment shown, the quantity, shapes, sizes and positions of the light-transmitting holes 352 on the arc-shaped plate 351 are in one-to-one correspondence with those of the light-transmitting protrusions 342 on the built-in optimizing lens 304. Because only the light-transmitting holes 352 transmit light and the arc-shaped plate 351 is not light-transmitting, the optical shielding structure is better able to highlight the optical design formed by the light-transmitting protrusions 342, e.g. the display effect of point-array light dots arranged in an array that is formed in the embodiment shown.

[0024] The array light curtain vehicle lamp of the present invention is formed of multiple components stacked in sequence one in front of another, so assembly and disassembly are convenient. The direction of light rays is changed and light rays are homogenized by means of two sets of lenses, so a light curtain effect is achieved using a compact structure. As the optical design is achieved by means of the light-transmitting protrusions and the optical shielding structure, point-array optical dis-

play and design effects can be achieved flexibly according to requirements.

[0025] The above embodiment is provided for those skilled in the art to implement or use the present invention, but those skilled in the art could make various amendments or changes to the above embodiment without departing from the inventive concept of the present invention, so the scope of protection of the present invention is not limited by the above embodiment, but should be the maximum scope conforming to the innovative features mentioned in the claims.

Claims

1. An array light curtain vehicle lamp, **characterized by** comprising:

a base support, mounted on a vehicle body structure;
 an LED assembly, the LED assembly being mounted on the base support, and the LED assembly comprising a circuit board and an LED light source;
 a built-in light curtain lens, mounted in front of the base support, the built-in light curtain lens converting light emitted by the LED light source to uniform horizontal light in the form of a light curtain;
 a built-in optimizing lens, mounted in front of the built-in light curtain lens, with an optical optimization structure formed on the built-in optimizing lens, the optical optimization structure optimizing the uniformity of light and forming an optical design;
 an outer trim ring, mounted in front of the built-in optimizing lens, with an optical shielding structure provided on the outer trim ring, the optical shielding structure blocking a portion of light to enhance the optical design.

2. The array light curtain vehicle lamp as claimed in claim 1, **characterized in that** the array light curtain vehicle lamp is arranged around a headlamp, with the base support, the built-in light curtain lens, the built-in optimizing lens and the outer trim ring being assembled in a sequentially nested manner; the base support, the built-in light curtain lens, the built-in optimizing lens and the outer trim ring all have a middle opening and two arc-shaped wings extending from the middle opening to two sides, and the position of the middle opening corresponds to the position of the headlamp.

3. The array light curtain vehicle lamp as claimed in claim 2, **characterized in that** the LED assembly is mounted at the top of the base support, and multiple LED light sources are arranged on the circuit board,

the multiple LED light sources producing vertical light rays shining downward.

4. The array light curtain vehicle lamp as claimed in claim 3, **characterized in that** an optical pattern is formed on an inner side of the built-in light curtain lens, the optical pattern converting vertical light rays to horizontal light rays.
5. The array light curtain vehicle lamp as claimed in claim 4, **characterized in that** the optical pattern is uniformly distributed horizontal stripes, distributed on the built-in light curtain lens at inner sides of the two arc-shaped wings, and the optical pattern converts vertical light rays to uniformly distributed horizontal light rays, presenting a light curtain form.
6. The array light curtain vehicle lamp as claimed in claim 2, **characterized in that** the optical optimization structure on the built-in optimizing lens comprises an arc-shaped light-transmitting plate and a light-transmitting protrusion; the arc-shaped light-transmitting plate optimizes the uniformity of light, and the light-transmitting protrusion forms the optical design.
7. The array light curtain vehicle lamp as claimed in claim 6, **characterized in that** the arc-shaped light-transmitting plate of the built-in optimizing lens forms two arc-shaped wings, and the light-transmitting protrusion is formed on the arc-shaped light-transmitting plate; the quantity, shape, size and position of the light-transmitting protrusion are determined according to the required optical design.
8. The array light curtain vehicle lamp as claimed in claim 7, **characterized in that** the shielding structure of the outer trim ring is an arc-shaped plate with a light-transmitting hole, the arc-shaped plate does not transmit light, the arc-shaped plate forms two arc-shaped wings, the light-transmitting hole is matched to the light-transmitting protrusion on the built-in optimizing lens, and the arc-shaped plate and light-transmitting hole enhance the optical design.
9. The array light curtain vehicle lamp as claimed in claim 8, **characterized in that** the quantity, shape, size and position of the light-transmitting hole are in one-to-one correspondence with those of the light-transmitting protrusion on the built-in optimizing lens.

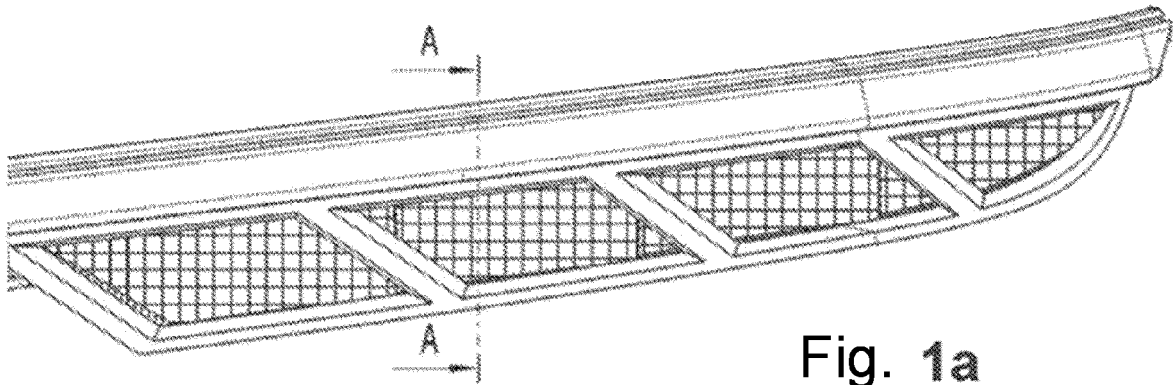


Fig. 1a

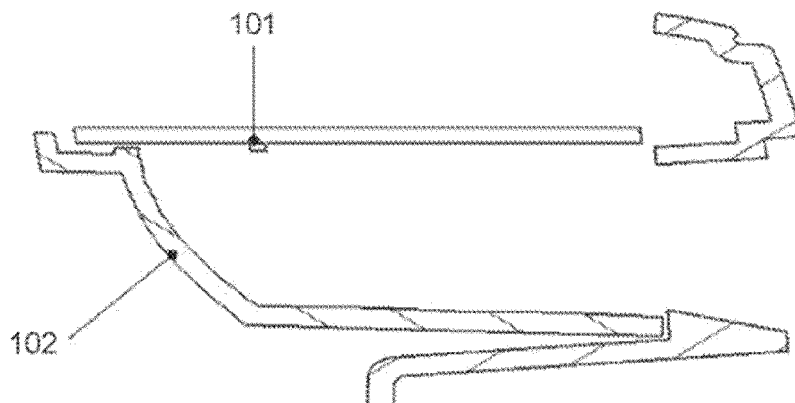


Fig. 1b

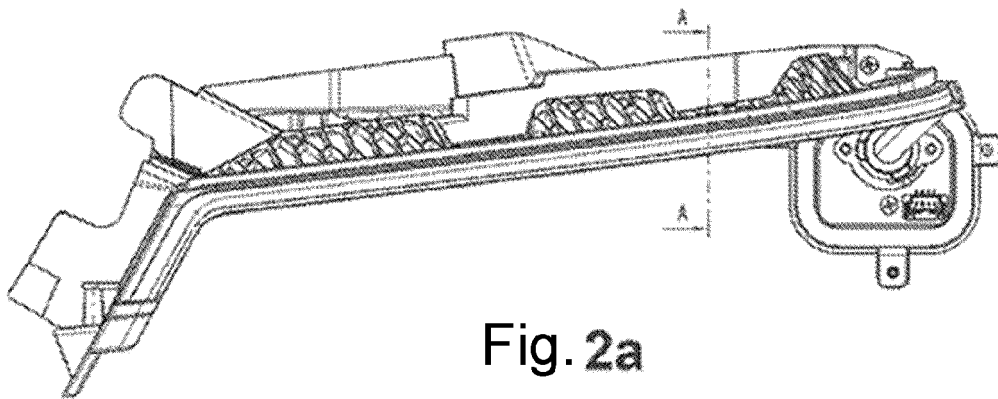


Fig. 2a

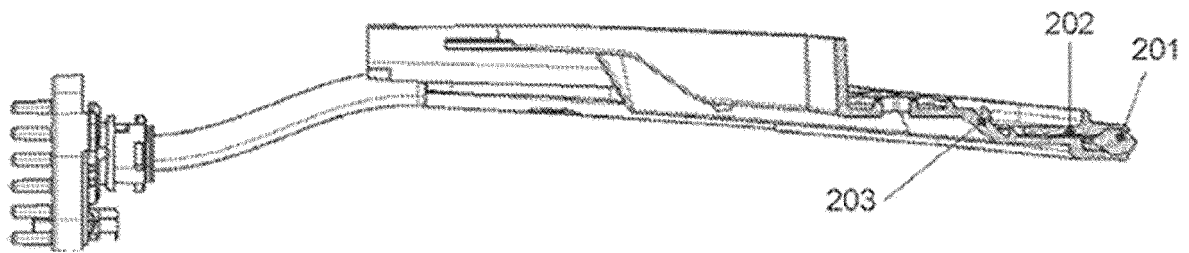


Fig. 2b

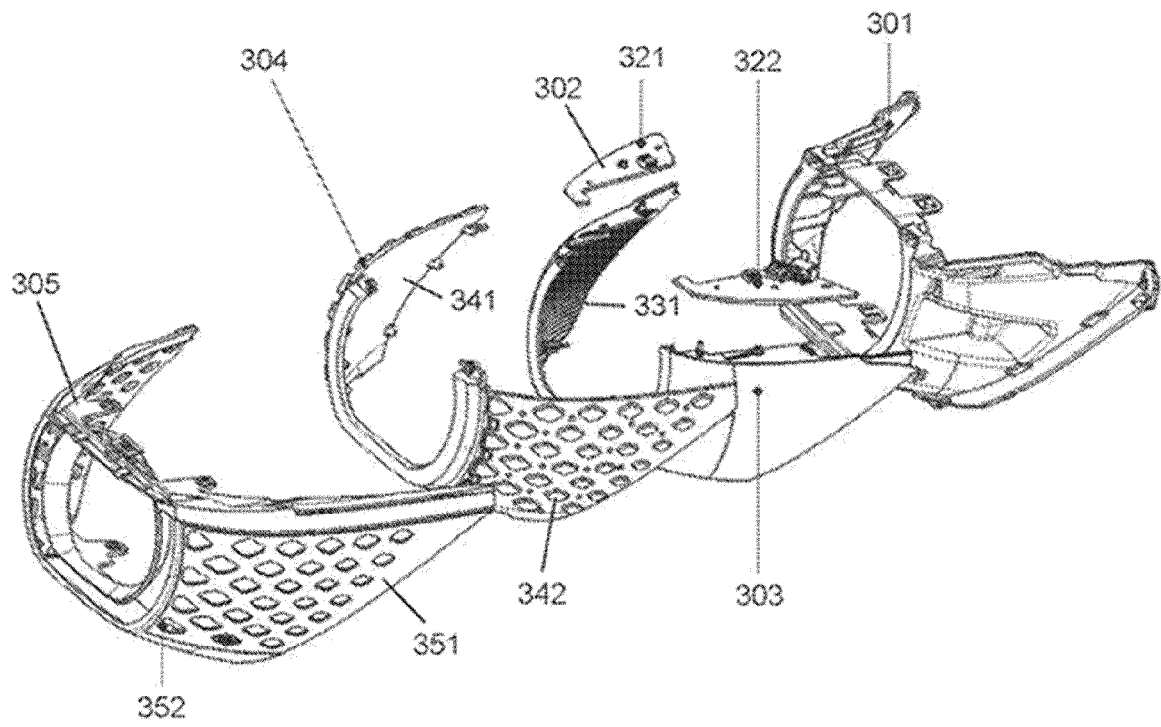


Fig. 3

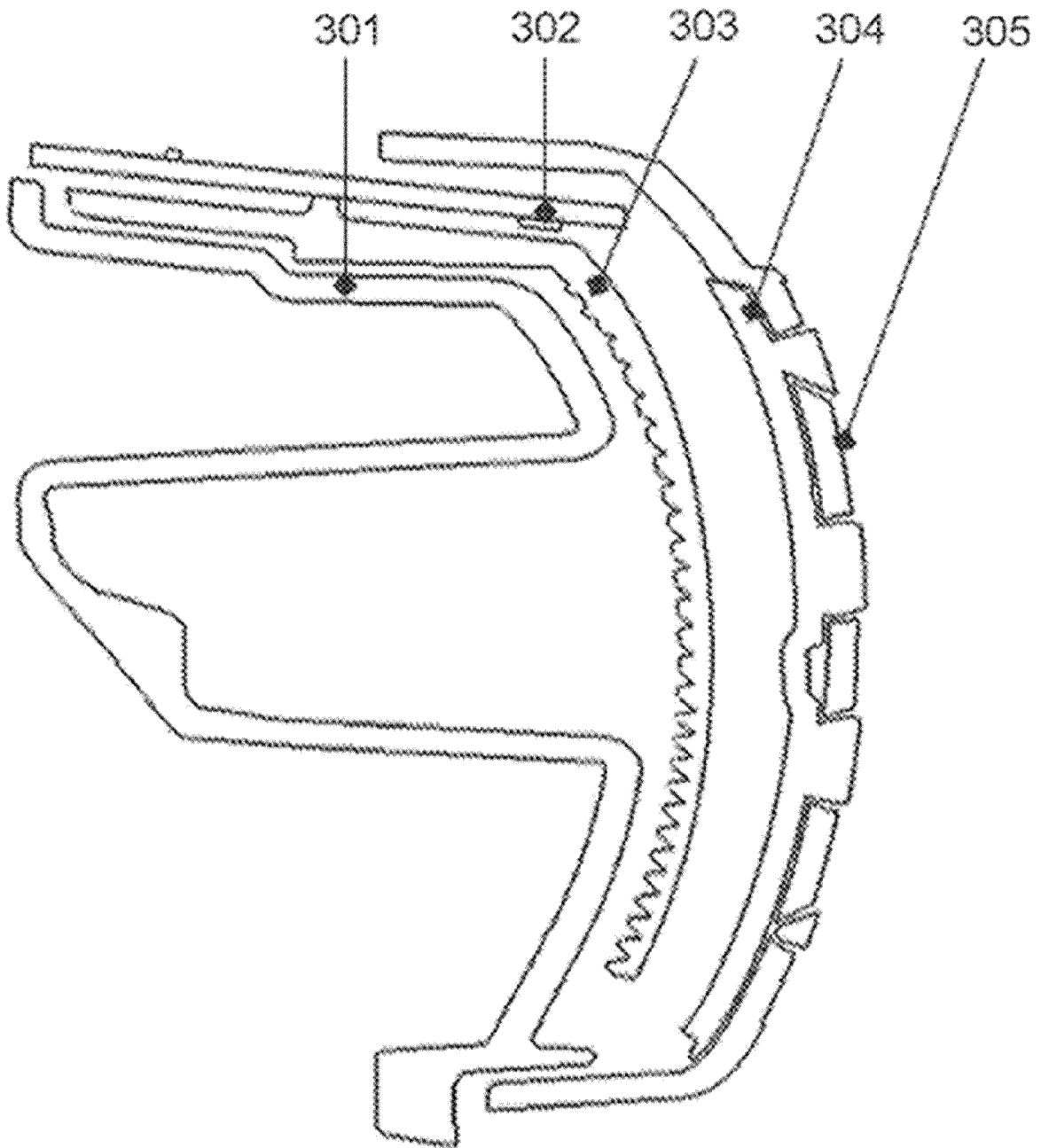


Fig.4

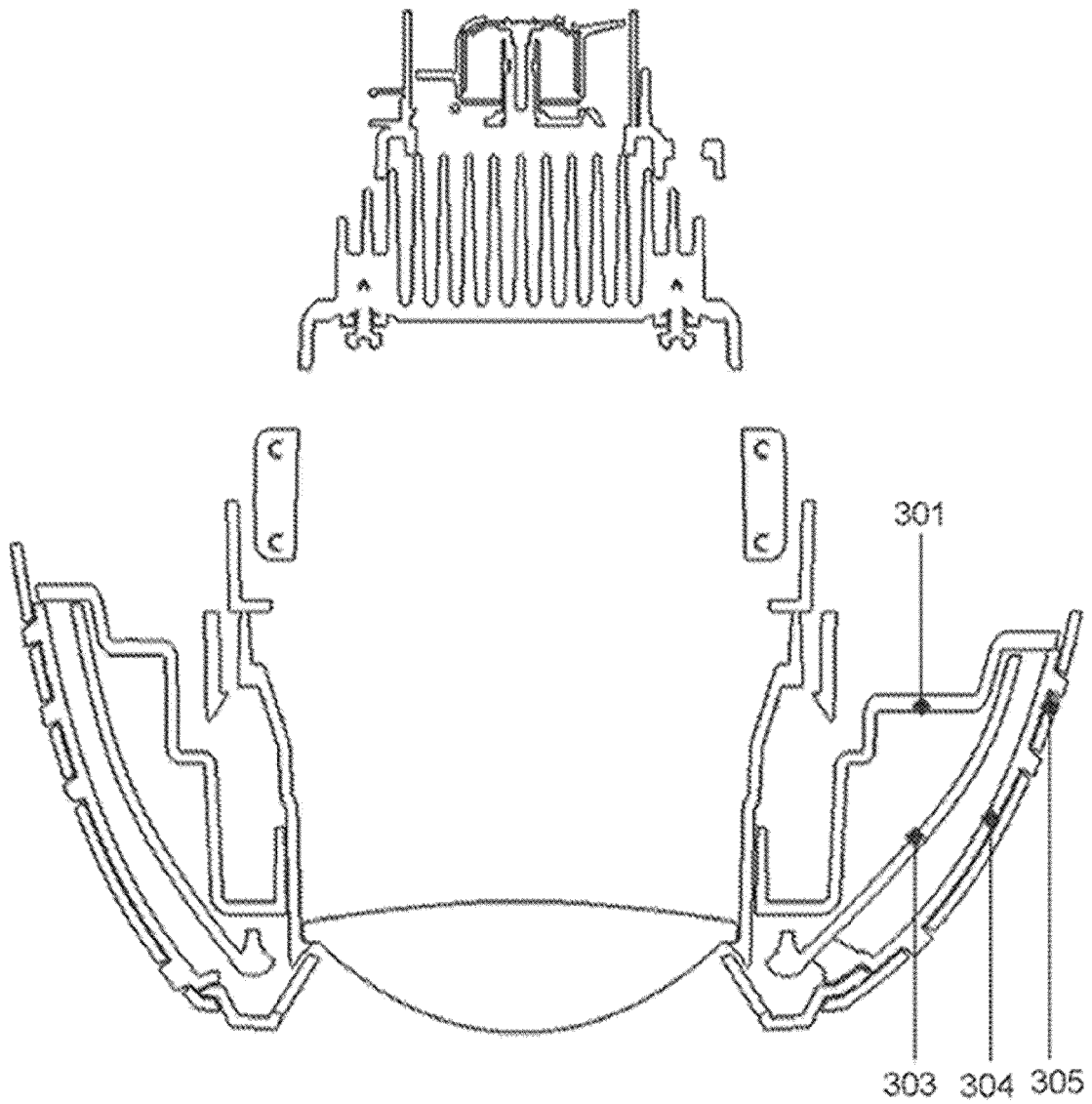


Fig. 5

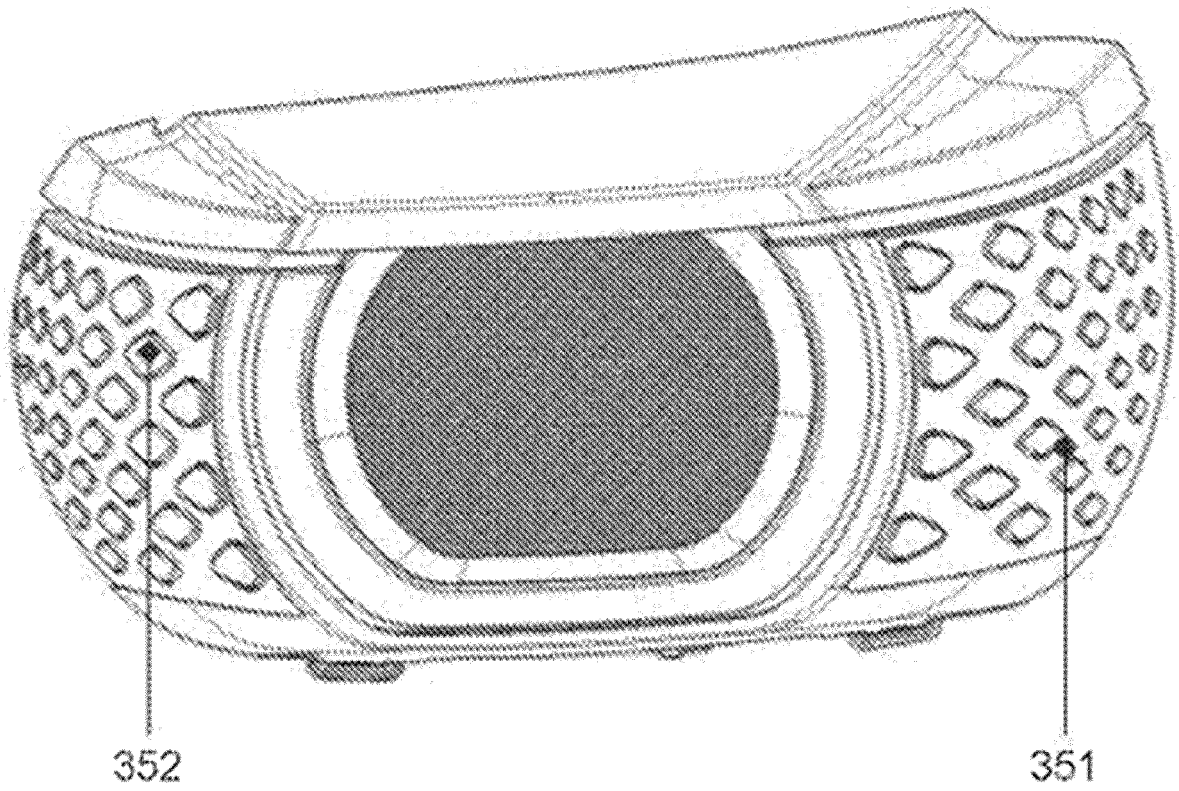


Fig.6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/081486

A. CLASSIFICATION OF SUBJECT MATTER F21S 43/14(2018.01)i; F21S 43/20(2018.01)i; F21S 43/50(2018.01)i; F21V 8/00(2006.01)i 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; F21V																		
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) WPI, EPODOC, CNPAT, CNKI: 光幕, 灯幕, 阵列, 矩阵, 底座, 支架, 安装, 光源, 光导, 内配, 透镜, 饰圈, 遮蔽, 遮挡, 挡光, LED?, screen, array, base, hold+, mount+, distribut+, shield+																		
C. DOCUMENTS CONSIDERED TO BE RELEVANT																		
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>PX</td> <td>CN 211083952 U (SAIC VOLKSWAGEN AUTOMOTIVE CO., LTD. et al.) 24 July 2020 (2020-07-24) description, paragraphs [0025]-[0030], and figures 1-6</td> <td>1-9</td> </tr> <tr> <td>Y</td> <td>CN 206617870 U (SHANGHAI KOITO AUTOMOTIVE LAMP CO., LTD.) 07 November 2017 (2017-11-07) description, paragraphs [0017], [0019], figure 3</td> <td>1-9</td> </tr> <tr> <td>Y</td> <td>CN 109827145 A (HUAYU VISION TECHNOLOGY (SHANGHAI) CO., LTD.) 31 May 2019 (2019-05-31) description, paragraphs [0022], [0027], figure 1</td> <td>1-9</td> </tr> <tr> <td>A</td> <td>CN 209991402 U (HUAYU VISION TECHNOLOGY (SHANGHAI) CO., LTD.) 24 January 2020 (2020-01-24) entire document</td> <td>1-9</td> </tr> <tr> <td>A</td> <td>CN 110056793 A (HUNAN KAIXING ELECTRONIC TECHNOLOGY CO., LTD.) 26 July 2019 (2019-07-26) entire document</td> <td>1-9</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	PX	CN 211083952 U (SAIC VOLKSWAGEN AUTOMOTIVE CO., LTD. et al.) 24 July 2020 (2020-07-24) description, paragraphs [0025]-[0030], and figures 1-6	1-9	Y	CN 206617870 U (SHANGHAI KOITO AUTOMOTIVE LAMP CO., LTD.) 07 November 2017 (2017-11-07) description, paragraphs [0017], [0019], figure 3	1-9	Y	CN 109827145 A (HUAYU VISION TECHNOLOGY (SHANGHAI) CO., LTD.) 31 May 2019 (2019-05-31) description, paragraphs [0022], [0027], figure 1	1-9	A	CN 209991402 U (HUAYU VISION TECHNOLOGY (SHANGHAI) CO., LTD.) 24 January 2020 (2020-01-24) entire document	1-9	A	CN 110056793 A (HUNAN KAIXING ELECTRONIC TECHNOLOGY CO., LTD.) 26 July 2019 (2019-07-26) entire document	1-9
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A	CN 110056793 A (HUNAN KAIXING ELECTRONIC TECHNOLOGY CO., LTD.) 26 July 2019 (2019-07-26) entire document	1-9																
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<table border="0"> <tr> <td style="vertical-align: top;"> * 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 </td> <td style="vertical-align: top;"> “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 </td> </tr> </table>	* 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																
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Date of the actual completion of the international search 12 May 2021	Date of mailing of the international search report 17 June 2021																	
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451	Authorized officer Telephone No.																	

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INTERNATIONAL SEARCH REPORT

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 208817379 U (HUAYU VISION TECHNOLOGY (SHANGHAI) CO., LTD.) 03 May 2019 (2019-05-03) entire document	1-9
A	CN 204629366 U (CHONGQING QINCHUAN INDUSTRY AND TRADE CO., LTD.) 09 September 2015 (2015-09-09) entire document	1-9
A	US 2016167576 A1 (LEE, Kuo-Jen) 16 June 2016 (2016-06-16) entire document	1-9

INTERNATIONAL SEARCH REPORT
Information on patent family members

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CN	211083952	U	24 July 2020		None				
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