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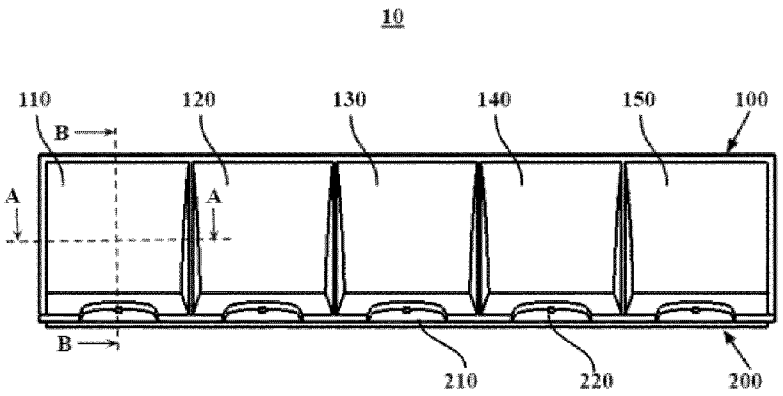
(54) Title: REFLECTING DEVICE, PROJECTOR LAMP AND VEHICLE

[Fig. 1]



(57) Abstract: The present invention relates to a reflecting device for forming at least one rectangular light pattern, the reflecting device comprising at least one reflection cavity, each reflection cavity comprising : a reflecting curved surface, for reflecting light rays from a light source assembly towards a projection surface, to obtain a rectangular light pattern; and two baffles in the form of flat plates, located at two sides of the reflecting curved surface respectively, and reflecting some of the light rays from the reflecting curved surface toward the projection surface, to obtain cut-off lines at two sides of the rectangular light pattern. The present invention further relates to a projector lamp and a vehicle.

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Description

Title of Invention: Reflecting device, projector lamp and vehicle

Technical Field

[0001] The present invention relates to the technical field of vehicle lamps, in particular to a reflecting device, a vehicle lamp and a vehicle.

Background Art

[0002] In recent years, to meet market and customer demand, projector lamps have been widely used in vehicles, for projecting diverse pattern information onto roads or inside the vehicles. For example, projector lamps can be used to project logos, danger alert patterns, welcome patterns and other signal indication patterns, etc.

[0003] Existing projector lamps generally use film for projection. The film is first illuminated by a light source, then a projecting lens projects the pattern onto the ground. However, such projector lamps are structurally complex, difficult to implement and high-cost.

Summary of the Utility Model

[0004] Therefore, an objective of the present utility model is to propose a reflecting device, a projector lamp and a vehicle, which can at least partially solve the above-mentioned problems.

[0005] According to an aspect of the present utility model, a reflecting device for forming one or more rectangular beam pattern is provided, the reflecting device comprising one or more reflection chamber, each reflection chamber comprising:

[0006] a reflecting curved surface, for reflecting light rays from a light source assembly towards a projection surface, to obtain a rectangular beam pattern;

[0007] two baffles in the form of flat plates, located at two sides of the reflecting curved surface respectively, and reflecting some of the light rays from the reflecting curved surface towards the projection surface, to obtain cut-off lines at two sides of the rectangular beam pattern.

[0008] According to an embodiment of the present utility model, a beam pattern obtained by means of the reflecting curved surface alone is not a standard rectangular beam pattern; although cut-off lines at two sides thereof are straight, the cut-off lines at the remaining two sides are deformed. By adding baffles in the form of flat plates at two sides of the reflecting curved surface, the deformed cut-off lines can be corrected to straight cut-off lines, thereby obtaining a standard rectangular beam pattern.

[0009] In an embodiment, the one or more rectangular beam patterns are combined to form zebra stripes.

[0010] According to an embodiment of the present utility model, a projection of zebra

stripes is achieved through the configuration of multiple reflection chambers; this is structurally simple, easy to implement and low-cost. In addition, the projection of zebra stripes can be used in various application scenarios, e.g. for danger alert patterns, welcome patterns and other signal indication patterns, etc.

[0011] In an embodiment, each reflection chamber further comprises a base plate, the base plate being connected to the reflecting curved surface and the two baffles, in order to mount the reflection chamber to the light source assembly.

[0012] According to an embodiment of the present utility model, providing the base plate makes it possible to mount the reflection chamber to the light source assembly, so as to fix the positions of the reflection chamber and the light source assembly relative to one another.

[0013] In one embodiment, the reflecting device is integrally formed.

[0014] According to an embodiment of the present utility model, having the reflecting device integrally formed can simplify the manufacturing process.

[0015] In an embodiment, the one or more reflection chambers are arranged horizontally in a straight line, with two adjacent reflection chambers sharing one baffle.

[0016] According to an embodiment of the present utility model, having the one or more reflection chambers arranged horizontally in a straight line can solve the problem of limited size, in a non-horizontal direction, of the space used to accommodate the reflecting device; and having two adjacent reflection chambers share one baffle can further reduce the volume of the reflecting device.

[0017] In an embodiment, the one or more reflection chambers are arranged vertically in a straight line, with the reflecting curved surface of one of two adjacent reflection chambers being connected to the base plate of the other of the two adjacent reflection chambers.

[0018] According to an embodiment of the present utility model, having the one or more reflection chambers arranged vertically in a straight line can solve the problem of limited size, in a non-vertical direction, of the space used to accommodate the reflecting device.

[0019] In an embodiment, the reflection chamber and the rectangular beam pattern are in one-to-one correspondence.

[0020] According to an embodiment of the present utility model, the reflecting device can be made to project as many rectangular beam patterns as possible.

[0021] In an embodiment, the rectangular beam pattern corresponds to multiple reflection chambers.

[0022] According to an embodiment of the present utility model, using multiple reflection chambers to project the same rectangular beam pattern can solve the problem of insufficient brightness of a rectangular beam pattern that is further away from the re-

flecting device.

[0023] In an embodiment, the size of the rectangular beam pattern is related to the curvature of the reflecting curved surface, and the distance from the rectangular beam pattern to the reflecting device is related to the pitch angle of the reflecting curved surface.

[0024] According to an embodiment of the present utility model, the size of the rectangular beam pattern and the distance from the rectangular beam pattern to the reflecting device can be adjusted by adjusting the curvature and pitch angle of the reflecting curved surface.

[0025] According to another aspect of the present utility model, a projector lamp is further provided, comprising:

[0026] any one of the reflecting devices described above;

[0027] one or more light source assembly emitting light rays towards the one or more reflection chamber.

[0028] According to another aspect of the present utility model, a vehicle is also provided, comprising any one of the reflecting devices described above, or any one of the projector lamps described above.

Brief Description of the Figures

[0029] The above-described characteristics, technical features and advantages of the present invention and modes of implementation thereof will be further explained below in a clear and easy-to-understand manner through a description of preferred embodiments with reference to the drawings, wherein

[0030] [Fig.1] shows a front view of a projector lamp 10 according to an embodiment of the present utility model.

[0031] [Fig.2] shows a perspective view of the reflecting device 100 in [Fig.1].

[0032] [Fig.3] shows a schematic drawing of a beam pattern obtained by means of the reflecting curved surface when the reflection chamber is not provided with baffles.

[0033] [Fig.4] shows a horizontal sectional view of the reflecting curved surface 111 in [Fig.1] along line A-A, and a schematic drawing of a rectangular beam pattern 20 obtained on a projection surface 70 by means of the reflecting curved surface 111.

[0034] [Fig.5] shows a perpendicular sectional view of the reflecting curved surface 111 in [Fig.1] along line B-B, and a schematic drawing of the rectangular beam pattern 20 obtained on the projection surface 70 by means of the reflecting curved surface 111.

[0035] [Fig.6] shows a schematic drawing of zebra stripes obtained by means of the reflecting device 100.

[0036] [Fig.7] shows a schematic drawing of the pitch angles of the reflecting curved surfaces in [Fig.2].

[0037] [Fig.8] shows a perpendicular sectional view of the projector lamp 10 according to another embodiment of the present utility model.

Detailed Description of Embodiments

[0038] Embodiments of the present invention are described demonstratively below. As those skilled in the art should realize, the embodiments explained may be amended in various ways without departing from the concept of the present invention. Accordingly, the drawings and the description are exemplary and not restrictive in nature. In the following text, identical drawing reference labels generally indicate functionally identical or similar elements.

[0039] [Fig.1] shows a front view of a projector lamp 10 according to an embodiment of the present utility model. As shown in the figure, the projector lamp 10 may comprise a reflecting device 100 and a light source assembly 200, wherein the reflecting device 100 can receive light rays from the light source assembly 200, and reflect them towards a projection surface, to obtain at least one rectangular beam pattern on the projection surface. Here, the projection surface may be any suitable surface, for example the ground or another object surface, etc., but is not limited thereto. The reflecting device 100 may comprise at least one reflection chamber. As an example, [Fig.1] shows the reflecting device 100 as comprising five reflection chambers 110, 120, 130, 140, 150. It must be explained that the number of reflection chamber(s) is not limited to this, and can be specifically set according to needs. The light source assembly 200 is configured to emit light rays towards each reflection chamber of the reflecting device 100. In one example, the light source assembly 200 may comprise a printed circuit board 210 and an LED light source 220 carried by the printed circuit board 210. Each reflection chamber of the reflecting device 100 corresponds to at least one LED light source 220. Each LED light source 220 may be carried by the same printed circuit board 210, or by a different printed circuit board 210. It must be explained that the light source assembly 200 may also be implemented in another way, i.e. may comprise other types of light sources and control circuits thereof, as long as it is able to emit light rays towards each reflection chamber of the reflecting device 100.

[0040] [Fig.2] shows a perspective view of the reflecting device 100 in [Fig.1]. As shown in the figure, the reflection chambers 110, 120, 130, 140, 150 of the reflecting device 100 are arranged horizontally in a straight line. The reflection chamber 110 may comprise a reflecting curved surface 111, for reflecting light rays from the light source assembly 200 towards the projection surface to obtain a rectangular beam pattern; and two baffles 112 and 114 in the form of flat plates, located at two sides of the reflecting curved surface 111 respectively and capable of reflecting some of the light rays from the reflecting curved surface 111 towards the projection surface, for the purpose of obtaining cut-off lines at said two sides of the rectangular beam pattern. Similarly, the reflection chamber 120 may comprise a reflecting curved surface 121, for reflecting

light rays from the light source assembly 200 towards the projection surface to obtain a rectangular beam pattern; and two baffles 114 and 116 in the form of flat plates, located at two sides of the reflecting curved surface 121 respectively and capable of reflecting some of the light rays from the reflecting curved surface 121 towards the projection surface, for the purpose of obtaining cut-off lines at these two sides of the rectangular beam pattern. The baffle 114 is shared by the reflection chamber 110 and the reflection chamber 120. In addition, the reflection chambers 130, 140, 150 are structurally identical to the reflection chambers 110, 120, and comprise reflecting curved surfaces 131, 141, 151 respectively as well as baffles located at two sides of each reflecting curved surface, wherein two adjacent reflection chambers may share one baffle. It must be explained that if space allows, two adjacent reflection chambers may also not share one baffle.

[0041] As shown in [Fig.1], the baffles 112 and 114 extend in a direction perpendicular to the plane of the paper. However, the embodiments of the present utility model are not limited to this; the directions of extension of the baffles may be adjusted as required, as long as it is possible to obtain straight cut-off lines at two sides of the rectangular beam pattern.

[0042] Preferably, the reflection chambers 110 and 120 may also comprise base plates 113, 115 respectively, wherein the base plate 113 is connected to the reflecting curved surface 111 and the baffles 112, 114, the base plate 115 is connected to the reflecting curved surface 121 and the baffles 114, 116, and the base plates 113 and 115 can mount the reflection chambers 110 and 120 to the light source assembly 200, for example by screw connection, without limitation thereto. The reflection chambers 130, 140, 150 may also have respective base plates; this is not described further here.

[0043] Preferably, to simplify the manufacturing process, the reflection chambers of the reflecting device 100 may be integrally formed.

[0044] [Fig.3] shows a schematic drawing of a beam pattern obtained by means of the reflecting curved surface when the reflection chamber of the reflecting device 100 is not provided with baffles. As shown in [Fig.3], the beam pattern is approximately rectangular, having a straight upper cut-off line and a straight lower cut-off line, but the cut-off lines at the left and right sides of the beam pattern are deformed. In one example, a paraboloid as the reflecting curved surface can obtain such an approximately rectangular beam pattern. For example, fog lamps and corner lamps, etc. in the prior art generally use paraboloids to reflect light rays of light sources in order to obtain beam patterns that are straight at the top and bottom but wider at the left and right sides. However, regulations governing fog lamps and corner lamps have no requirements regarding cut-off lines at the left and right sides of the beam pattern. For this reason, fog lamps and corner lamps are generally not provided with baffles. In an

embodiment of the present utility model, to obtain a rectangular beam pattern, it is proposed that baffles be provided at two sides of the reflecting curved surface, to reflect light rays from the reflecting curved surface towards the projection surface, so that the deformed cut-off lines at the left and right sides of the reflecting curved surface are optimized as straight cut-off lines. It must be explained that the embodiments of the present utility model do not impose requirements on the type of the reflecting curved surface, which may be a paraboloid, an approximate paraboloid or a free curved surface, etc., as long as it is able to realize an approximately rectangular beam pattern as shown in [Fig.3].

[0045] [Fig.4] shows a horizontal sectional view of the reflecting curved surface 111 in [Fig.1] along line A-A, and a schematic drawing of a rectangular beam pattern 20 obtained on a projection surface 70 by means of the reflecting curved surface 111. Here, suppose that the projection surface 70 is located below the projector lamp 10, and that [Fig.4] shows a top view of the projection surface 70 and the rectangular beam pattern 20. As shown in [Fig.4], the beam pattern 20 may comprise an upper cut-off line 21, a lower cut-off line 22, a left cut-off line 23 and a right cut-off line 24, wherein the upper cut-off line 21 and lower cut-off line 22 may be obtained by means of the reflecting curved surface 111 of a specific type, the left cut-off line 23 may be obtained by optimization of the left side of an original beam pattern of the reflecting curved surface 111 by the baffle 114, and the right cut-off line 24 may be obtained by optimization of the right side of the original beam pattern of the reflecting curved surface 111 by the baffle 113. In addition, a length L of the rectangular beam pattern 20 can be changed by adjusting the curvature of the reflecting curved surface 111 in the horizontal direction.

[0046] [Fig.5] shows a perpendicular sectional view of the reflecting curved surface 111 in [Fig.1] along line B-B, and a schematic drawing of the rectangular beam pattern 20 obtained on the projection surface 70 by means of the reflecting curved surface 111. Here, suppose that the projection surface 70 is located below the projector lamp 10, and that [Fig.5] shows a side view of the projection surface 70 and the rectangular beam pattern 20. As shown in [Fig.4], the width W of the rectangular beam pattern 20 can be changed by adjusting the curvature of the reflecting curved surface 111 in the vertical direction, and the distance from the rectangular beam pattern 20 to the reflecting curved surface 111 can be changed by adjusting the pitch angle of the reflecting curved surface 111. As a non-limiting example, a rectangular beam pattern with a width W of 20 - 30 cm can be obtained when the height H1 of the reflecting curved surface 111 is 40 - 45 mm and the height H2 between the reflecting curved surface 111 and the projection surface 70 is 200 - 250 mm.

[0047] Although the projection relationship between only the reflecting curved surface 111

and the rectangular beam pattern 20 has been described above by means of Figs. 4 and 5, it will be understood that this projection relationship also applies to the other reflecting curved surfaces. This will not be described further here.

[0048] [Fig.6] shows a schematic drawing of zebra stripes obtained by means of the reflecting device 100; [Fig.7] shows a schematic drawing of the pitch angles of the reflecting curved surfaces in [Fig.2]. As stated above, one rectangular beam pattern can be obtained by means of each reflection chamber of the reflecting device 100. In an embodiment of the present utility model, it is further proposed that the rectangular beam patterns obtained by means of the reflection chambers be combined to form zebra stripes, as shown in [Fig.6]. In [Fig.6], the distances D from the rectangular beam patterns 20, 30, 40, 50, 60 to the reflecting device 100 increase sequentially, so in accordance with what was stated above, the pitch angles of the reflecting curved surfaces corresponding to the rectangular beam patterns 20, 30, 40, 50, 60 should increase sequentially. To obtain such zebra stripes, in one example, as shown in [Fig.7], the pitch angles of the reflecting curved surfaces 131, 141, 121, 151, 111 increase sequentially, such that the reflecting curved surface 131 projects the closest rectangular beam pattern 60, the reflecting curved surface 141 projects the rectangular beam pattern 50, the reflecting curved surface 121 projects the rectangular beam pattern 40, the reflecting curved surface 151 projects the rectangular beam pattern 30, and the reflecting curved surface 111 projects the rectangular beam pattern 20. However, the embodiments of the present utility model are not limited to this; it is also possible for the reflecting curved surfaces 111, 121, 131, 141, 151 to project the rectangular beam patterns 20, 30, 40, 50, 60 respectively, or for the reflecting curved surfaces 111, 121, 131, 141, 151 to project the rectangular beam patterns 60, 50, 40, 30, 20 respectively, and so on.

[0049] Because the light propagation distances are different, a rectangular beam pattern that is further from the reflecting device 100 will have lower brightness, and the brightness of the zebra stripes will consequently not be uniform. To solve this problem, in an embodiment of the present utility model, it is also possible for different reflection chambers to project the same rectangular beam pattern. As a non-limiting embodiment, in the case of the zebra stripes shown in [Fig.6], it is possible for the reflecting curved surface 131 to project the closest rectangular beam pattern 60, the reflecting curved surfaces 121 and 141 to project the rectangular beam pattern 50, and the reflecting curved surfaces 111 and 151 to project the rectangular beam pattern 40.

[0050] In the embodiments above, the reflection chambers 110 - 150 of the reflecting device 100 have been described as being arranged horizontally in a straight line, but the embodiments of the present utility model are not limited to this. As a variant embodiment, the reflection chambers of the reflecting device 100 may also be arranged perpen-

dicularly in a straight line. [Fig.8] shows a simplified perpendicular sectional view of the projector lamp 10 according to another embodiment of the present utility model, wherein only two reflection chambers 110 and 120 of the reflecting device 100 are shown. As shown in the figure, the reflection chambers 110 and 120 may be arranged perpendicularly in a straight line, and the reflecting curved surface 111 of the reflection chamber 110 is connected to the base plate 115 of the reflection chamber 120. In this case, the reflection chambers 110 and 120 do not share the same printed circuit board. Preferably, in this variant embodiment, the reflecting device 100 may also be integrally formed.

[0051] In addition, in this variant embodiment, the projection relationship between the reflecting curved surface and the rectangular beam pattern, and the projection strategy of the zebra stripes, may refer to the embodiments above, and are not described again here.

[0052] It must be explained that the reflection chambers of the reflecting device 100 may also be arranged in another way, as long as the rectangular beam patterns obtained by means of the reflecting device 100 are combined to form zebra stripes.

[0053] In an embodiment of the present utility model, each reflection chamber of the reflecting device can project a rectangular beam pattern, and is structurally simple, easy to implement and low-cost. Furthermore, zebra stripes can be formed by combining the rectangular beam patterns, for use in danger alert patterns, welcome patterns and other signal indication patterns, etc.

[0054] According to an embodiment of the present invention, a vehicle is also provided, comprising the projector lamp 10 or reflecting device 100 as described above.

[0055] The present invention is not limited to the structure described above; various other variants could also be used. Although the present invention has already been described by means of a limited number of embodiments, those skilled in the art could, drawing benefit from this disclosure, design other embodiments which do not depart from the scope of protection of the present invention disclosed herein. Thus, the scope of protection of the present invention should be defined by the attached claims alone.

Claims

[Claim 1] Reflecting device (100) for forming one or more rectangular beam pattern, characterized by comprising one or more reflection chamber, each reflection chamber comprising:
a reflecting curved surface, for reflecting light rays from a light source assembly (200) towards a projection surface (70), to obtain a rectangular beam pattern;
two baffles in the form of flat plates, located at two sides of the reflecting curved surface respectively, and reflecting some of the light rays from the reflecting curved surface towards the projection surface (70), to obtain cut-off lines at said two sides of the rectangular beam pattern.

[Claim 2] Reflecting device (100) according to Claim 1, characterized in that the one or more rectangular beam patterns are combined to form zebra stripes.

[Claim 3] Reflecting device (100) according to Claim 2, characterized in that each reflection chamber further comprises a base plate, the base plate being connected to the reflecting curved surface and the two baffles, in order to mount the reflection chamber to the light source assembly (200).

[Claim 4] Reflecting device (100) according to Claim 3, characterized in that the reflecting device (100) is integrally formed.

[Claim 5] Reflecting device (100) according to Claim 3, characterized in that the one or more reflection chambers are arranged horizontally in a straight line, with two adjacent reflection chambers sharing one baffle.

[Claim 6] Reflecting device (100) according to Claim 3, characterized in that the one or more reflection chambers are arranged vertically in a straight line, with the reflecting curved surface of one of two adjacent reflection chambers being connected to the base plate of the other of the two adjacent reflection chambers.

[Claim 7] Reflecting device (100) according to Claim 2, characterized in that the reflection chamber and the rectangular beam pattern are in one-to-one correspondence.

[Claim 8] Reflecting device (100) according to Claim 2, characterized in that the rectangular beam pattern corresponds to multiple reflection chambers.

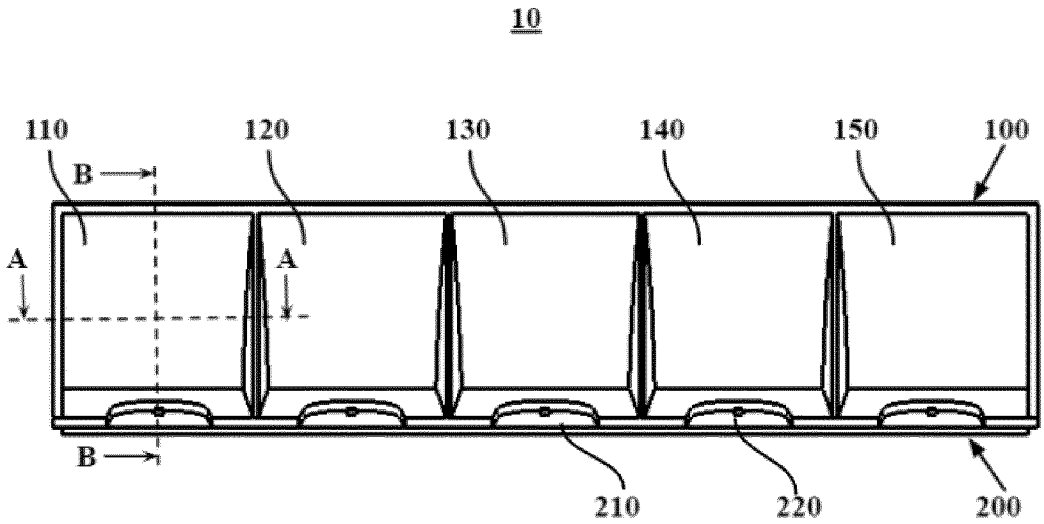
[Claim 9] Reflecting device (100) according to Claim 2, characterized in that the size of the rectangular beam pattern is related to the curvature of the reflecting curved surface, and the distance from the rectangular beam

pattern to the reflecting device (100) is related to the pitch angle of the reflecting curved surface.

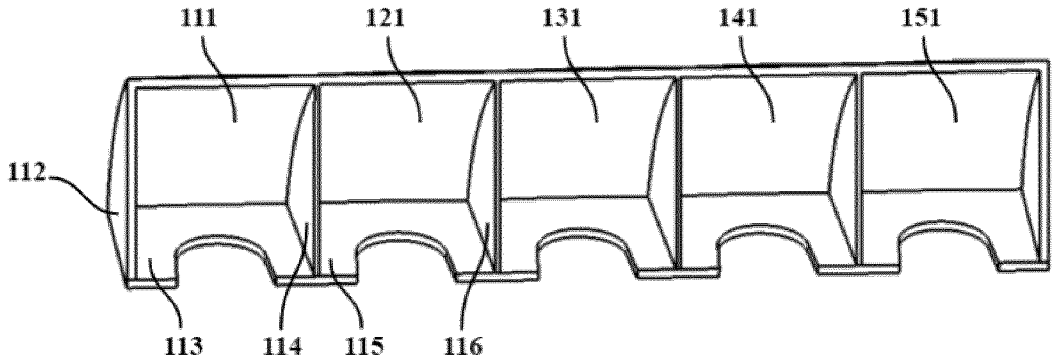
[Claim 10] Projector lamp (10), characterized by comprising:
the reflecting device (100) according to any one of Claims 1 - 9;
one or more light source assembly (200) emitting light rays towards the one or more reflection chamber.

[Claim 11] Vehicle, characterized by comprising the reflecting device (100) according to any one of Claims 1 - 9, or comprising the projector lamp (10) according to Claim 10.

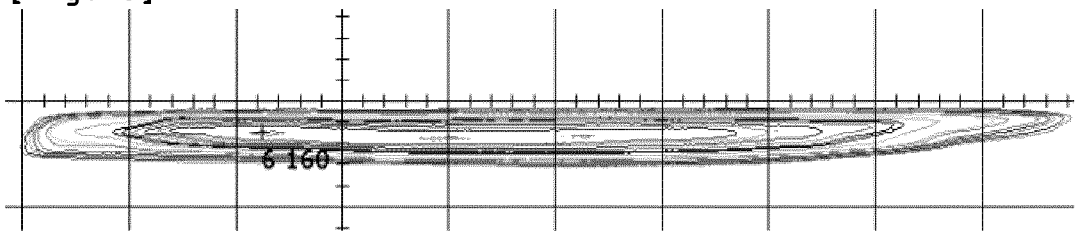
[Fig. 1]



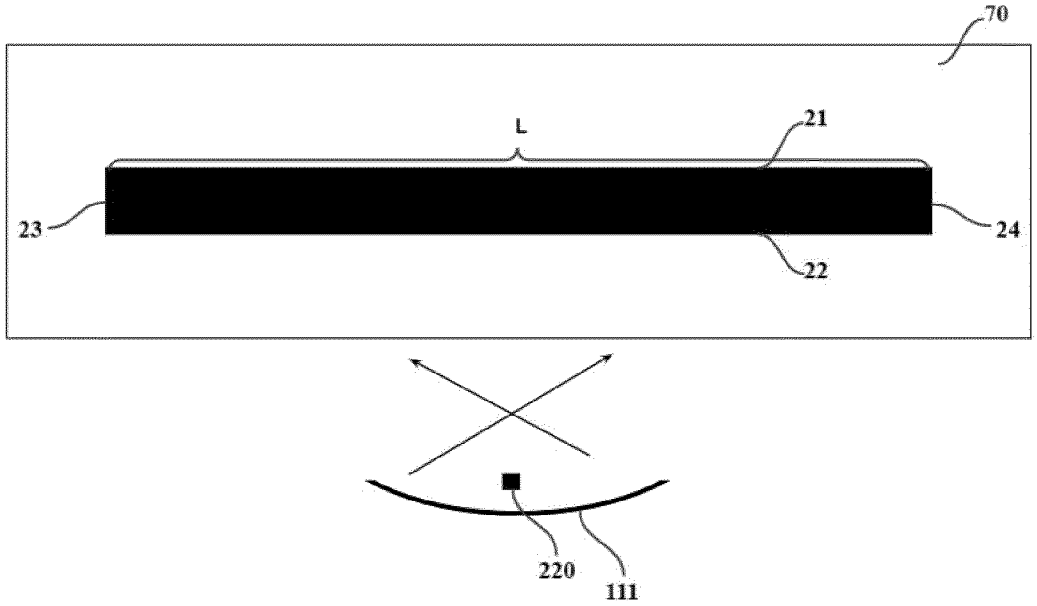
[Fig. 2]



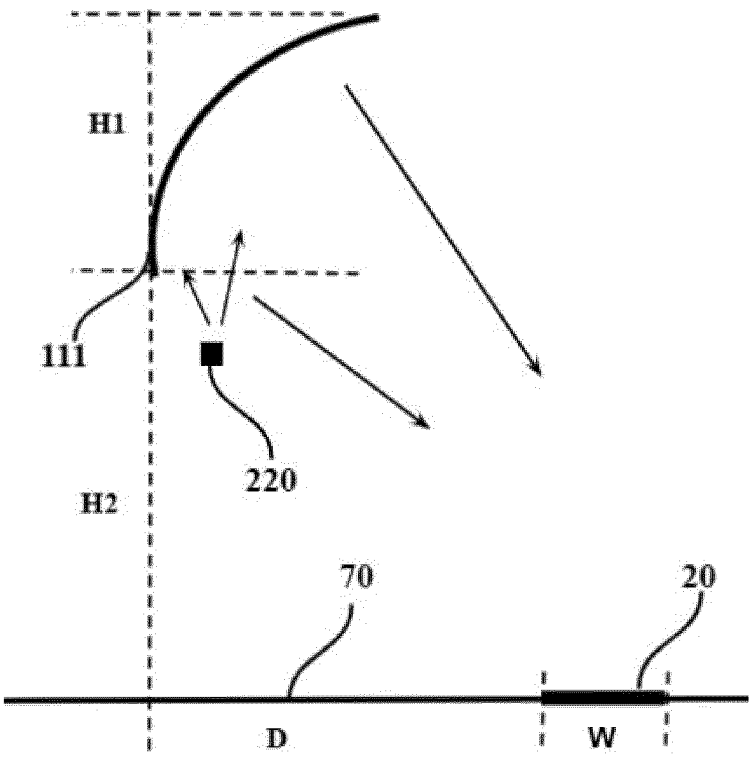
[Fig. 3]



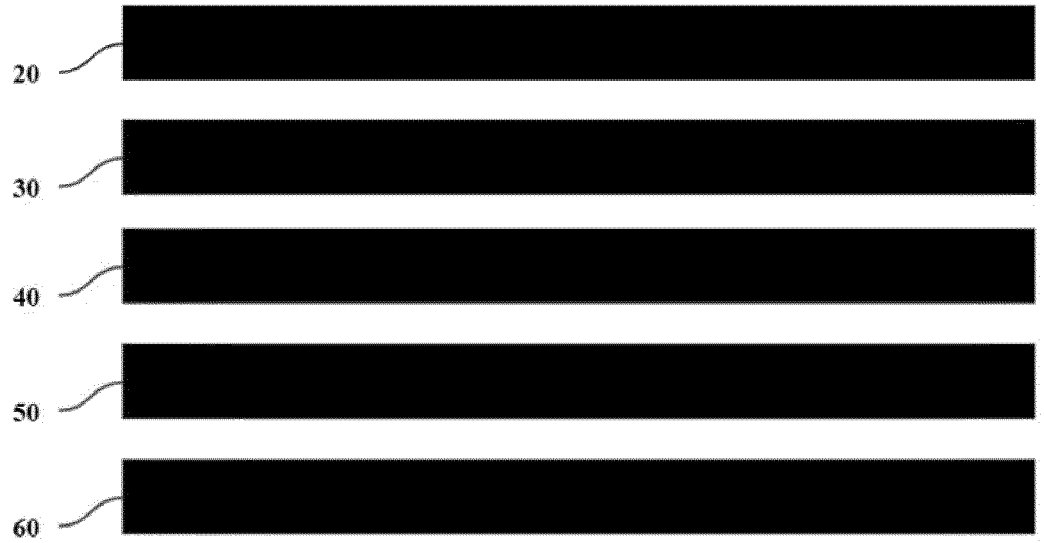
[Fig. 4]



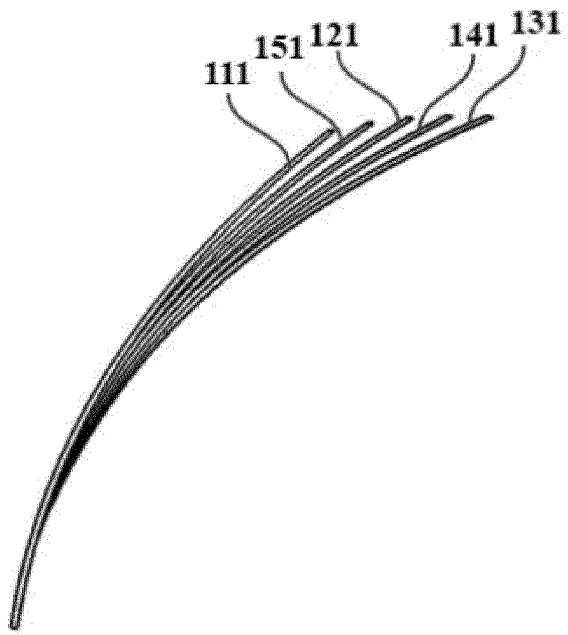
[Fig. 5]



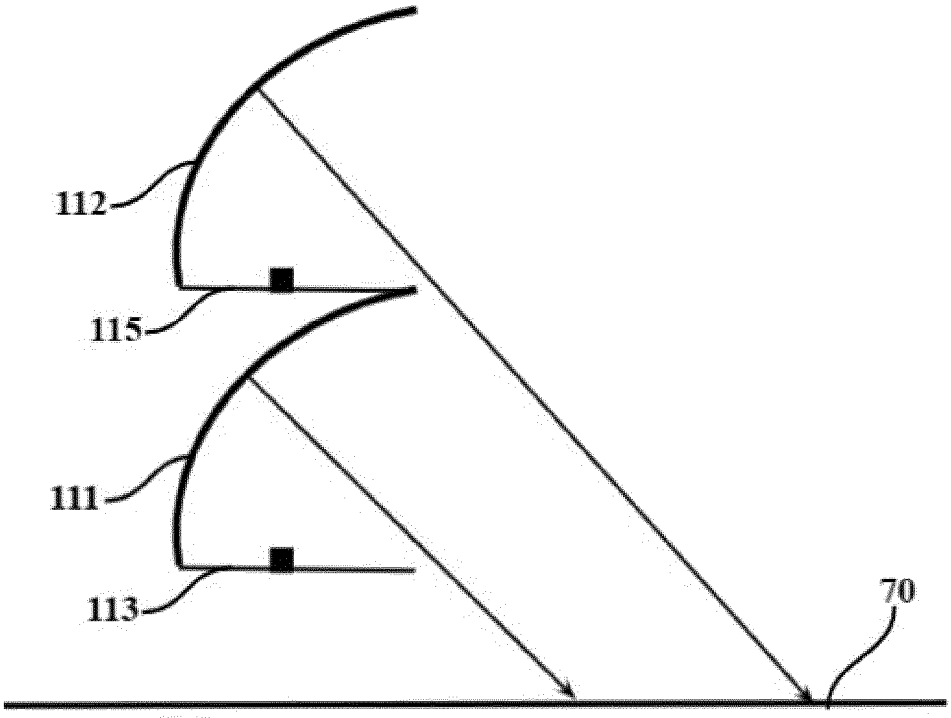
[Fig. 6]



[Fig. 7]



[Fig. 8]



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2022/064426

A. CLASSIFICATION OF SUBJECT MATTER
INV. F21S41/32 F21S41/43 F21S41/151 F21S43/15 F21S43/31
F21S41/147 F21S43/14 F21S41/663
ADD. F21W103/60
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 F21W

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 2018/023783 A1 (MADRIL EDGAR A [US]) 25 January 2018 (2018-01-25)	1-4,7-11
Y	paragraphs [0027] - [0105]; figures 1-11	6
Y	EP 3 450 828 A1 (VALEO ILUMINACION SA [ES]) 6 March 2019 (2019-03-06) paragraphs [0035], [0036], [0044], [0045]; figures 1a,1b,5,6	6
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[X] Further documents are listed in the continuation of Box C.
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10 August 2022	22/08/2022

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INTERNATIONAL SEARCH REPORT

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