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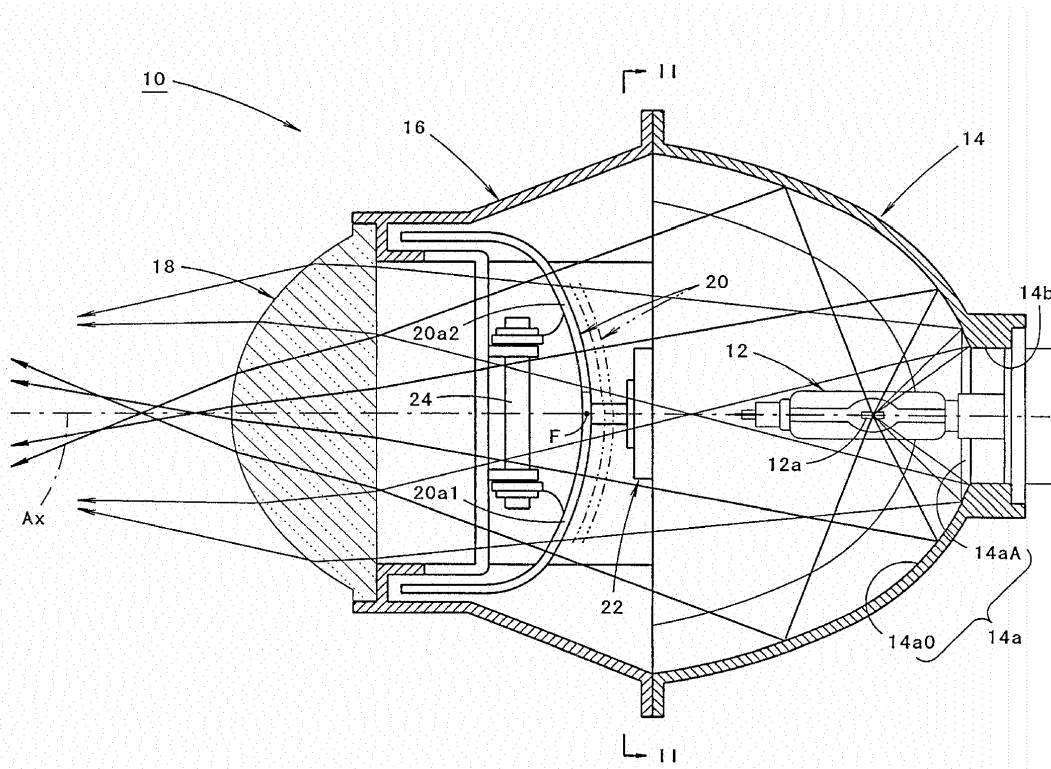
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(54) **Vehicle lamp**

(57) A vehicle lamp is provided with a projector lens 18, a light source 12a, and a reflector 14. A reflective surface 14a of the reflector 14 includes a partial reflection area 14aA and a general reflection area 14a0 other than the partial reflection area 14aA. A light distribution pattern PL0, PH0 to be formed by an irradiation light from the

vehicle lamp is adapted to be formed by a reflected light on the general reflection area 14a0. The partial reflection area 14aA is configured such that a light from the light source 12a which is reflected on the partial reflection area 14aA is incident on the projector lens 18 as a diffusely reflected light.

FIG. 1



Description**BACKGROUND OF THE INVENTION**

<FIELD OF THE INVENTION>

[0001] The invention relates to a so-called projector type vehicle lamp and more particularly, to a vehicle lamp capable of stabilizing a light distribution performance thereof.

<RELATED ART>

[0002] Generally, a projector type vehicle lamp is configured such that a reflector reflects a light from a light source placed on a rear side of a rear focal point of a projector lens toward the projector lens.

[0003] JP-A-2006-079984 discloses a projector type vehicle lamp in which a partial reflection area of a reflective surface of a reflector is formed in a shape different from other reflection area thereof to improve a light distribution performance.

[0004] Specifically, the vehicle lamp of JP-A-2006-079984 has a configuration that a portion of a reflection area contributing to forming a horizontal cut-off line on a side of an opposite lane in a low-beam light distribution pattern is configured to reflect a light from a light source toward an area in a vicinity of a rear focal point of the projector lens. Due to this configuration, a large glare is not given to a driver of an oncoming vehicle in a low-beam condition even when a pitching of a vehicle occurs, and a central brightness increases in a high-beam light distribution pattern.

[0005] In a projector type vehicle lamp, an image of a light source formed on a rear focal plane of a projector lens by a reflected light from a reflector is reversely projected by the projector lens. Accordingly, when a problem (for example, sticking of foreign matter or a defect of a reflection deposition film, etc.) occurs at a portion of a reflective surface of the reflector and thus it is not possible to obtain reflected light from such a problematic portion, a dark zone is caused in an image of the light source on the rear focal plane of the projector lens. This dark zone is reversely projected by the projector lens and thus the dark zone can be caused on a portion of a light distribution pattern. When the dark zone is caused, there is a problem that a visibility of a road surface in front of the vehicle or a fence of side strips is deteriorated.

SUMMARY OF THE INVENTION

[0006] An Embodiment and its modification of the invention relate to a projector type vehicle lamp in which, even if there is a defective area in a portion of a reflective surface of a reflector, a deterioration of a visibility due to the defective area can be effectively suppressed.

BRIEF DESCRIPTION OF THE DRAWINGS**[0007]**

5 FIG. 1 is a plan sectional view illustrating a vehicle lamp according to an embodiment, in a state where a movable shade thereof is placed in a light shielding position.

FIG. 2 is a view taken along line II-II in FIG. 1.

10 FIGS. 3(a) to 3(f) are perspective views illustrating several types of light distribution patterns formed on a virtual vertical screen at a position 25m in front of a lamp unit by a light irradiated from the vehicle lamp.

FIG. 4 is a view similar to FIG. 2, illustrating essential parts in a modification of the embodiment.

15 FIGS. 5(a) to 5(f) are views similar to FIGS. 3(a) to 3(f), illustrating light distribution patterns obtained by the modification.

20 DETAILED DESCRIPTION OF THE EMBODIMENTS

[0008] Hereinafter, an embodiment will be described by referring to the accompanying drawings.

[0009] FIG. 1 is a plan sectional view illustrating a vehicle lamp 10 according to an embodiment, in a state where a movable shade 20 thereof is placed in a light shielding position. FIG. 2 is a view taken along line II-II in FIG. 1.

[0010] As illustrated in FIGS. 1 and 2, the vehicle lamp 10 according to the present embodiment is configured as a projector type lamp unit and used in a state of being assembled to a lamp body (not-illustrated), etc.

[0011] The vehicle lamp 10 includes a light source bulb 12, a reflector 14, a holder 16, a projector lens 18, a movable shade 20 and an actuator 22. The vehicle lamp 10 has an optical axis Ax extending in a front-rear direction of a vehicle. However, the optical axis Ax of the vehicle lamp 10 after an aiming adjustment thereof is completed is disposed in a state of extending in a direction inclined downward approximately 0.5° to 0.6° with respect to the front-rear direction of a vehicle.

[0012] The projector lens 18 is formed of a plane-convex aspheric lens in which a surface on a front side is a convex face and a surface on a rear side is a plane face and is disposed on the optical axis Ax. The projector lens 18 projects a light source image formed on a rear focal plane thereof (that is, a plane containing a rear focal point F of the projector lens 18) on a virtual vertical screen disposed in front of the lamp as a reverted image.

50 **[0013]** According to the embodiment, the light source bulb 12 is a discharge bulb such as a metal halide bulb using a discharge light emitting portion as a light source 12a. The light source bulb 12 is fixedly inserted into an opening 14b formed on a rear apex portion of the reflector 14 from the rear side. The light source 12a of the light source bulb 12 is configured as a segment light source extending approximately concentric with the optical axis Ax and disposed on a rear side relative to the rear focal

point F of the projector lens 18.

[0014] The reflector 14 includes a reflective surface 14a for reflecting a light from the light source 12a toward the projector lens 18.

[0015] A general reflection area 14aO of the reflective surface 14a other than a partial reflection area 14aA (will be described later) thereof is configured to reflect the light from the light source 12a toward the front along the optical axis Ax.

[0016] Specifically, a cross-sectional shape of the general reflection area 14aO taken along a plane containing the optical axis Ax is set to an approximately elliptical shape and an eccentricity thereof is set to be gradually larger from a vertical cross-section toward a horizontal cross-section. Hence, the light emitted from the light source 12a and reflected by the general reflection area 14aO is substantially converged to a position in a vicinity of the rear focal point F in a vertical cross-section and the convergence position is displaced to a front side of the rear focal point F in the horizontal cross-section.

[0017] Meanwhile, the partial reflection area 14aA is disposed to annularly surround an opening 14b in an inner peripheral edge of the reflective surface 14a, as indicated by a dashed-line region in FIG. 2.

[0018] The partial reflection area 14aA is configured to cause the light from the light source 12a to be incident as a diffusely reflected light on the projector lens 18. In this case, the partial reflection area 14aA is formed so that the light from the light source 12a is diffusely reflected at a relatively large diffusion angle and evenly in the left and right in a horizontal direction, and diffusely reflected at a relatively small diffusion angle and slightly downward in a vertical direction.

[0019] A holder 16 is formed to extend in an approximately cylindrical shape from a front end opening of the reflector 14 toward the front. The reflector 14 is fixedly supported on a rear end of the holder. The projector lens 18 is fixedly supported on a front end of the holder. The holder 16 is provided at a lower region thereof with a cut out portion.

[0020] A movable shade 20 is provided in the position of approximately lower half in the interior of the holder 16. The movable shade is pivotably supported on the holder 16 by a pivot pin 24 which extends at a lower end of the movable shade in a lateral direction. The movable shade 20 is movable between a light shielding position (that is, a position indicated by a solid line in FIG. 1 and indicated by a two-dot chain line in FIG. 2) and a light shield releasing position (that is, a position indicated by a two-dot chain line in FIG. 1) which is pivoted from the light shielding position toward the rear by a predetermined angle.

[0021] Upper end edges 20a1, 20a2 of the movable shade 20 are formed to have different heights in right and left sides. When the movable shade 20 is in the light shielding position, the upper end edges is disposed to extend in an approximately arc shape in a horizontal direction along the rear focal plane of the projector lens 18

and therefore a portion of the reflected light from the reflector 14 is shaded. Meanwhile, when the movable shade 20 is in the light shield releasing position, the shading of the reflected light from the reflector 14 is released.

[0022] The actuator 22 is formed of a solenoid having a plunger extending in a front-rear direction and fixed to a lower end of the reflector 14. The actuator 22 is adapted to be driven when a beam switching switch (not-illustrated) is operated. Therefore, the plunger is moved in a front-rear direction to displace the movable shade 20 between the light shielding position and the light shield releasing position.

[0023] FIGS. 3(a) to 3(f) are perspective views illustrating several types of light distribution patterns formed on a virtual vertical screen at a position 25m in front of the lamp unit by the light irradiated from the vehicle lamp 10 toward the front. FIG. 3 (c) illustrates a low-beam light distribution pattern PL and FIG. 3 (f) illustrates a high-beam light distribution pattern PH.

[0024] The low-beam light distribution pattern PL is a light distribution pattern formed when the movable shade 20 is in the light shielding position and is formed as a synthetic light distribution pattern of a basic light distribution pattern PLO illustrated in FIG. 3 (a) and an additional light distribution pattern PLA illustrated in FIG. 3 (b). Meanwhile, the high-beam light distribution pattern PH is a light distribution pattern formed when the movable shade 20 is in the light shield releasing position and is formed as a synthetic light distribution pattern of a basic light distribution pattern PHO illustrated in FIG. 3 (d) and an additional light distribution pattern PHA illustrated in FIG. 3 (e).

[0025] As illustrated in FIG. 3 (c), the low-beam light distribution pattern PL is a low-beam light distribution pattern for left-side light distribution and the upper end edges thereof have cut-off lines CL1, CL2 with right and left sections which are different in height. The cut-off lines CL1, CL2 extend in the horizontal direction and are formed to have different heights in right and left sides of a boundary on the line V-V vertically passing through H-V serving as a vanishing point in the front direction of the lamp. At this time, the opposite lane side cut-off line CL1 on the right side of the line V-V is formed to extend in a horizontal direction over entire length thereof. Meanwhile, the own lane side cut-off line CL2 on the left side of the line V-V is formed to rise step-by-step from the left end of the opposite lane side cut-off line CL1 via an incline portion and then to extend in a horizontal direction.

[0026] In the low-beam light distribution pattern PL, an elbow point E serving as an intersection point of the opposite lane side cut-off line CL1 and the line V-V is located downward approximately 0.5° to 0.6° from H-V. This is attributed to the fact that the optical axis Ax of the vehicle lamp 20 extends downward approximately 0.5° to 0.6° in the front-rear direction of a vehicle. And, a hot zone HZL as a high brightness region is provided in the low-beam light distribution pattern PL to surround the elbow point E.

[0027] The low-beam light distribution pattern PL is formed by projecting the image of the light source 12a formed on the rear focal plane of the projector lens 18 by the light emitted from the light source 12a and reflected by the reflective surface 14a of the reflector 14 as the reverted projection image on the virtual vertical screen by the projector lens 18. The cut-off lines CL1, CL2 with right and left sections which are different in height are formed as the reverted projection image of the upper end edges 20a1, 20a2 of the movable shade 20.

[0028] The basic light distribution pattern PLO illustrated in FIG. 3 (a) is a light distribution pattern formed by the reflected light from the general reflection area 14aO of the reflective surface 14a of the reflector 14 and formed as a light distribution pattern which is substantially same as the low-beam light distribution pattern PL.

[0029] The basic light distribution pattern PLO includes a dark zone DZ at the right lower side of the elbow point E thereof. As illustrated in FIG. 2, since the light to be reflected from a defective area 14aD is disappeared when the defective area 14aD due to the sticking of foreign matter or the defect of a reflection deposition film occurs at the left upper position (the right upper position as seen from the front surface of the lamp) of the optical axis Ax in the reflective surface 14a of the reflector 14, the dark zone DZ is caused.

[0030] The additional light distribution pattern PLA illustrated in FIG. 3 (b) is a light distribution pattern formed by the reflected light from the partial reflection area 14aA of the reflective surface 14a of the reflector 14 and formed as a light distribution pattern slightly smaller and darker than the basic light distribution pattern PLO. At this time, since the reflected light from the partial reflection area 14aA is also partially shaded by the movable shade 20 in the light shielding position, the additional light distribution pattern PLA is provided at its upper end edges with the cut-off lines CL1, CL2 with right and left sections which are different in height.

[0031] As illustrated in FIG. 3 (c), since the low-beam light distribution pattern PL is formed as the synthetic light distribution pattern of the basic light distribution pattern PLO and the additional light distribution pattern PLA, the dark zone DZ of the basic light distribution pattern PLO is covered with the additional light distribution pattern PLA.

[0032] Meanwhile, the high-beam light distribution pattern PH illustrated in FIG. 3 (f) is formed to be expanded upward from the cut-off lines CL1, CL2 thereof with respect to the low-beam light distribution pattern PL and has a hot zone HZH in the vicinity of the H-V.

[0033] The basic light distribution pattern PHO illustrated in FIG. 3 (d) is a light distribution pattern formed by the reflected light from the general reflection area 14aO of the reflective surface 14a of the reflector 14 and formed as a light distribution pattern which is substantially same as the high-beam light distribution pattern PH. At this time, the basic light distribution pattern PHO also includes the dark zone DZ due to the defective area 14aD

caused in the reflective surface 14a of the reflector 14.

[0034] The additional light distribution pattern PHA illustrated in FIG. 3 (e) is a light distribution pattern formed by the reflected light from the partial reflection area 14aA of the reflective surface 14a of the reflector 14 and formed as a light distribution pattern slightly smaller and darker than the basic light distribution pattern PHO.

[0035] As illustrated in FIG. 3 (f), since the high-beam light distribution pattern PH is formed as the synthetic light distribution pattern of the basic light distribution pattern PHO and the additional light distribution pattern PHA, the dark zone DZ of the basic light distribution pattern PHO is covered with the additional light distribution pattern PHA.

[0036] Next, effects of the present embodiment will be described.

[0037] The vehicle lamp 10 according to the present embodiment is configured as a projector type vehicle lamp. However, the basic light distribution patterns PLO, PHO which are substantially same as the light distribution patterns PL, PH to be formed by the irradiation light thereof are adapted to be formed by the reflected light from the general reflection area 14aO other than the partial reflection area 14aA of the reflective surface 14a of the reflector 14. Further, the partial reflection area 14aA is configured to cause the light from the light source 12a to be incident as diffusely reflected light on the projector lens 18. Accordingly, the following effects can be obtained.

[0038] That is, the vehicle lamp 10 according to the present embodiment is so configured that the basic light distribution patterns PLO, PHO as the light distribution patterns PL, PH are formed by the reflected light from the general reflection area 14aO and, in addition, the additional light distribution patterns PLA, PHA with certain diffusion are formed by the reflected light from the partial reflection area 14aA.

[0039] Consequently, since the dark zone DZ is covered with the additional light distribution patterns PLA, PHA even though a defective area occurs in a portion of the general reflection area 14aO and thus the dark zone DZ is caused in a portion of the basic light distribution patterns PLO, PHO, it is possible to prevent a portion of the light distribution patterns PL, PH from being extremely dark. By this configuration, it is possible to prevent the visibility of the road surface in front of a vehicle or a fence of side from being deteriorated.

[0040] As such, according to the present embodiment, for the projector type vehicle lamp 10, it is possible to effectively suppress the deterioration of the visibility due to a defective area even though the defective area occurs in a portion of the reflective surface 14a of the reflector 14. Further, since there is no demand for strict quality management in the manufacturing process of the reflector 14, it is possible to reduce a cost for manufacturing the lamp.

[0041] At this time, since the partial reflection area 14aA is placed on a position of the reflective surface 14a

in the vicinity of the optical axis Ax of the projector lens 18 in the present embodiment, it is possible to cause the diffusely reflected light to be incident on the projector lens 18 even when maximum diffusion angle of the diffusely reflected light from the partial reflection area 14aA in a horizontal direction is set to be relatively large. In this way, the additional light distribution patterns PLA, PHA can be formed to a size similar to the basic light distribution patterns PLO, PHO. Accordingly, it is possible to cover the dark zone DZ formed on the basic light distribution patterns PLO, PHO with the additional light distribution patterns PLA, PHA, even though the defective areas are largely dispersed in the general reflection area 14aO.

[0042] In particular, since the partial reflection area 14aA is formed to annularly surround the opening 14b in an inner peripheral edge of the reflective surface 14a in the present embodiment, it is possible to form the additional light distribution patterns PLA, PHA while preventing a portion of the basic light distribution patterns PLO, PHO from being absent in an unnatural manner.

[0043] In the present embodiment, the vehicle lamp 10 is configured to form the low-beam light distribution pattern for left-side light distribution as the low-beam light distribution pattern PL. However, even in a case where the vehicle lamp is configured to form the low-beam light distribution pattern for right-side light distribution, the same effects as the above embodiment can be obtained by employing the same configuration as the above embodiment.

[0044] Next, a modification of the embodiment will be described.

[0045] FIG. 4 is a view similar to FIG. 2, illustrating essential parts of a vehicle lamp according to the modification.

[0046] As illustrated in FIG. 4, although the basic configuration of the vehicle lamp according to the modification is similar to that of the vehicle lamp according to the above embodiment, but the configuration of a reflective surface 114a of a reflector 114 thereof is different from that of the above embodiment.

[0047] That is, also in the present modification, the partial reflection area 114aA is placed on a position of the reflective surface 114a in the vicinity of the optical axis Ax, as indicated by dashed-line in FIG. 4. However, the partial reflection area 114aA is placed on a left side (that is, an own lane side) of the optical axis Ax. Specifically, the partial reflection area 114aA is formed as an approximately rectangular area which is transversely long and faces an opening 114b in an inner peripheral edge of a left side reflective surface 114a of the optical axis Ax.

[0048] FIGS. 5(a) to 5(f) are perspective views illustrating several types of light distribution patterns formed on the virtual vertical screen by the light irradiated from the vehicle lamp 10 toward the front. FIG. 5 (c) illustrates the low-beam light distribution pattern PL and FIG. 5 (f) illustrates the high-beam light distribution pattern PH.

[0049] Also in the present modification, the basic light

distribution patterns PL1, PH1 illustrated in FIGS. 5(a) and 5(d) are formed by the reflected light from the general reflection area 114aO other than a partial reflection area 114aA of the reflective surface 114a of the reflector 114 and the additional light distribution patterns PLB, PHB illustrated in FIGS. 5(b) and 5(e) are formed by the reflected light from the partial reflection area 114aA.

[0050] By this configuration, since the dark zone DZ is covered with the additional light distribution pattern PHB even though a defective area 114aD occurs in the general reflection area 114aO and thus the dark zone DZ is caused in a portion of the basic light distribution patterns PL1, PH1, it is possible to prevent a portion of the light distribution patterns PL, PH from being extremely dark.

[0051] At this time, since the partial reflection area 114aA is placed on the inner peripheral edge of a left side reflective surface 114a of the optical axis Ax in the present modification, the brightness of a portion A adjacent to the elbow point E along the opposite lane side cut-off line CL1 in the low-beam light distribution pattern PL is reduced and therefore it is possible to prevent a portion of the low-beam light distribution pattern PL and the high-beam light distribution pattern PH from being extremely dark.

[0052] By this configuration, the approximately same effects as the above embodiment can be obtained in a state where large glare is not given to the driver of the oncoming vehicle even when the pitching of a vehicle occurs during driving in a low-beam condition.

[0053] The numeric values indicated as data in the above-mentioned embodiment and the modification are only examples and may be set to different values as necessary as a matter of course.

[0054] In accordance with the above embodiment and the modification, a vehicle lamp may include a projector lens 18, a light source 12a disposed on a rear side of a rear focal point F of the projector lens 18, and a reflector 14, 114 for reflecting light from the light source 12a toward the projector lens 18. A reflective surface 14a, 114a of the reflector 14, 114 may include a partial reflection area 14aA, 114aA and a general reflection area 14aO, 114aO which is an area of the reflective surface 14a, 114a other than the partial reflection area 14aA, 114aA. A light distribution pattern PLO, PHO, PL1, PH1 to be formed by an irradiation light from the vehicle lamp may be adapted to be formed by a reflected light on the general reflection area 14aO, 114aO. The partial reflection area 14aA, 114aA may be configured such that a light from the light source 12a which is reflected on the partial reflection area 14aA, 114aA is incident on the projector lens 18 as a diffusely reflected light.

[0055] According to this structure, a basic light distribution pattern as a light distribution patterns to be formed by the vehicle lamp is formed by the reflected light from the general reflection area and, in addition, an additional light distribution pattern with a certain diffusion is formed by the reflected light from the partial reflection area.

[0056] Consequently, even though there is a defective

area in a portion of the general reflection area and a dark zone is generated in a portion of the basic light distribution pattern due to the defective area, since the dark zone is covered with the additional light distribution pattern, it is possible to prevent a portion of the light distribution pattern from being extremely dark. By this configuration, it is possible to prevent the visibility of the road surface in front of a vehicle or a fence of side strips from being deteriorated.

[0057] Therefore, according to the projector type vehicle lamp of the embodiment, the modification or the like, it is possible to effectively suppress the deterioration of the visibility due to the defective area even if there is the defective area in a portion of the reflective surface of the reflector. In addition, since there is no demand for strict quality management in a manufacturing process of the reflector, it is possible to reduce a cost for manufacturing the lamp.

[0058] The type of the light source is not particularly limited. A light emitting unit of a discharge bulb or a filament of a halogen lamp may be employed as the light source, for example.

[0059] The type of the light distribution pattern of the lamp is not particularly limited, as long as the 'light distribution pattern of the lamp' is a light distribution pattern formed by the irradiation light from the vehicle lamp. For example, a low-beam light distribution pattern or a high-beam light distribution pattern of a headlamp or a light distribution pattern of a fog lamp may be employed as the light distribution pattern of the lamp.

[0060] As long as the partial reflection area is configured to cause the light from the light source to be incident as diffusely reflected light on the projector lens, the specific shape of the partial reflection area or specific forming position thereof in the reflective surface of the reflector is not particularly limited.

[0061] The partial reflection area 14aA, 114aA may be located on a position of the reflective surface 14a, 114a in a vicinity of an optical axis Ax of the projector lens 18. According to this structure, even when a maximum diffusion angle of the diffusely reflected light from the partial reflection area is set to be relatively large, it is possible to cause the diffusely reflected light to be incident on the projector lens. In this way, the additional light distribution pattern can be formed to a size similar to the basic light distribution pattern. Accordingly, even if the defective areas are largely dispersed in the general reflection area, it is possible to cover the dark zone formed on the basic light distribution pattern with the additional light distribution pattern.

[0062] A shade 20 for shading a part of the reflected light from the reflector 14, 114 may be placed on a rear side of the projector lens 18 so as to form a low-beam light distribution pattern PL having a cut-off line CL1, CL2 at an upper end edge of the low-beam light distribution pattern PL as the light distribution pattern. The partial reflection area 14aA, 114aA may be disposed on a side of an own lane relative to an optical axis of the projector

lens.

In a case where the low-beam light distribution pattern having cut-off line at its upper end edge is formed as the light distribution pattern of the lamp, the lamp may include a shade for shading a portion of the reflected light from the reflector. In this case, if the partial reflection area is placed on an own lane side of the optical axis of the projector lens, the above effects can also be obtained in a state where large glare is not given to the driver of the oncoming vehicle even when the pitching of a vehicle occurs during driving in a low-beam condition.

Claims

1. A vehicle lamp comprising:

a projector lens (18);
a light source (12a) disposed on a rear side of a rear focal point (F) of the projector lens (18); and
a reflector (14, 114) for reflecting light from the light source (12a) toward the projector lens (18), wherein a reflective surface (14a, 114a) of the reflector (14, 114) includes a partial reflection area (14aA, 114aA) and a general reflection area (14a0, 114a0) which is an area of the reflective surface (14a, 114a) other than the partial reflection area (14aA, 114aA), wherein a light distribution pattern (PLO, PHO, PL1, PH1) to be formed by an irradiation light from the vehicle lamp is adapted to be formed by a reflected light on the general reflection area (14a0, 114a0), and wherein the partial reflection area (14aA, 114aA) is configured such that a light from the light source (12a) which is reflected on the partial reflection area (14aA, 114aA) is incident on the projector lens (18) as a diffusely reflected light.

2. The vehicle lamp according to claim 1, wherein the partial reflection area (14aA, 114aA) is located on a position of the reflective surface (14a, 114a) in a vicinity of an optical axis (Ax) of the projector lens (18).

3. The vehicle lamp according to claim 1 or 2, wherein a shade (20) for shading a part of the reflected light from the reflector (14, 114) is placed on a rear side of the projector lens (18) so as to form a low-beam light distribution pattern (PL) having a cut-off line (CL1, CL2) at an upper end edge of the low-beam light distribution pattern (PL) as the light distribution pattern, and wherein the partial reflection area (14aA, 114aA) is disposed on a side of an own lane relative to an optical axis of the projector lens.

FIG.1

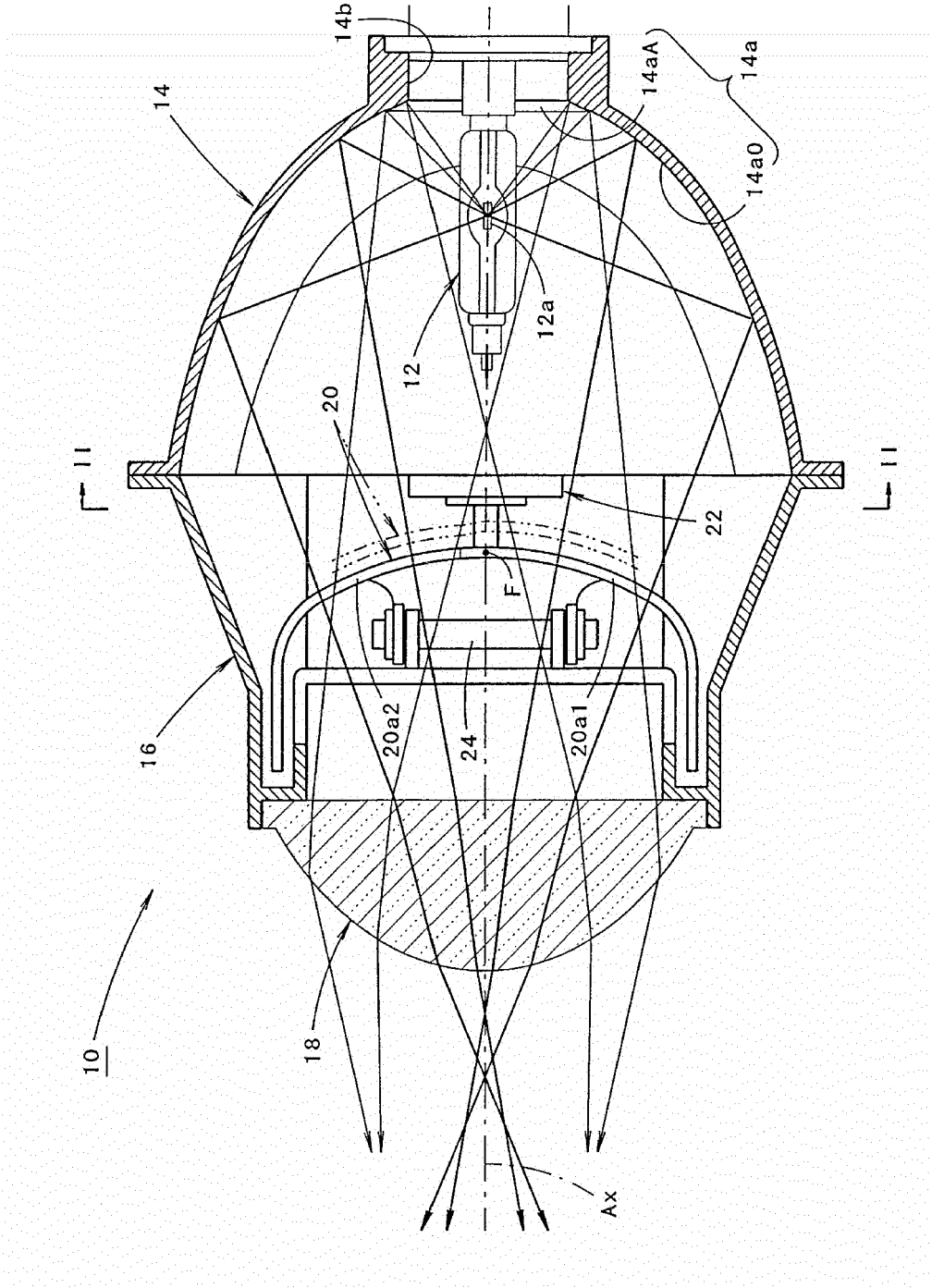
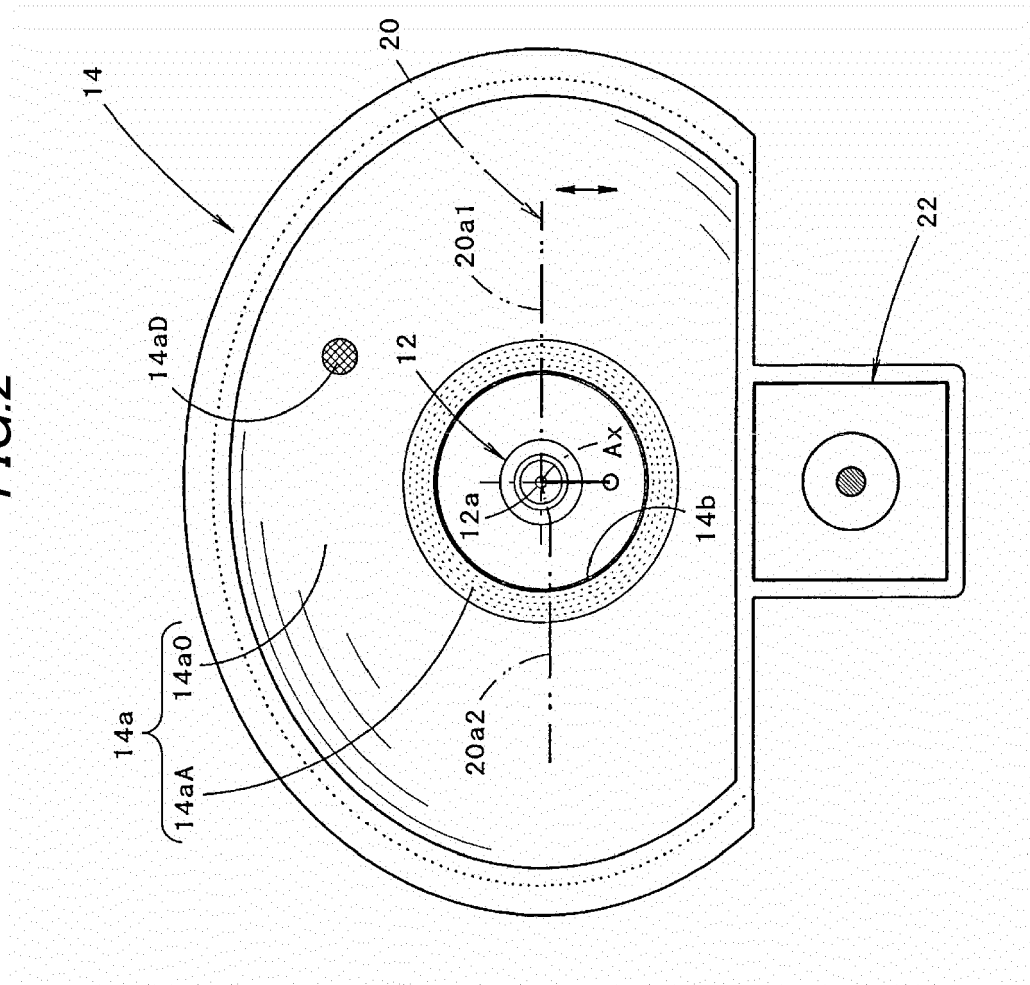
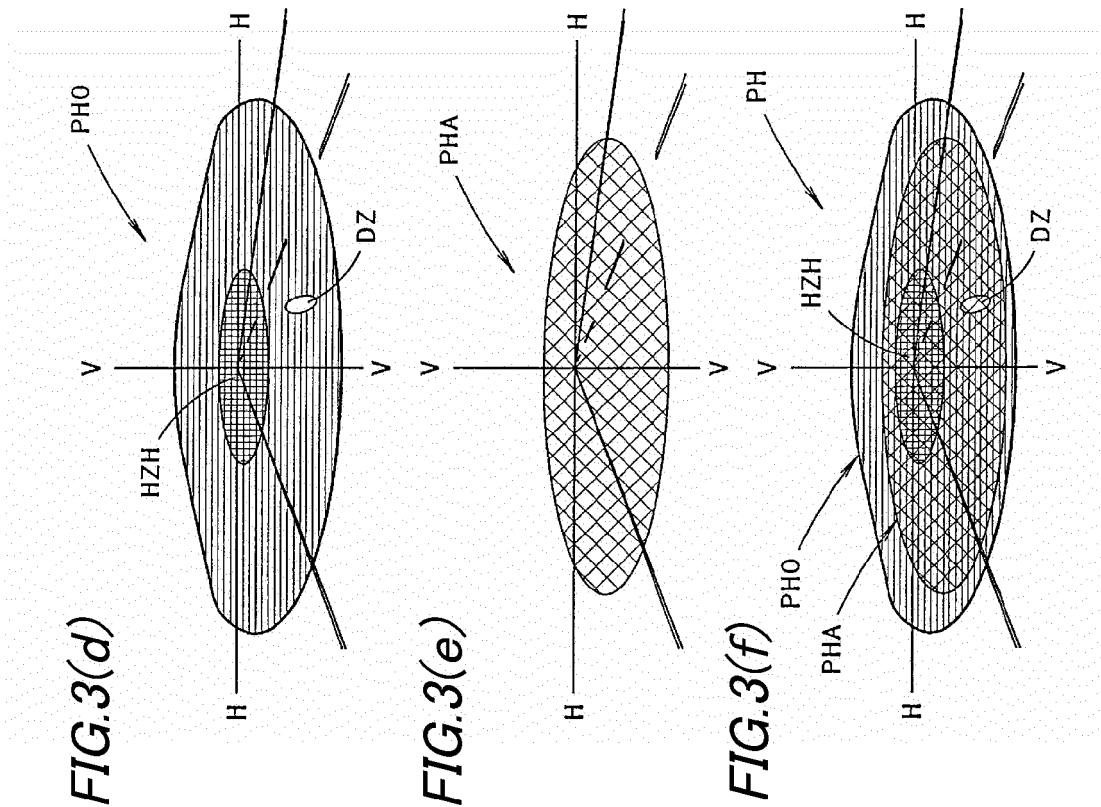
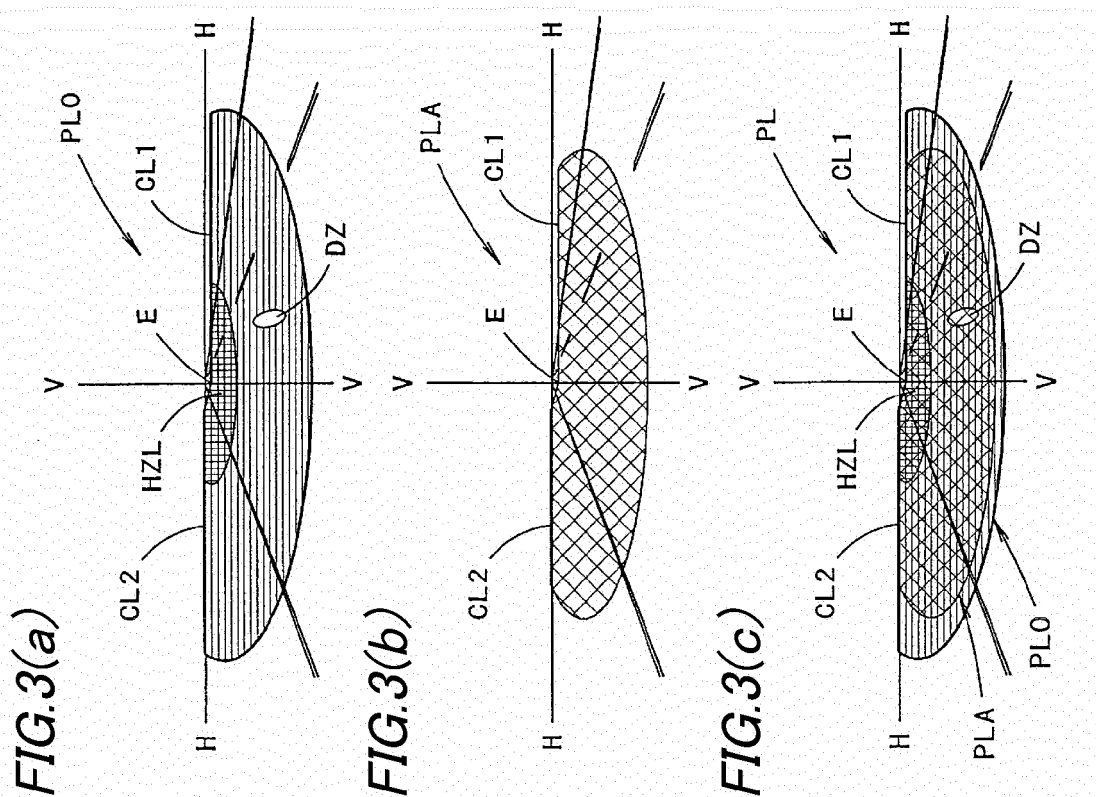
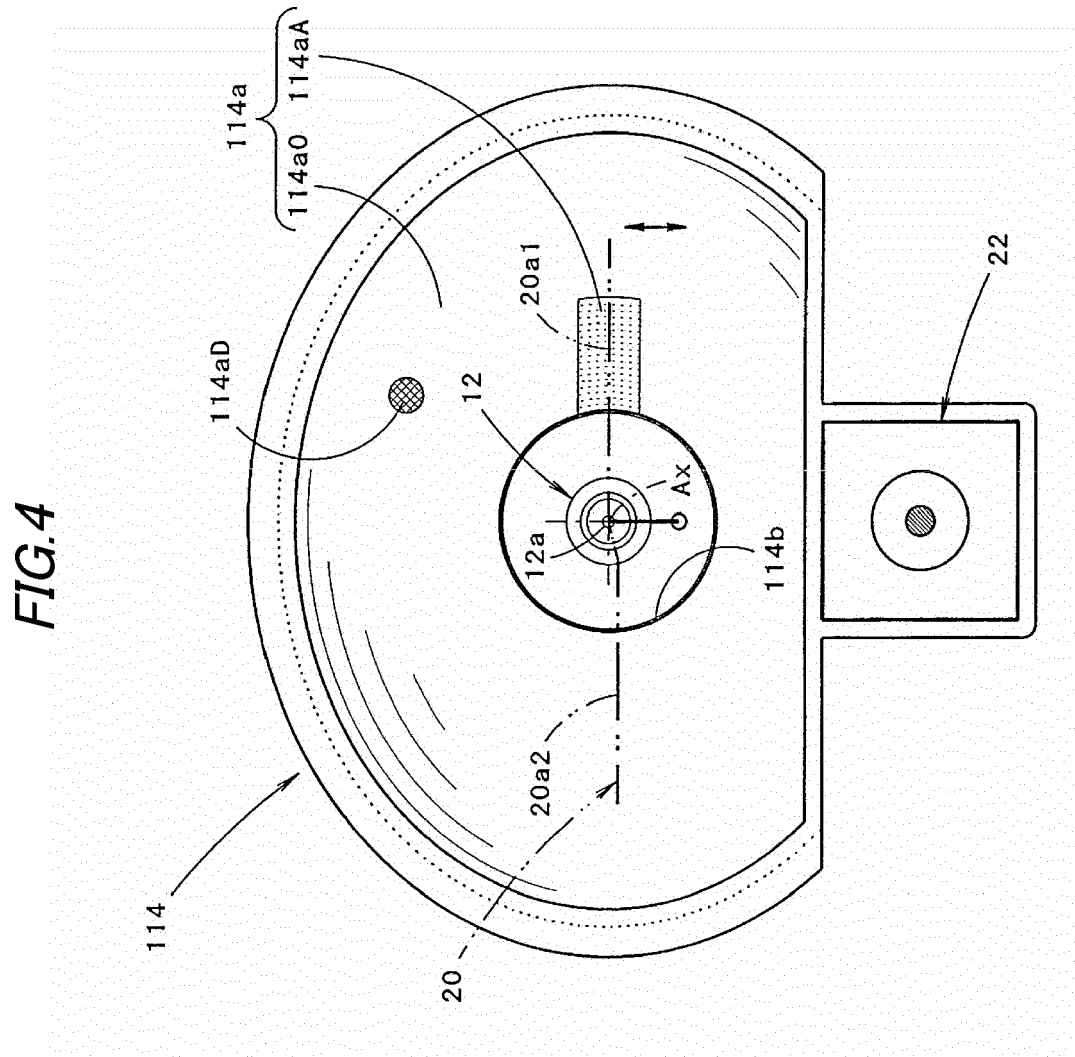
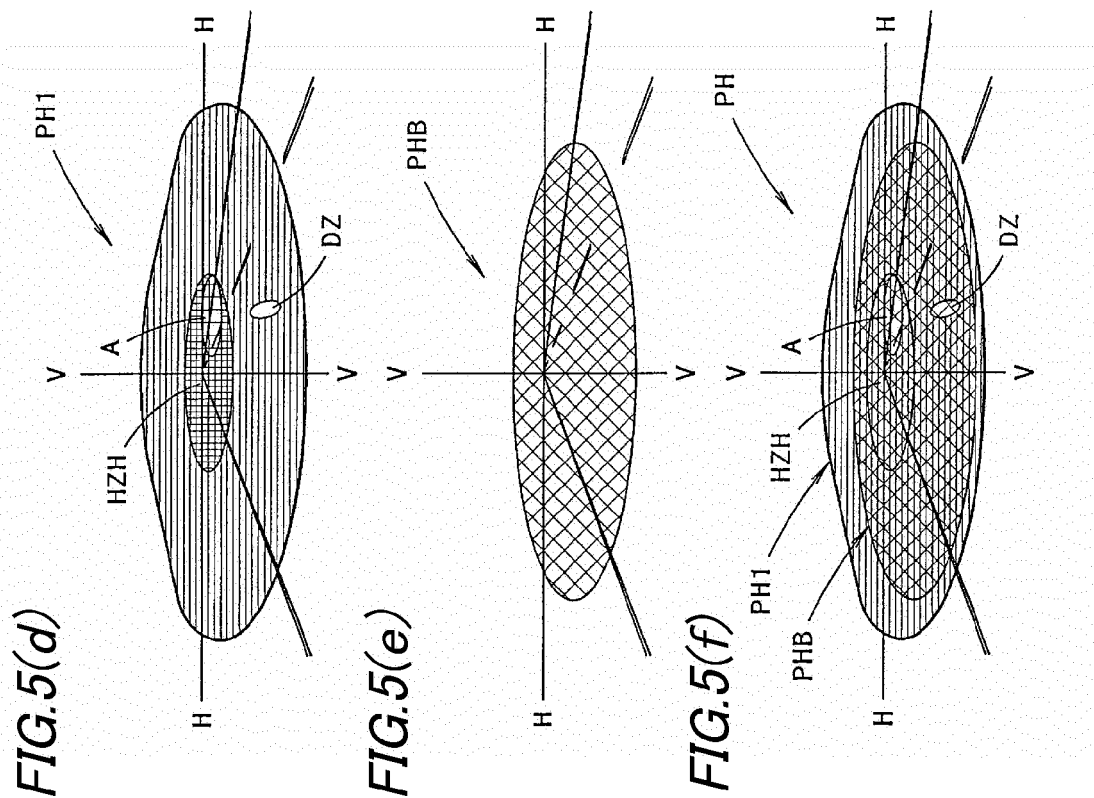
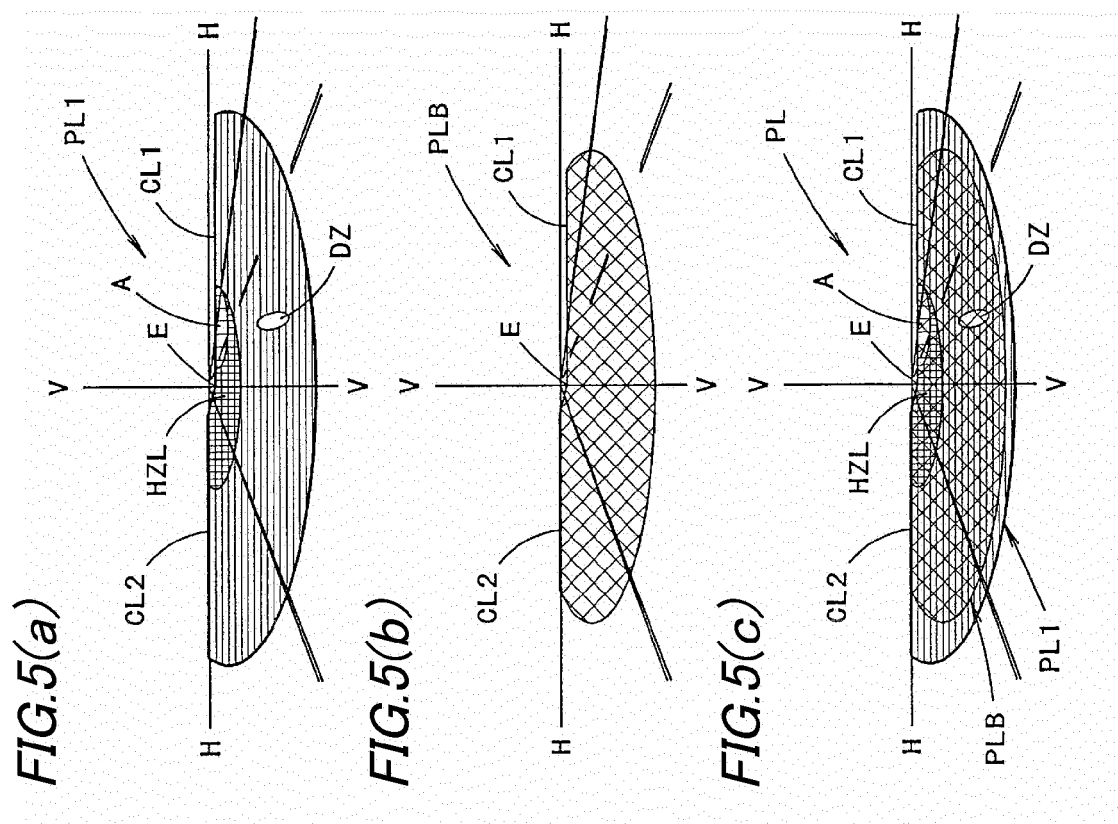


FIG.2









REFERENCES CITED IN THE DESCRIPTION

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