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(54) **Vehicle illumination lamp**

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## Description

### Background to the Invention

**[0001]** The present invention relates to a so-called projector type vehicle illumination lamp, and more particularly to a vehicle illumination lamp which is designed to form a variable luminous intensity distribution pattern.

**[0002]** In general, in a projector type vehicle illumination lamp, light from a light source which is disposed further rearwards than a rear focal point of a projection lens is designed to be reflected towards the projection lens by a reflector.

**[0003]** JP-A-2011-65960 describes a projector type vehicle illumination lamp which is designed to form a high-beam variable luminous intensity distribution pattern.

**[0004]** Namely, in the vehicle illumination lamp described in JP-A-2011-65960, a movable shade is disposed between the reflector and the projection lens. This movable shade is designed to shift between a light interruptive position where part of reflected light from the reflector is interrupted and a light uninterruptive position where the part of the reflected light becomes free from interruption or is left uninterrupted. Then, when this movable shade shifts to the light uninterruptive position, a high-beam luminous intensity distribution pattern is formed as a first variable luminous intensity distribution pattern, whereas when the movable shade shifts to the light interruptive position, a luminous intensity distribution pattern in which part of the high-beam luminous intensity distribution pattern is lost is formed as a second variable luminous intensity distribution pattern.

**[0005]** As done in the vehicle illumination lamp described in JP-A-2011-65960, by adopting the configuration which enables the formation of the high-beam variable luminous intensity distribution pattern, the forward visibility of the driver of the subject vehicle can be enhanced without dazzling the driver of a preceding vehicle or an oncoming vehicle.

**[0006]** In a vehicle illumination lamp like this, when a configuration is adopted in which a second light source and a second reflector which reflects to shine light from the second light source to the front of the lamp without allowing it to be incident on the projection lens are additionally provided, it becomes possible to increase the brightness of the high-beam luminous intensity distribution pattern.

**[0007]** However, the following problem remains unsolved only by adopting that configuration alone. In particular, a luminous intensity distribution pattern that is formed by the reflected light from the second reflector is formed into a constant pattern irrespective of the position of the movable shade. Therefore, when the movable shade shifts to the light interruptive position to form the second variable luminous intensity distribution pattern, part of the luminous intensity distribution pattern formed by the reflected light from the second reflector projects to a dark portion which is formed in the second variable luminous intensity distribution pattern when it is formed as a result of the part of the high-beam luminous intensity distribution pattern being lost. This causes a problem that the driver of a preceding vehicle or an oncoming vehicle is dazzled by the resulting luminous intensity distribution pattern.

**[0008]** In US 2003/0090906A1, there is disclosed a vehicle illumination lamp comprising a projection lens and a light source and first and second auxiliary reflectors, as well as a movable shade, so configured that when in an interruptive position, light from the light source is prevented from being incident on the second auxiliary reflector, thus forming a low beam light pattern. When the shade is moved to an uninterruptive position, light from the light source is reflected by the first and second auxiliary reflectors to bypass the projection lens, thereby forming a high beam light pattern, and in particular one having a high intensity hot zone in the central portion thereof.

### Summary of the Invention

**[0009]** The invention has been made in view of these situations, and an object thereof is to provide a projector type vehicle illumination lamp designed to form a high-beam variable luminous intensity distribution pattern in which when a second variable luminous intensity distribution pattern is formed which lacks part of a high-beam luminous intensity distribution pattern as a first variable luminous intensity distribution pattern, the brightness of the first variable luminous intensity distribution pattern can be enhanced without dazzling the driver of a preceding vehicle or an oncoming vehicle.

**[0010]** In the present invention, this object is attained by adopting a configuration in which a second light source and a second reflector are additionally provided and then devising an optimum relationship between them.

**[0011]** According to an aspect of the invention, there is provided a vehicle illumination lamp designed to form a high-beam variable luminous intensity distribution pattern, the vehicle illumination lamp comprising, as set forth in the accompanying claim 1, a projection lens, a light source which is disposed further rearwards than a rear focal point of the projection lens, a reflector which reflects light from the light source towards the projection lens, and a movable shade which is disposed between the reflector and the projection lens so as to shift between a light interruptive position where part of reflected light from the reflector is interrupted so as to eliminate part of a high-beam luminous intensity distribution pattern and a light uninterruptive position where the interruption of the reflected light is released, wherein a second light source is disposed rearwards of the movable shade and a second reflector is disposed forwards of the movable shade, and wherein the second light source and the second reflector are disposed in such a positional relationship that when the movable shade shifts to the light uninterruptive

position, light from the second light source is reflected by the second reflector so as to be shone to the front of the lamp without being allowed to be incident on the projection lens, while when the movable shade shifts to the light interruptive position, the light from the second light source is interrupted by the movable shade so as not to be incident on the second reflector. The light source is made up of a light emitting element which is disposed to be oriented upwards on or near to an optical axis of the projection lens, the second light source is made up of a light emitting element which is disposed to be oriented downwards in a position lying further forwards than the light source and further upwards than the optical axis, and the second reflector is disposed further downwards than the optical axis. The light source, the second light source and the second reflector can be disposed compact.

**[0012]** The type of the "light source" is not limited to any specific type, and hence, for example, a light emitting portion of a discharge bulb, a filament of a halogen lamp or a light emitting chip of a light emitting element such as a light emitting diode can be adopted.

**[0013]** The disposition of the "second light source" and the "second reflector" is not limited to any specific disposition as long as the second light source and the second reflector are disposed in such a positional relationship that when the movable shade shifts to the light uninterruptive position, light from the second light source is reflected by the second reflector so as to be shone to the front of the lamp without being allowed to be incident on the projection lens, while when the movable shade shifts to the light interruptive position, the light from the second light source is interrupted by the movable shade so as not to be incident on the second reflector. In disposing the second light source and the second reflector in such a positional relationship, as long as the driver of a preceding or oncoming vehicle is not dazzled, it is not necessarily required that light from the second light source is interrupted by the movable shade to such an extent that the light is totally prevented from being incident on the second reflector.

**[0014]** As the configuration described above shows, in the vehicle illumination lamp according to the present invention configured as a projector type vehicle illumination lamp designed to form the high-beam variable luminous intensity distribution pattern, with the movable shade designed to selectively form the high-beam luminous intensity distribution pattern which is the first variable luminous intensity distribution pattern and the second variable luminous intensity distribution pattern in which part of the first variable luminous intensity distribution pattern is eliminated, the second light source is disposed rearwards of the movable shade, and the second reflector is disposed forwards of the movable shade. Additionally, the second light source and the second reflector are disposed in such a positional relationship that when the movable shade shifts to the light uninterruptive position, light from the second light source is reflected by the second reflector so as to be shone to the front of the lamp without being allowed to be incident on the projection lens, while when the movable shade shifts to the light interruptive position, the light from the second light source is interrupted by the movable shade so as not to be incident on the second reflector. Thus, the following function and advantage can be obtained.

**[0015]** Namely, the first variable luminous intensity distribution pattern is formed when the movable shade shifts to the light uninterruptive position, and as this occurs, the light from the second light source is reflected by the second reflector and is thereafter shone to the front of the lamp without being allowed to be incident on the projection lens. Therefore, the brightness of the first variable luminous intensity distribution pattern can be enhanced by a luminous intensity distribution pattern which is formed by the light shone to the front of the lamp.

**[0016]** On the other hand, the second variable luminous intensity distribution pattern in which part of the first variable luminous intensity distribution pattern is eliminated is formed when the movable shade shifts to the light interruptive position. As this occurs, the light from the second light source is interrupted by the movable shade and is not allowed to be incident on the second reflector. Therefore, it becomes possible to prevent part of the luminous intensity distribution pattern which is formed by the reflected light from the second reflector from being formed so as to project to a dark portion in the second variable luminous intensity distribution pattern which is formed as a result of the part of the first movable luminous intensity distribution pattern being eliminated. By so doing, it becomes possible to prevent the driver of a preceding or oncoming vehicle from being dazzled.

**[0017]** In this way, in the present invention, in a projector type vehicle illumination lamp designed to form a high-beam variable luminous intensity distribution pattern, when the second variable luminous intensity distribution pattern is formed in which the part of the high-beam luminous intensity distribution pattern which is the first variable luminous intensity distribution pattern is eliminated, the brightness of the first variable luminous intensity distribution pattern can be enhanced without dazzling the driver of a preceding or oncoming vehicle.

**[0018]** In the configuration described above, in the event that a third reflector is disposed rearwards of the movable shade which third reflector is designed to reflect light from the second light source towards the projection lens, the brightness of the high-beam variable luminous intensity distribution pattern can be enhanced further by a luminous intensity distribution pattern which is formed by the reflected light from the third reflector.

**[0019]** In the configuration described above, in the event that a second movable shade is disposed between the reflector and the projection lens which second movable shade is designed to shift between a light interruptive position where part of reflected light from the reflector is interrupted so as to form a low-beam luminous intensity

distribution pattern and a light uninterruptive position where the interruption of the reflected light is released, the vehicle illumination lamp can be switched between a low beam and a high beam. In this case, in the event that the second light source and the second reflector are disposed in such a positional relationship that light from the second light source reaches the second reflector by passing above the second movable shade which shifts to the light uninterruptive position, the movable shade and the second movable shade can be disposed without any difficulty.

## Brief description of the Drawings

**[0020]** Examples of the present invention will now be described in detail with reference to the accompanying drawings, in which:

Fig. 1 is a front view of a vehicle illumination lamp according to an embodiment of the invention, which shows a state in which a movable shade is in a light uninterruptive position and a second movable shade is in a light interruptive position.

Fig. 2 is a sectional view of the vehicle illumination lamp taken along the line II-II in Fig. 1.

Fig. 3 is a sectional view of the vehicle illumination lamp, which is similar to Fig. 2, showing a state in which the second movable shade is caused to shift from the state shown in Fig. 2 to a light uninterruptive position.

Fig. 4 is a perspective view of the vehicle illumination lamp which is in the state shown in Fig. 3 with main constituent elements removed.

Fig. 5 is a sectional view of the vehicle illumination lamp, which is similar to Fig. 3, showing a state in which the movable shade is caused to shift from the state shown in Fig. 3 to a light interruptive position.

Fig. 6 is a perspective view of the vehicle illumination lamp which is in the state shown in Fig. 5 with the main constituent elements removed.

Fig. 7 shows diagrams depicting in a perspective fashion variable luminous intensity distribution patterns which are formed on an imaginary vertical aiming board which is disposed 25 m ahead of the lamp, of which Fig. 7(a) shows a first variable luminous intensity distribution pattern and Fig. 7(b) shows a second variable luminous intensity distribution pattern.

Fig. 8 shows diagrams depicting the variable luminous intensity distribution patterns in a disassembled fashion by disassembling them into a plurality of luminous intensity distribution patterns.

## Detailed Description

**[0021]** Fig. 1 is a front view of a vehicle illumination lamp 10 according to an embodiment of the invention, which shows a state in which a movable shade 18 is in a light uninterruptive position and a second movable shade 28 is in a light interruptive position. Fig. 2 is a sectional view of the vehicle illumination lamp 10 which is taken along the line II-II in Fig. 1.

**[0022]** As shown in these figures, the vehicle illumination lamp 10 according to the embodiment is configured as a projector type lamp unit and is designed to be incorporated in a lamp body, not shown, for use.

**[0023]** This vehicle illumination lamp 10 is designed to form a high-beam variable luminous intensity distribution pattern.

**[0024]** To realize this, the vehicle illumination lamp 10 includes a projection lens 12, a light source 14 which is disposed further rearwards than a rear focal point F of the projection lens 12, a reflector 16 which reflects light from the light source 14 towards the projection lens 12, a movable shade 18 which is disposed between the reflector 16 and the projection lens 12, and a holder 40 which supports these constituent components of the vehicle illumination lamp 10.

**[0025]** The projection lens 12 is a planoconvex aspheric lens which is convex on a front surface and is flat on a rear surface thereof. This projection lens 12 is supported on the holder 40 via a lens holder 20.

**[0026]** The light source 14 is made up of a light emitting element which is disposed to be oriented upwards on an optical axis Ax of the projection lens 12. Specifically, the light source 14 is made up of a white light emitting diode having a horizontally elongated rectangular light emitting chip.

**[0027]** The reflector 16 is disposed so as to cover the light source 14 from thereabove. A reflecting surface 16a of the reflector 16 is formed into a substantially ellipsoidal curved surface which has a major axis which is coaxial with the optical axis Ax and whose first focal point is constituted by a light emitting center of the light source 14. A lower edge of the reflecting surface 16 is situated on a horizontal plane which contains the optical axis Ax. This reflecting surface 16a is designed to reflect light from the light source 14 in such a form that the light substantially converges near to the front of the rear focal point F in a vertical plane and that the converging position is displaced forwards in a horizontal plane.

**[0028]** The movable shade 18 is disposed near to the front of the rear focal point F of the projection lens 12 and is designed to shift between a light interruptive position (a position indicated by chain double-dashed lines in Fig. 1) where part of reflected light from the reflector 16 is interrupted and a light uninterruptive position (a position indicated by solid lines in Fig. 1) where the interruption of the reflected light is released.

**[0029]** This movable shade 18 is a plate-shaped member which is disposed so as to lie along a vertical plane which intersects the optical axis Ax at right angles. The movable shade 18 is supported on an actuator 42 at a right end portion (a left end portion when the lamp is seen from the front, this being true in the following diagrams) thereof so as to rotate about an axis Ax1 which extends

in a front-to-rear direction of the actuator 42. Then, the movable shade 18 is designed to shift between the light interruptive position and the light uninterruptive position when the actuator 42 is driven.

**[0030]** When shifting to the light interruptive position, the movable shade 18 is disposed so that an upper edge 18a extends horizontally near to a lower side of the optical axis Ax, while a left edge 18b extends along a vertical plane which contains the optical axis Ax.

**[0031]** Additionally, in this vehicle illumination lamp 10, when the movable shade 18 shifts to the light uninterruptive position, a high-beam variable luminous intensity distribution pattern is formed as a first variable luminous intensity distribution pattern PH1 (refer to Fig. 7(a)), while when the movable shade 18 shifts to the light interruptive position, a luminous intensity distribution pattern in which part of the high-beam luminous intensity distribution pattern is eliminated is formed as a second variable luminous intensity distribution pattern PH2 (refer to Fig. 7(b)).

**[0032]** As shown in Figs. 1 and 2, a second light source 24 is disposed rearwards of the movable shade 18, and a second reflector 26 is disposed forwards of the movable shade 18.

**[0033]** Fig. 3 is a sectional view of the vehicle illumination lamp 10, which is similar to Fig. 2, showing a state in which the second movable shade 28 is caused to shift from the state shown in Fig. 2 to a light uninterruptive position. Additionally, Fig. 4 is a perspective view of the vehicle illumination lamp 10 which is in the state shown in Fig. 3 with main constituent elements removed.

**[0034]** On the other hand, Fig. 5 is a sectional view of the vehicle illumination lamp 10, which is similar to Fig. 3, showing a state in which the movable shade 18 is caused to shift from the state shown in Fig. 3 to the light interruptive position. Additionally, Fig. 6 is a perspective view of the vehicle illumination lamp 10 which is in the state shown in Fig. 5 with the main constituent elements removed.

**[0035]** As shown in these figures, the second light source 24 and the second reflector 26 are disposed in such a positional relationship that when the movable shade 18 shifts to the light uninterruptive position, light from the second light source 24 is reflected by the second reflector 26 so as to be shone to the front of the lamp without being allowed to be incident on the projection lens 12, while when the movable shade 18 shifts to the light interruptive position, the light from the second light source 24 is interrupted by the movable shade 18 so as not to be incident on the second reflector 26.

**[0036]** In order to realize this, the second light source 24 is made up of a light emitting element which is disposed to be oriented downwards in a position which lies further forwards than the light source 14 and further upwards than the optical axis Ax. Specifically, this light source 24 is made up of a white light emitting diode having a horizontally elongated rectangular light emitting chip.

**[0037]** In addition, the second reflector 26 is disposed further downwards than the optical axis Ax of the projection lens 12. Specifically, this second reflector 26 is disposed downwardly rightwards of the projection lens 12. A reflecting surface 26a of the second reflector 26 is formed into a paraboloidal surface whose focal point is constituted by the second light source 24 as a reference plane. The reflecting surface 26a is designed to reflect light from the second light source 24 as light which slightly diffuses.

**[0038]** A third reflector 36 is disposed rearwards of the movable shade 18, and this third reflector 36 is designed to reflect light from the second light source 24 towards the projection lens 12.

**[0039]** This third reflector 36 is disposed so as to cover the second light source 24 from therebelow. A reflecting surface 36a of this third reflector 36 is formed into a substantially ellipsoidal curved surface which has a major axis which is coaxial with the optical axis Ax and whose first focal point is constituted by a light emitting center of the second light source 24. An upper edge of the reflecting surface 36a is situated on the horizontal plane which contains the optical axis Ax. Additionally, this reflecting surface 36a is designed to reflect light from the second light source 24 in such a form that the light substantially converges in a position lying obliquely upwards and forwards of the rear focal point F in a vertical plane and that the converging position is displaced forwards in a horizontal plane.

**[0040]** The vehicle illumination lamp 10 according to the embodiment is designed not only to form the high-beam variable luminous intensity distribution pattern but also to form selectively a low-beam luminous intensity distribution pattern.

**[0041]** In order to realize this, the second movable shade 28 is disposed between the reflector 16 and the projection lens 12.

**[0042]** The second movable shade 28 is disposed near to the rear of the movable shade 18 so as to shift between a light interruptive position (a position indicated by solid lines in Fig. 1) where part of reflected light from the reflector 16 is interrupted and a light uninterruptive position (a position indicated by chain double-dashed lines in Fig. 1) where the interruption of the reflected light is released.

**[0043]** This second movable shade 28 is a plate-shaped member which is disposed so as to lie along a vertical plane which intersects the optical axis Ax at right angles. The second movable shade 28 is rotatably supported on an actuator 44 at a left end portion thereof. Then, the second movable shade 28 is designed to shift between the light interruptive position and the light uninterruptive position when the actuator 44 is driven.

**[0044]** When shifting to the light interruptive position, the second movable shade 28 is disposed so that an upper edge 28a extends horizontally in a step-like fashion so as to pass through the rear focal point F of the projection lens 12.

**[0045]** Then, when this vehicle illumination lamp 10 is switched to the low beam, only the light source 14 is turned on with the second movable shade 28 caused to

shift to the light interruptive position, whereby a low-beam luminous intensity distribution pattern PL (refer to Fig. 8(a)) is formed. On the other hand, when the vehicle illumination lamp 10 is switched to the high beam, the second light source 24 is additionally turned on with the second movable shade 28 caused to shift to the light uninterruptive position, whereby the high-beam luminous intensity distribution patterns PH1, PH2 (refer to Figs. 7(a), (b)) are formed.

**[0046]** As this occurs, the second light source 24 and the second reflector 26 are in such a positional relationship that light from the second light source 24 passes above the second movable shade 28 which has shifted to the light uninterruptive position to reach the second reflector 26.

**[0047]** The second light source 24, the second and third reflectors 26, 36, the second movable shade 28 and the actuators 42, 44 are also supported on the holder 40.

**[0048]** Fig. 7 shows diagrams depicting in a perspective fashion the variable luminous intensity distribution patterns which are formed on an imaginary vertical aiming board which is disposed 25 m ahead of the vehicle illumination lamp 10, of which Fig. 7(a) shows the first variable luminous intensity distribution pattern and Fig. 7(b) shows the second variable luminous intensity distribution pattern.

**[0049]** The first variable luminous intensity distribution pattern PH1 shown in Fig. 7(a) is the high-beam luminous intensity distribution pattern and is formed when the light source 14 and the second light source 24 are tuned on simultaneously with both the movable shade 18 and the second movable shade 28 having shifted to the light uninterruptive positions.

**[0050]** This first variable luminous intensity distribution pattern PH1 is formed as a composite luminous intensity distribution pattern in which three luminous intensity distribution patterns P1A, P2, P3 are superposed one on another.

**[0051]** As shown in Fig. 8(b), the luminous intensity distribution pattern P1A is a luminous intensity distribution pattern which forms a basic configuration of the first variable luminous intensity distribution pattern PH1. The luminous intensity distribution pattern P1A is a luminous intensity distribution pattern which is formed by light which is emitted from the light source 14, is then reflected on the reflector 16 and is thereafter shone to the front of the lamp through the projection lens 12.

**[0052]** As shown in Fig. 8(d), the luminous intensity distribution pattern P2 is a relatively small luminous intensity distribution pattern which enhances a central luminous intensity of the first variable luminous intensity distribution pattern PH1 so as to ensure a sufficient far-field visibility. This luminous intensity distribution pattern P2 is a luminous intensity distribution pattern which is formed by light which is emitted from the second light source 24, is then reflected on the second reflector 26 and is thereafter shone to the front of the lamp without being allowed to be incident on the projection lens 12.

**[0053]** As shown in Fig. 8(e), a luminous intensity distribution pattern P3A is a luminous intensity distribution pattern which enhances the overall brightness of the first variable luminous intensity distribution pattern PH1. This luminous intensity distribution pattern P3A is a luminous intensity distribution pattern which is formed by light which is emitted from the second light source 24, is then reflected on the third reflector 36 and is thereafter shone to the front of the lamp through the projection lens 12.

**[0054]** On the other hand, the second variable luminous intensity distribution pattern PH2 shown in Fig 7(b) is a luminous intensity distribution pattern in which part of the high-beam luminous intensity distribution pattern is eliminated and is formed when the light source 14 and the second light source 24 are turned on simultaneously with the second movable shade 28 and the movable shade 18 having shifted to the light uninterruptive position and the light interruptive position, respectively.

**[0055]** In the second variable luminous intensity distribution pattern PH2, a horizontal cut-off line CL3 and a vertical cut-off line CL4 are formed, respectively, by the upper edge 18a and the left edge 18b of the movable shade 18 which is in the light interruptive position to thereby form a luminous intensity distribution pattern in which a dark portion is formed at an upper right-hand side portion as a result of a corresponding portion of the first variable luminous intensity distribution pattern PH1 being eliminated.

**[0056]** This second variable luminous intensity distribution pattern PH2 is formed as a composite luminous intensity distribution pattern in which two luminous intensity distribution patterns P1 B, P3B are superposed one on the other.

**[0057]** As shown in Fig. 8(c), the luminous intensity distribution pattern PB1 is a luminous intensity distribution pattern which forms a basic configuration of the second variable luminous intensity distribution pattern PH2. This luminous intensity distribution pattern PB1 is a luminous intensity distribution pattern which is formed by light which is emitted from the light source 14, is then reflected on the reflector 16 and is thereafter shone to the front of the lamp through the projection lens 12. This luminous intensity distribution pattern P1B has the horizontal cut-off line CL3 and the vertical cut-off line CL4.

**[0058]** As shown in Fig. 8(f), the luminous intensity distribution pattern P3B is a luminous intensity distribution pattern which enhances the overall brightness of the second variable luminous intensity distribution pattern PH2. This luminous intensity distribution pattern PH2 is a luminous intensity distribution pattern which is formed by light which is emitted from the second light source 24, is then reflected on the third reflector 36 and is thereafter shone to the front of the lamp through the projection lens 12. This luminous intensity distribution pattern P3B also has the horizontal cut-off line CL3 and the vertical cut-off line CL4.

**[0059]** In this second variable luminous intensity distribution pattern PH2, the luminous intensity distribution

pattern P2 which contributes to the formation of the first variable luminous intensity distribution pattern PH1 does not contribute to the formation of the second variable luminous intensity distribution pattern PH2. This is because the light from the second light source 24 is interrupted by the movable shade 18 which is in the light interruptive position so as not to be incident on the second reflector 26.

**[0060]** Consequently, in this second variable luminous intensity distribution pattern PH2, the upper right-hand side portion defined by the horizontal cut-off line CL3 and the vertical cut-off line CL4 is left as the dark portion, whereby the dazzling of the driver of an oncoming vehicle 2 is prevented.

**[0061]** As shown in Fig. 8(a), the low-beam luminous intensity distribution pattern PL is formed as a luminous intensity distribution pattern in which an upper portion of the luminous intensity distribution pattern P1A (refer to Fig. 8(b)) which forms the basic configuration of the first variable luminous intensity distribution pattern PH1 is eliminated.

**[0062]** This low-beam luminous intensity distribution pattern PL is a low-beam luminous intensity distribution pattern which is suitable for a left-hand traffic. Left and right horizontal cut-off lines CL1, CL2 are formed at an upper end portion thereof, and these left and right horizontal cut-off lines CL1, CL2 are different in level and are connected together via an elbow point E. These left and right cut-off lines CL1, CL2 which are different in level are formed by the upper edge 28a of the second movable shade 28 which has shifted to the light interruptive position.

**[0063]** Next, the function and advantage of the embodiment will be described.

**[0064]** The vehicle illumination lamp 10 according to the embodiment is configured as the projector type vehicle illumination lamp which forms the high-beam variable luminous intensity distribution pattern. In the vehicle illumination lamp 10, the second light source 24 is disposed rearwards of the movable shade 18 which forms selectively the high-beam luminous intensity distribution pattern as the first variable luminous intensity distribution pattern PH1 and the second variable luminous intensity distribution pattern PH2 in which the part of the first variable luminous intensity distribution pattern is eliminated, and the second reflector 26 is disposed forwards of the movable shade 18. Then, these second light source 24 and the second reflector 26 are in such a positional relationship that when the movable shade 18 shifts to the light uninterruptive position, the light from the second light source 24 is reflected by the second reflector 26 so as to be shone to the front of the lamp without being allowed to be incident on the projection lens 12, while when the movable shade 18 shifts to the light interruptive position, the light from the second light source 24 is interrupted by the movable shade 18 so as not to be incident on the second reflector 26. Thus, the following function and advantage can be obtained.

**[0065]** Namely, the first variable luminous intensity distribution pattern PH1 is formed when the movable shade 18 shifts to the light uninterruptive position, and as this occurs, the light from the second light source 24 is reflected by the second reflector 26 and is thereafter shone to the front of the lamp without being allowed to be incident on the projection lens 12. Therefore, the brightness of the first variable luminous intensity distribution pattern PH1 can be enhanced by a luminous intensity distribution pattern P2 which is formed by the light so shone to the front of the lamp.

**[0066]** On the other hand, the second variable luminous intensity distribution pattern in which the part of the first variable luminous intensity distribution pattern PH1 is eliminated is formed when the movable shade 18 shifts to the light interruptive position. As this occurs, the light from the second light source 24 is interrupted by the movable shade 18 and is not allowed to be incident on the second reflector 26. Therefore, it becomes possible to prevent part of the luminous intensity distribution pattern P2 which is formed by the reflected light from the second reflector 26 from being formed so as to project to the upper right-hand side dark portion in the second variable luminous intensity distribution pattern which is formed as a result of the part of the first movable luminous intensity distribution pattern PH1 being eliminated. By so doing, it becomes possible to prevent the driver of the oncoming vehicle 2 from being dazzled.

**[0067]** In this way, according to the embodiment of the invention, in the projector type vehicle illumination lamp 10 designed to form the high-beam variable luminous intensity distribution pattern, when the second variable luminous intensity distribution pattern PH2 is formed in which the part of the high-beam luminous intensity distribution pattern which is the first variable luminous intensity distribution pattern PH1 is eliminated, the brightness of the first variable luminous intensity distribution pattern PH1 can be enhanced without dazzling the driver of the oncoming vehicle 2.

**[0068]** In addition, in the embodiment of the invention, the third reflector 36 is disposed rearwards of the movable shade 18 which third reflector 36 is designed to reflect light from the second light source 24 towards the projection lens 12, and therefore, the brightness of the high-beam variable luminous intensity distribution patterns PH1, PH2 can be enhanced further by the luminous intensity distribution patterns P3A, P3B which are formed by the reflected light from that third reflector 36.

**[0069]** Further, in the embodiment of the invention, the second movable shade 28 is disposed between the reflector 16 and the projection lens 12 which second movable shade 28 is designed to shift between the light interruptive position where part of the reflected light from the reflector 16 is interrupted so as to form the low-beam luminous intensity distribution pattern PL and the light uninterruptive position where the interruption of the reflected light is released, and therefore, the vehicle illumination lamp 10 can be switched between the low beam

and the high beam.

**[0070]** In this case, in the embodiment of the invention, the second light source 24 and the second reflector 26 are disposed in such a positional relationship that the light from the second light source 24 reaches the second reflector 26 by passing above the second movable shade 28 which has shifted to the light uninterruptive position, and therefore, the movable shade 18 and the second movable shade 28 can be disposed without any difficulty.

**[0071]** Additionally, in the embodiment of the invention, the light source 14 is made up of the light emitting element which is disposed to be oriented upwards on the optical axis Ax of the projection lens 12, the second light source 24 is made up of the light emitting element which is disposed to be oriented downwards in the position lying further forwards than the light source 14 and further upwards than the optical axis Ax, and the second reflector 26 is disposed further downwards than the optical axis Ax. Therefore, the light source 14, the second light source 24 and the second reflector 26 can be disposed compact.

**[0072]** In the embodiment of the invention, the luminous intensity distribution pattern P2 which is formed by the light which is emitted from the second light source 24, is then reflected by the second reflector 26 and is thereafter shone to the front of the lamp without being allowed to be incident on the projection lens 12 is described as being formed as the relatively small luminous intensity distribution pattern which enhances the central luminous intensity of the first variable luminous intensity distribution pattern PH1 so as to ensure the sufficient far-field visibility. However, instead of adopting this configuration, the luminous intensity distribution pattern P2 can also be formed as a relatively large luminous intensity distribution pattern.

**[0073]** In the embodiment of the invention, the second variable luminous intensity distribution pattern PH2 is described as being formed as the luminous intensity distribution pattern in which the upper right-hand side portion becomes the dark portion relative to the first variable luminous intensity distribution pattern PH1. However, in the event that a second movable shade is used which is disposed in such a position as to be laterally symmetrical with the second movable shade 28 of the embodiment described above with respect to the optical axis Ax, the second variable luminous intensity distribution pattern can be formed as a luminous intensity distribution pattern in which an upper left-hand side portion becomes a dark portion relative to the first variable luminous intensity distribution pattern PH1. Then, by adopting this configuration, the dazzling of the driver of a preceding vehicle can be prevented when the second variable luminous intensity distribution pattern is formed.

**[0074]** In this embodiment, the vehicle illumination lamp 10 is described as being designed to form the low-beam luminous intensity distribution pattern suitable for the left-hand traffic as the low-beam luminous intensity distribution pattern PL. However, even in the event that the vehicle illumination lamp 10 is designed to form a low-beam luminous intensity distribution pattern suitable for a right-hand traffic, the same function and advantage as those of the embodiment can be obtained by adopting the same configuration as that of the embodiment.

**[0075]** It should be noted that the numeric values shown as the specifications in the embodiment are only examples, and hence, those values may, of course, be set to different values as required.

## Claims

1. A vehicle illumination lamp (10) designed to form a high-beam variable luminous intensity distribution pattern (PH2), the vehicle illumination lamp (10) comprising: a projection lens (12); a light source (14) which is disposed further rearwards than a rear focal point (F) of the projection lens; a reflector (16) which reflects light from the light source (14) towards the projection lens (12); and a movable shade (18) which is disposed between the reflector (16) and the projection lens (12) so as to shift between a light interruptive position where part of reflected light from the reflector (16) is interrupted so as to eliminate part of a high-beam luminous intensity distribution pattern and a light uninterruptive position where the interruption of the reflected light is released, wherein
   a second light source (24) is disposed rearwards of the movable shade (18) and a second reflector (26) is disposed forwards of the movable shade (18), and wherein
   the second light source (24) and the second reflector (26) are disposed in such a positional relationship that when the movable shade (18) shifts to the light uninterruptive position, light from the second light source (24) is reflected by the second reflector (26) so as to be shone to the front of the lamp (10) without being allowed to be incident on the projection lens (12), while when the movable shade (18) shifts to the light interruptive position, the light from the second light source is interrupted by the movable shade (18) so as not to be incident on the second reflector (26),
   wherein the light source (14) is made up of a light emitting element which is disposed to be oriented upwards on or near to an optical axis (Ax) of the projection lens (12), wherein
   the second light source (24) is made up of a light emitting element which is disposed to be oriented downwards in a position lying further forwards than the light source (14) and further upwards than the optical axis (Ax), and wherein
   the second reflector (26) is disposed further downwards than the optical axis (Ax).

2. A vehicle illumination lamp according to claim 1, wherein
   a third reflector (36) is disposed rearwards of the

movable shade (18) which third reflector is designed to reflect light from the second light source (24) towards the projection lens (12).

**3.** A vehicle illumination lamp according to claim 2, wherein
a second movable shade (28) is disposed between the reflector (16) and the projection lens (12) which second movable shade (28) is designed to shift between a light interruptive position where part of reflected light from the reflector (16) is interrupted so as to form a low-beam luminous intensity distribution pattern (PL) and a light uninterruptive position where the interruption of the reflected light is released, and wherein
the second light source (24) and the second reflector (26) are disposed in such a positional relationship that light from the second light source (24) reaches the second reflector (26) by passing above the second movable shade (28) which shifts to the light uninterruptive position.

**Patentansprüche**

**1.** Fahrzeugleuchte (10), die so ausgeführt ist, dass sie ein Fernlicht-Lichtstärkeverteilungsmuster (PH2) erzeugt, wobei die Fahrzeugleuchte (10) eine Projektions-Linse (12), eine Lichtquelle (14), die weiter hinten angeordnet ist als ein hinterer Brennpunkt (F) der Projektions-Linse, einen Reflektor (16), der Licht von der Lichtquelle (14) auf die Projektions-Linse (12) zu reflektiert, sowie eine bewegliche Blende (18) umfasst, die zwischen dem Reflektor (16) und der Projektions-Linse (12) angeordnet ist und zwischen einer Position mit Unterbrechung von Licht, in der ein Teil von dem Reflektor (16) reflektierten Lichts unterbrochen wird, um einen Teil eines Fernlicht-Lichtstärkeverteilungsmusters zu eliminieren, und einer Position ohne Unterbrechung von Licht wechselt, in der die Unterbrechung des reflektierten Lichts aufgehoben wird, wobei
eine zweite Lichtquelle (24) hinter der beweglichen Blende (18) angeordnet ist und ein zweiter Reflektor (26) vor der beweglichen Blende (18) angeordnet ist, und wobei
die zweite Lichtquelle (24) und der zweite Reflektor (26) in einer Positionsbeziehung angeordnet sind, durch die, wenn die bewegliche Blende an die Position ohne Unterbrechung von Licht wechselt, Licht von der zweiten Lichtquelle (24) durch dem zweiten Reflektor (26) so reflektiert wird, dass es zur Vorderseite der Leuchte (10) scheint, ohne dass es auf die Projektions-Linse (12) auftreffen kann, während, wenn die bewegliche Blende (18) an die Position mit Unterbrechung von Licht wechselt, das Licht von der zweiten Lichtquelle durch die bewegliche Blende (18) unterbrochen wird, so dass es nicht auf den zweiten Reflektor (26) auftrifft,
wobei die Lichtquelle (14) aus einem lichtemittierenden Element besteht, das so angeordnet ist, dass es an oder nahe an einer optischen Achse (Ax) der Projektions-Linse (12) nach oben ausgerichtet ist,
die zweite Lichtquelle (24) aus einem lichtemittierenden Element besteht, das an einer Position, die weiter vorn liegt als die Lichtquelle (14) und weiter oben als die optische Achse (Ax), nach unten ausgerichtet ist, und
der zweite Reflektor (26) weiter unten angeordnet ist als die optische Achse (Ax).

**2.** Fahrzeugleuchte nach Anspruch 1, wobei
ein dritter Reflektor (96) hinter der beweglichen Blende (18) angeordnet ist, und der dritte Reflektor so ausgeführt ist, dass er Licht von der zweiten Lichtquelle (24) auf die Projektions-Linse (12) zur reflektiert.

**3.** Fahrzeugleuchte nach Anspruch 2, wobei
eine zweite bewegliche Blende (28) zwischen dem Reflektor (16) und der Projektions-Linse (12) angeordnet ist, und die zweite bewegliche Blende (28) so ausgeführt ist, dass sie zwischen einer Position mit Unterbrechung von Licht, in der ein Teil von dem Reflektor (16) reflektierten Lichts unterbrochen wird, um ein Abblendlicht-Lichtstärkeverteilungsmuster (PL) zu erzeugen, und einer Position ohne Unterbrechung von Licht wechselt, in der die Unterbrechung des reflektierten Lichts aufgehoben wird, und
die zweite Lichtquelle (24) und der zweite Reflektor (26) in einer Positionsbeziehung angeordnet sind, durch die Licht von der zweiten Lichtquelle (24) den zweiten Reflektor (26) erreicht, indem es die zweite bewegliche Blende (28), die an die Position ohne Unterbrechung von Licht wechselt, oberhalb passiert.

**Revendications**

**1.** Lampe d'éclairage de véhicule (10) conçue pour former un schéma de distribution d'intensité lumineuse variable de feu de route (PH2), la lampe d'éclairage de véhicule (10) comprenant : une lentille de projection (12) ; une source de lumière (14) qui est disposée plus à l'arrière qu'un point focal arrière (F) de la lentille de projection ; un réflecteur (16) qui réfléchit la lumière de la source de lumière (14) en direction de la lentille de projection (12) ; et un cache mobile (18) qui est disposé entre le réflecteur (16) et la lentille de projection (12) de manière à se déplacer entre une position d'interruption de lumière, dans laquelle une partie de la lumière réfléchie par le réflecteur (16) est interrompue de manière à éliminer une partie d'un schéma de distribution d'intensité lumineuse de feu de route, et une position sans interruption de

lumière, dans laquelle l'interruption de la lumière réfléchie est libérée, dans laquelle
une deuxième source de lumière (24) est disposée à l'arrière du cache mobile (18) et un deuxième réflecteur (26) est disposé à l'avant du cache mobile (18), et dans laquelle
la deuxième source de lumière (24) et le deuxième réflecteur (26) sont disposés dans une relation de position telle que, lorsque le cache mobile (18) se déplace dans la position sans interruption de lumière, la lumière provenant de la deuxième source de lumière (24) est réfléchie par le deuxième réflecteur (26) de manière à être projetée à l'avant de la lampe (10) sans pouvoir être incidente sur la lentille de projection (12), tandis que lorsque le cache mobile (18) se déplace dans la position d'interruption de lumière, la lumière provenant de la deuxième source de lumière est interrompue par le cache mobile (18) de manière à ne pas être incidente sur le deuxième réflecteur (26),
dans lequel la source de lumière (14) est composée d'un élément d'émission de lumière qui est disposé de manière à être orienté vers le haut sur un axe optique (Ax) de la lentille de projection (12) ou à proximité de celui-ci, dans lequel
la deuxième source de lumière (24) est composée d'un élément d'émission de lumière qui est disposé de manière à être orienté vers le bas dans une position située plus vers l'avant que la source de lumière (14) et plus vers le haut que l'axe optique (Ax), et dans lequel
le deuxième réflecteur (26) est disposé plus vers le bas que l'axe optique (Ax).

**2.** Lampe d'éclairage de véhicule selon la revendication 1, dans laquelle
un troisième réflecteur (36) est disposé à l'arrière du cache mobile (18), lequel troisième réflecteur est conçu pour réfléchir la lumière de la deuxième source de lumière (24) en direction de la lentille de projection (12).

**3.** Lampe d'éclairage de véhicule selon la revendication 2, dans laquelle
un deuxième cache mobile (28) est disposé entre le réflecteur (16) et la lentille de projection (12), lequel deuxième cache mobile (28) est conçu pour se déplacer entre une position d'interruption de lumière, dans laquelle une partie de la lumière réfléchie par le réflecteur (16) est interrompue de manière à former un schéma de distribution d'intensité lumineuse de feu de croisement (PL) et une position sans interruption de lumière dans laquelle l'interruption de la lumière réfléchie est libérée, et dans laquelle
la deuxième source de lumière (24) et le deuxième réflecteur (26) sont disposés dans une relation de position telle que la lumière provenant de la deuxième source de lumière (24) atteint le deuxième réflecteur (26) en passant au-dessus du deuxième cache mobile (28) qui se déplace vers la position sans interruption de lumière.

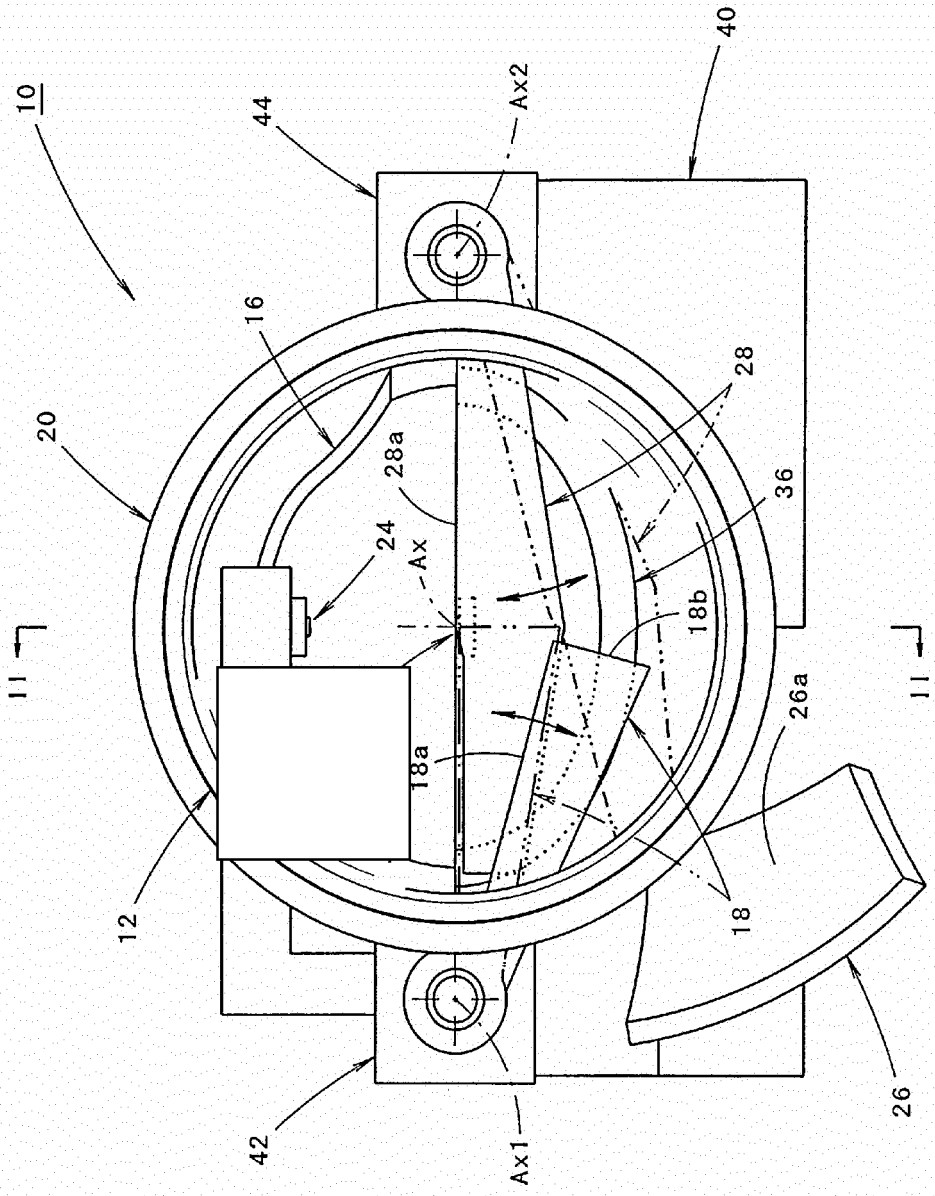



FIG. 1

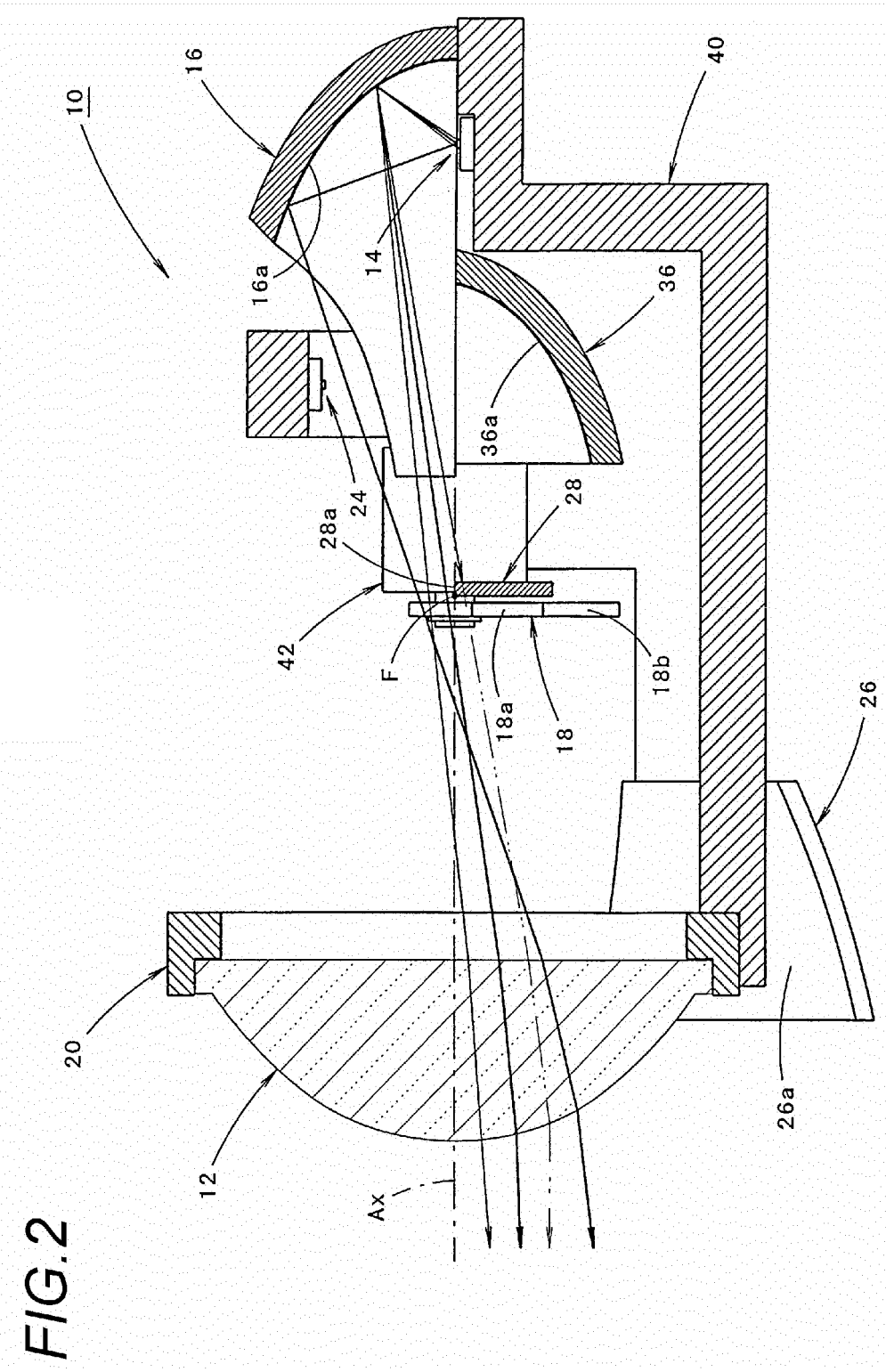



FIG.2

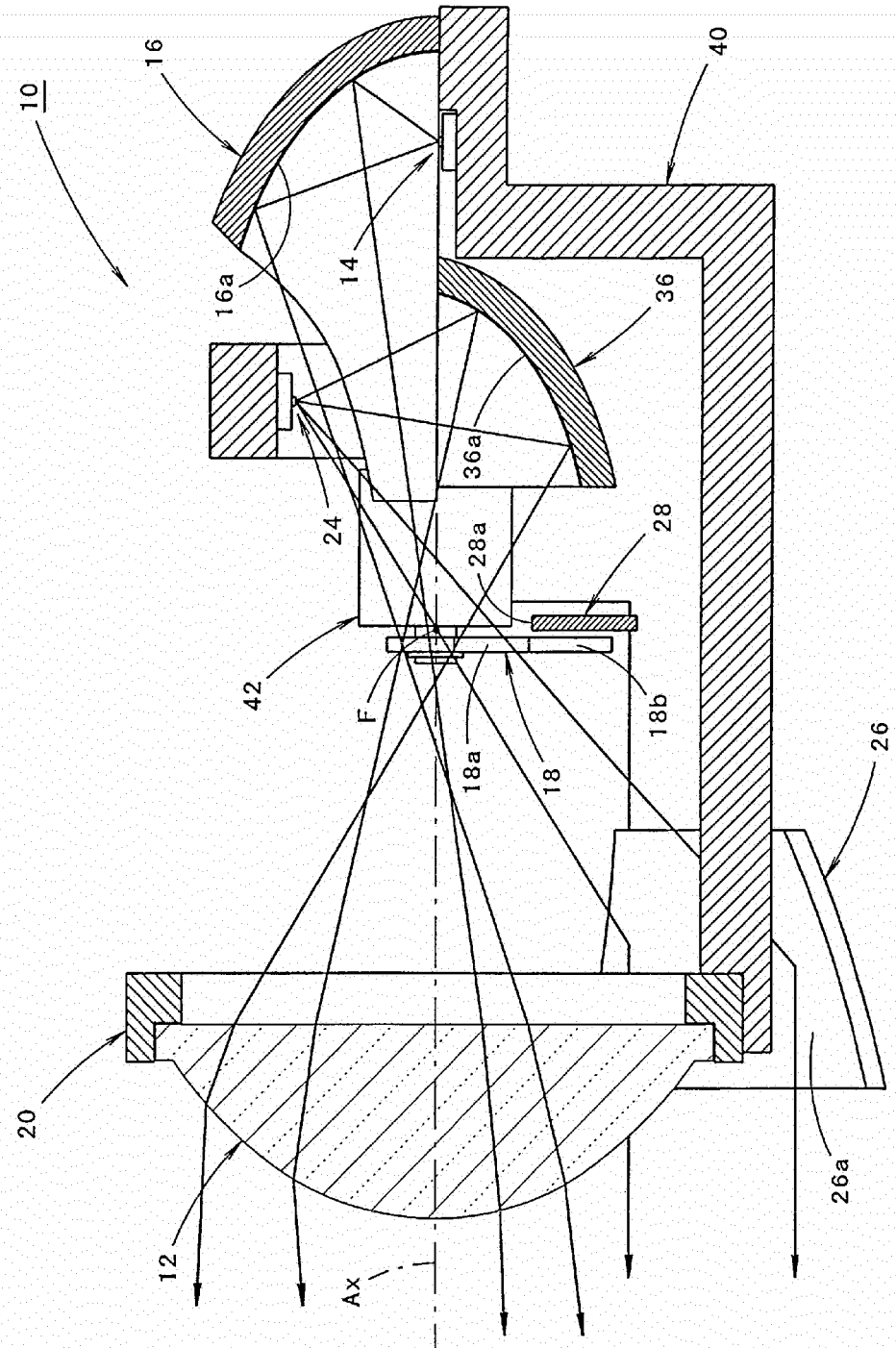



FIG.3

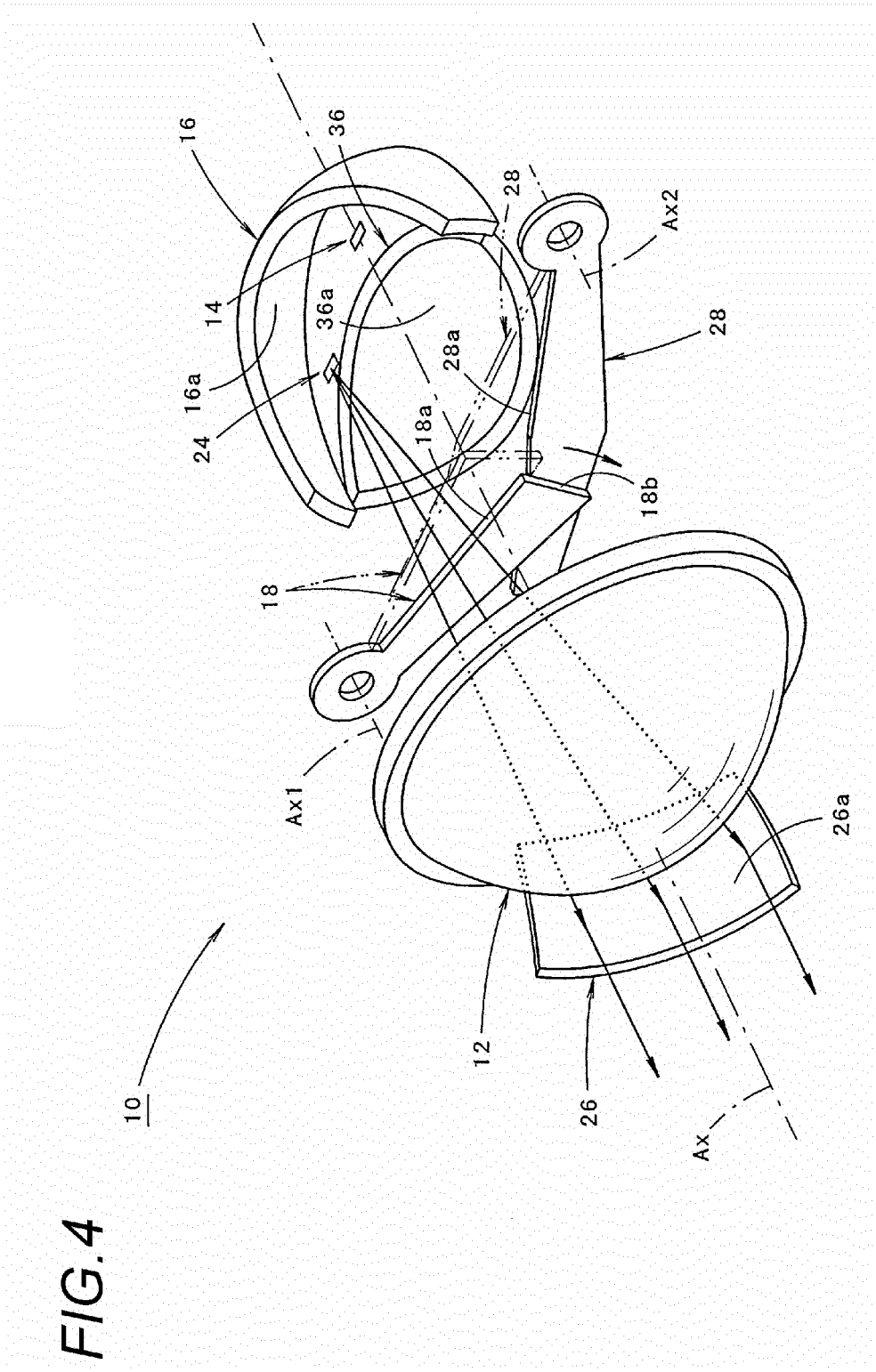



FIG.4

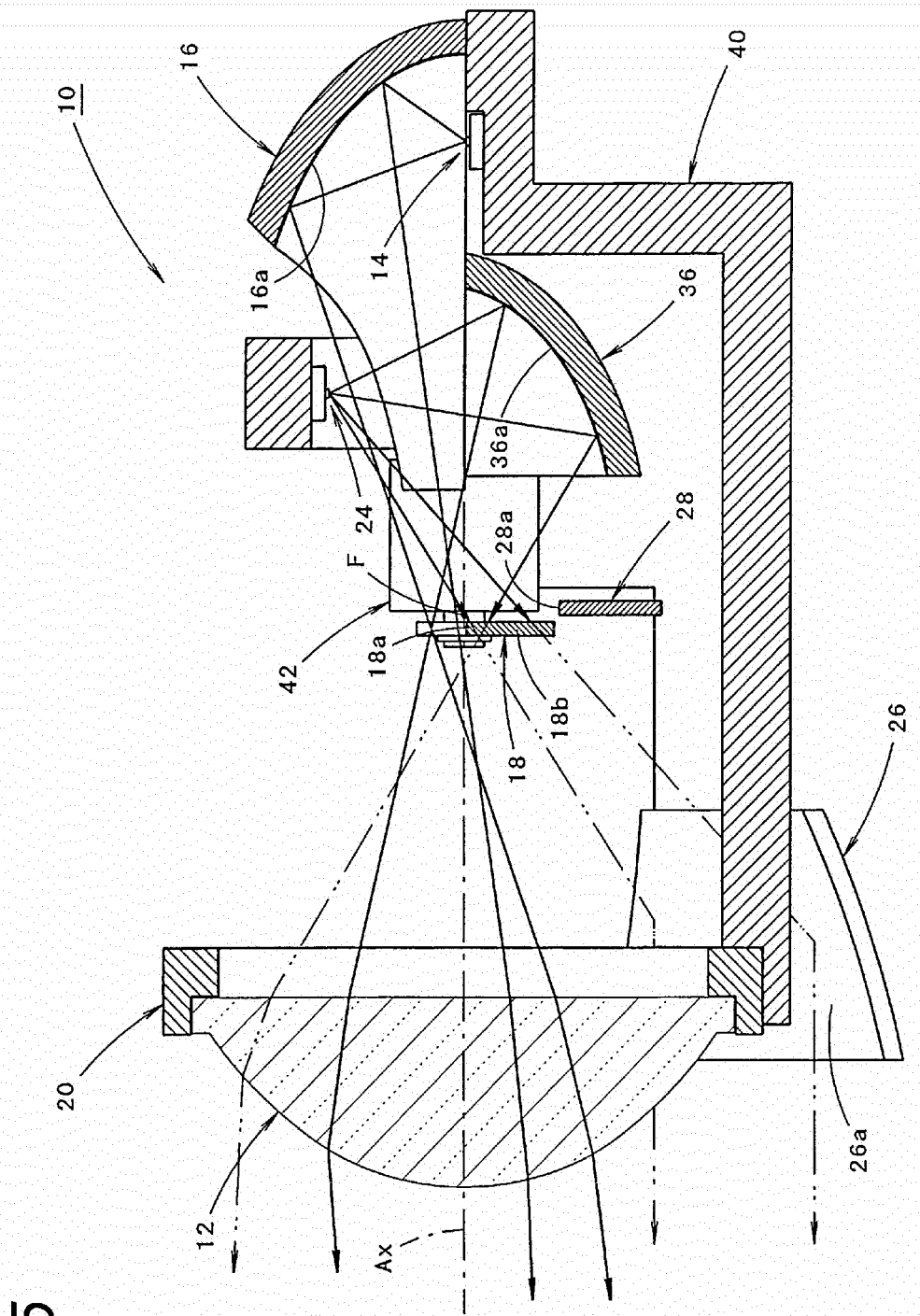



FIG.5

FIG.6

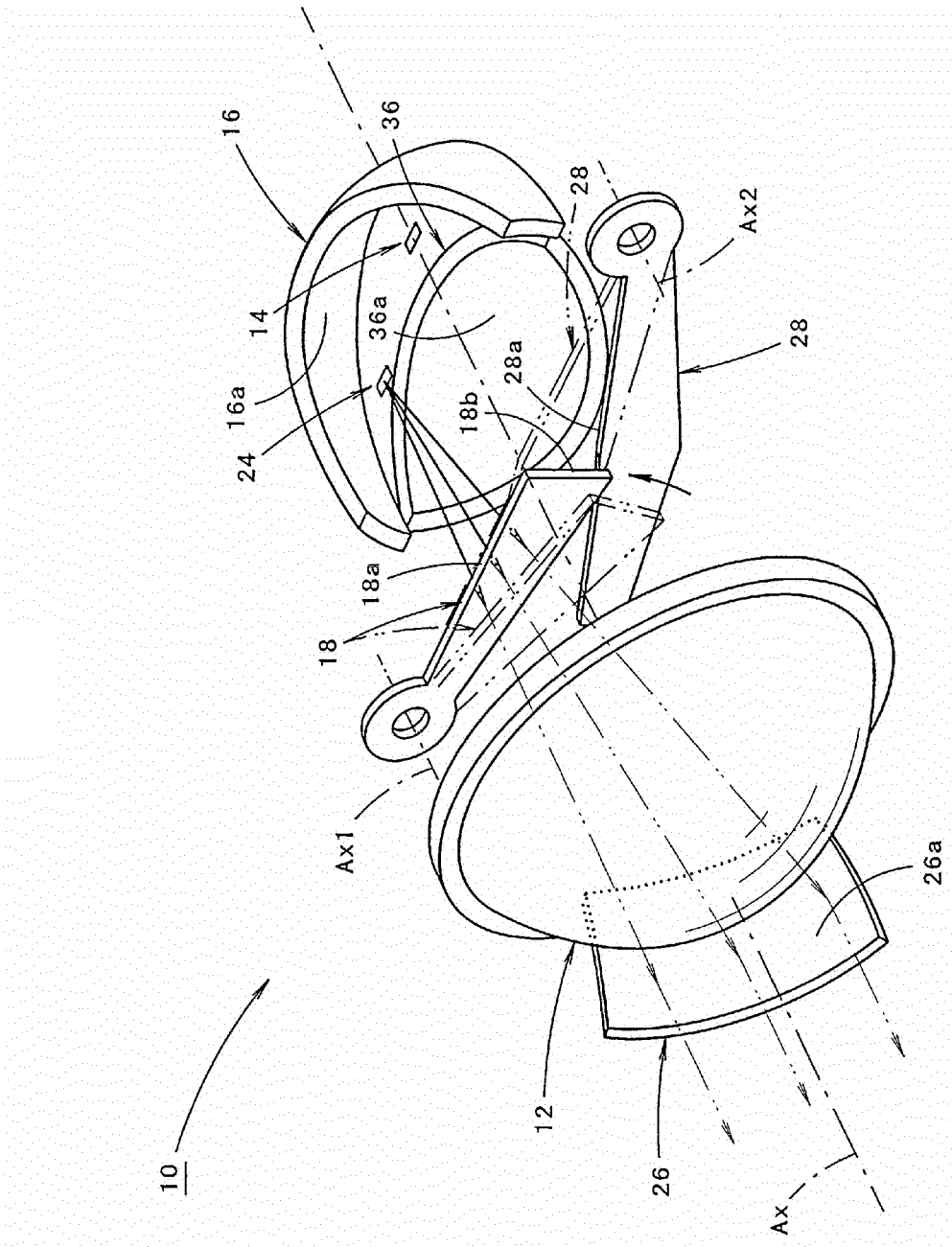


FIG.7

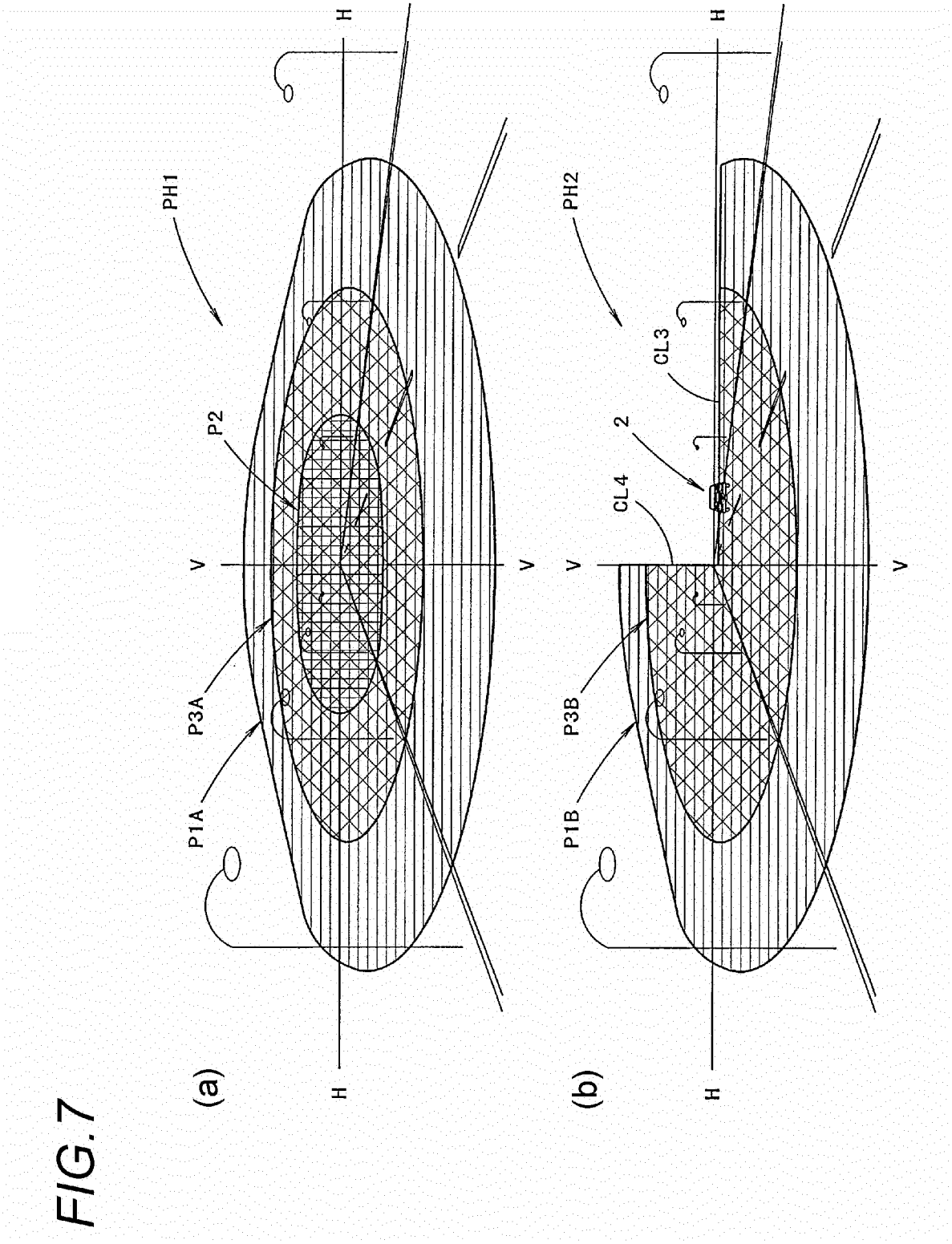
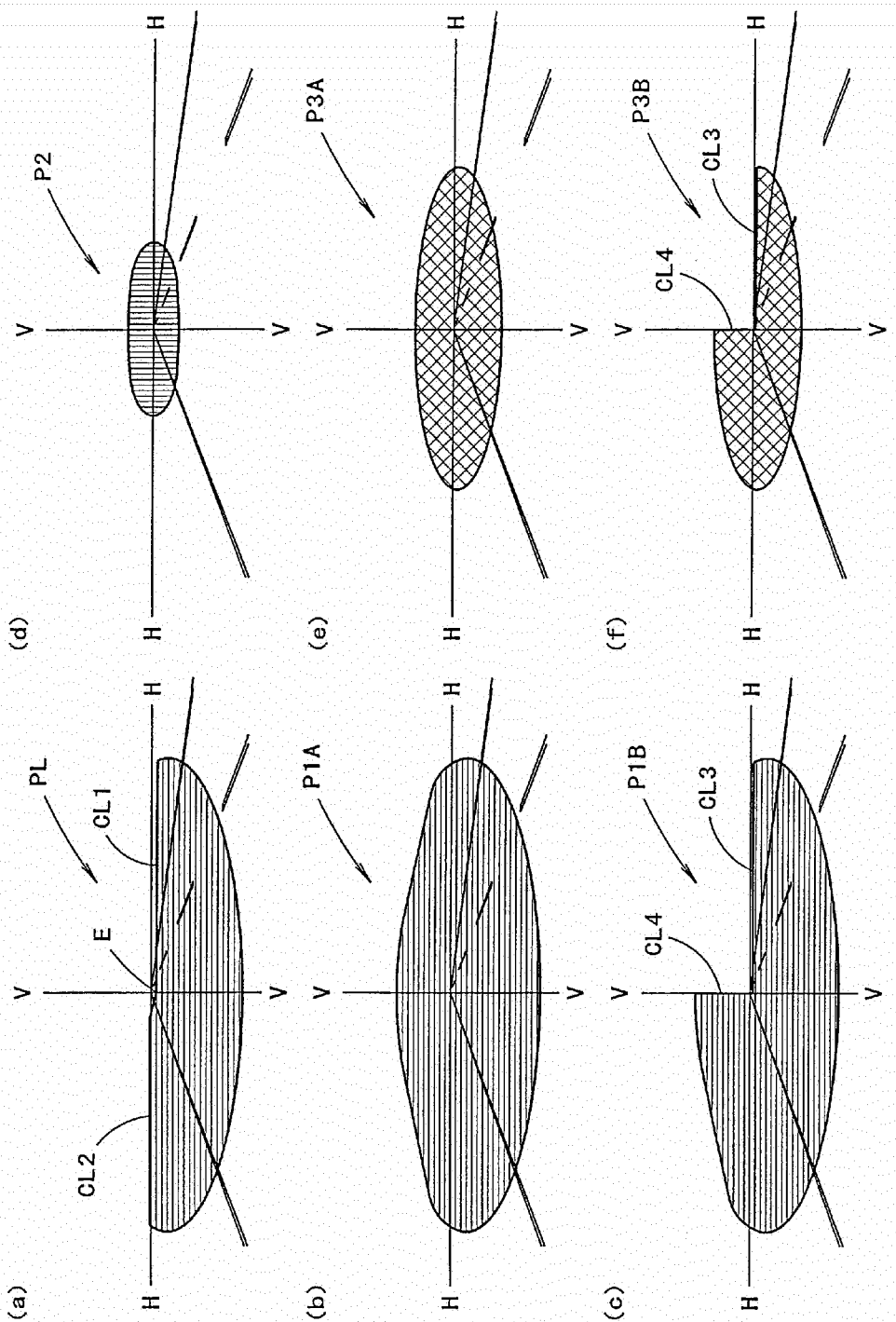


FIG.8



## REFERENCES CITED IN THE DESCRIPTION

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- JP 2011065960 A **[0003] [0004] [0005]**
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