



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
14.01.2015 Bulletin 2015/03

(51) Int Cl.:
F21S 8/10 ^(2006.01) **F21W 101/14** ^(2006.01)
F21Y 101/02 ^(2006.01)

(21) Application number: **13757684.9**

(86) International application number:
PCT/JP2013/000936

(22) Date of filing: **20.02.2013**

(87) International publication number:
WO 2013/132763 (12.09.2013 Gazette 2013/37)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(72) Inventor: **IWASE, Atsushi**
Shizuoka-shi
Shizuoka 424-8764 (JP)

(30) Priority: **08.03.2012 JP 2012052246**

(74) Representative: **Algemeen Octrooi- en Merkenbureau B.V.**
P.O. Box 645
5600 AP Eindhoven (NL)

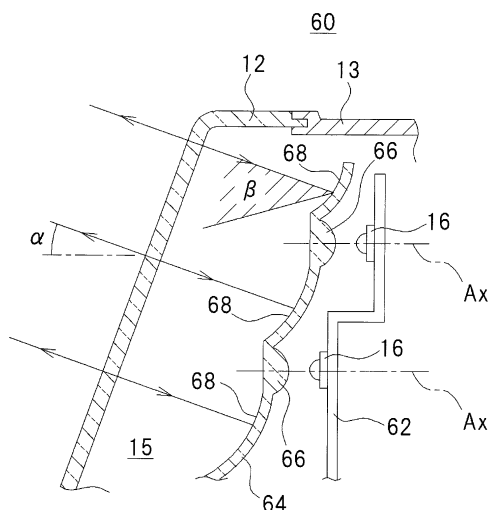
(71) Applicant: **Koito Manufacturing Co., Ltd.**
Tokyo 108-8711 (JP)

(54) **VEHICLE LAMP FITTING**

(57) An automotive lamp (60) includes a light source (16), an inner lens (64), a transparent cover (12), and a reflection structure that reflects at least part of light, which enters the automotive lamp (60), in directions excluding a predetermined range of angles including an optical axis of the light source. Here, the at least part of light enters the automotive lamp (60) through the transparent cover

(12) from above at a predetermined angle relative to the horizontal line. The reflection structure is reflective members (68), which are each formed approximately vertical to the direction of light entering the automotive lamp (60) and which are used to connect adjacent lens portions (66) of the inner lens (64).

FIG.6



Description

[Technical Field]

[0001] The present invention relates to an automotive lamp and, in particular, a structure of a lamp installed at a rear part of a vehicle.

[Background Art]

[0002] Known in the art is a daylight running lamp (DRL) or clearance lamp that is lit up in the daytime. DRL and clearance lamp are used for the purpose of having the drivers of other vehicles and the pedestrians visually recognize the presence of a driver's own vehicle in an accurate and clear manner. Such a lamp as DRL or clearance lamp is often installed not only at a front part of the vehicle but also at a rear part thereof. In order to improve the safety, it is required that the visibility of this type of lamps be enhanced.

[0003] A vehicular indicator lamp described as follows is disclosed in Patent Document 1. This vehicular indicator lamp has fan-shaped reflection regions where a group of linearly-arranged bright parts, in which the size of each bright part is gradually increased radially outward, are generated and where another group of linearly-arranged small bright parts, in which these small bright parts having approximately equal size are arranged in a chain-like form, are generated. This lamp having such the reflection regions causes a glittering and lively-varied effect when the lamp is lit. As a result, the visibility of the driver's own vehicle relative to a vehicle behind the driver's own vehicle (hereinafter referred to as "following vehicle" also) is supposedly improved.

[Related Art Documents]

[Patent Documents]

[0004] [Patent Document 1] Japanese Patent Application Publication No. 2006-216455.

[Disclosure of Invention]

[Problems to be solved by the Invention]

[0005] A white transparent cover is generally mounted to the daytime running lamp or clearance lamp. Since such a white transparent cover hardly absorbs the sunlight, the sunlight enters the lamp and is reflected by a reflector p when the morning or evening sunlight hits the lamp. Thus there is problem that it is not easy for the driver of the following vehicle to recognize whether the light source of the lamp itself is lit or not. For this reason, new regulations may possibly be formulated in the near future. Here, the new regulations may so regulate that a predetermined difference in the brightness between when the light source is turned off and when it is turned

on can be ensured when the automotive lamp is irradiated with the artificial sunlight.

[0006] The present invention has been made in view of the foregoing circumstances, and a purpose thereof is to provide a technology that improves the visibility for a driver of the following vehicle as to a lighting state of the light source of a lamp, when the sunlight hits the lamp installed at a rear part of the vehicle.

10 [Means for Solving the Problem]

[0007] In order to resolve the above-described problems, an automotive lamp according to one embodiment of the present invention includes: a light source; a transparent cover, placed in front of the light source, through which light emitted from the light source passes; and a reflection structure that reflects at least part of light in a direction excluding a predetermined range of angles including an optical axis of the light source, wherein the at least part of light enters the automotive lamp through the transparent cover from above at a predetermined angle relative to a horizontal line.

[0008] According to this embodiment, the reflection structure reflects a part of light, which enters the automotive lamp, in the direction excluding the predetermined range of angles including the optical axis of the light source. Provision of this reflection structure reduces an area where the sunlight reflected inside the lamp and the light emitted from the light source overlap with each other. This allows the lighting state of the light source to be easily determined. Note that the "predetermined range of angles" may be a range of light that can directly enter the eyes of the driver of the following vehicle, for instance.

35 [Advantageous Effects]

[0009] The present invention improves the visibility for a driver of the following vehicle as to a lighting state of the light source of a lamp, when the sunlight hits the lamp installed at a rear part of the vehicle.

[Brief Description of Drawings]

[0010]

FIG. 1 schematically shows a cross-sectional view of an automotive lamp according to a first exemplary embodiment;

FIG. 2 schematically shows a cross-sectional view of an automotive lamp according to a second exemplary embodiment;

FIG. 3 schematically shows a cross-sectional view of an automotive lamp according to a third exemplary embodiment;

FIG. 4 schematically shows a cross-sectional view of an automotive lamp according to a fourth exemplary embodiment;

FIG. 5 schematically shows a cross-sectional view

of an automotive lamp according to a fifth exemplary embodiment;

FIG. 6 schematically shows a cross-sectional view of an automotive lamp according to a sixth exemplary embodiment;

FIG. 7 schematically shows a cross-sectional view of an automotive lamp according to a seventh exemplary embodiment;

FIG. 8 schematically shows a cross-sectional view of an automotive lamp according to an eighth exemplary embodiment;

FIG. 9 schematically shows a cross-sectional view of an automotive lamp according to a ninth exemplary embodiment; and

FIG. 10 schematically shows a cross-sectional view of an automotive lamp according to a tenth exemplary embodiment.

[Modes for Carrying Out the Invention]

First Embodiment

[0011] A first exemplary embodiment of the present invention is characterized by a feature wherein a light shielding structure is provided in a lamp and whereby the visibility of the lamp when the lamp is lit is improved. Specifically, the light shielding structure is a structure that reduces an amount of irradiated light, which has reached a light source of the lamp, in the sunlight entering the lamp through a transparent cover from above at a predetermined angle relative to a horizontal line.

[0012] FIG. 1 is a schematically illustrated cross-sectional view of an automotive lamp 10, according to a first exemplary embodiment, cut along a vertical plane including an optical axis. The automotive lamp 10 is installed at a rear part of a vehicle, and the leftward direction (part) in FIG. 1 corresponds to a rearward or rear part of the vehicle. The automotive lamp 10 is a daytime running lamp (DRL) or a clearance lamp (CLL), for instance.

[0013] In the automotive lamp 10, a lamp chamber 15 is formed by a lamp body 13, having an opening in a direction toward the rear of the vehicle, and a transparent cover 12, made of white transparent resin, which is so disposed as to cover the opening. A plurality of light sources 16 mounted on a substrate 14 are provided inside the lamp chamber 15. The light sources 16 are each constituted by a semiconductor light-emitting element such as a light emitting diode (LED). An inner lens 18 made of resin having translucency is placed adjacent to the substrate 14. Lens portions 19 for controlling the distribution of light emitted from the light sources 16 (e.g., for refracting or diffusing the light) are formed in partial areas of the inner lens 18; the partial areas thereof face the light emission surfaces of the light sources 16, respectively. The light emitted from the light sources 16, which has been subjected to the light distribution control performed by the lens portions 19, transmits the transparent cover 12 and is irradiated in a rearward area of

the vehicle.

[0014] A plurality of extensions 2, 4 and 6 having non-translucency are disposed between the transparent cover 12 and the inner lens 18. The extensions 2, 4 and 6 have a role to block the light entering the lamp from above at a predetermined angle α relative to the horizontal line so that this light entering the lamp does not directly hit the light sources 16. Note here that the light entering the lamp from above at the predetermined angle α relative thereto is indicated by solid arrows in FIG. 1. For example, the angle α is set according to the angle of the morning or evening sunlight formed relative to the horizontal line, when it is especially hard to see the emission of light from the light sources in the automotive lamps, due to the reflected light of sun, for instance. And the angle α is preferably set at 10 to 15 degrees. For this purpose, the extensions 2, 4 and 6 have extending sections 2a, 4a and 6a, respectively, which extend from near the inner lens 18 toward the transparent cover 12 up to the positions where the extensions 2, 4 and 6 intersect respectively with lines extending upward from the light sources 16 by the predetermined angle α . Note here that the lines extending upward therefrom by the predetermined angle α is indicated by dotted lines in FIG. 1.

[0015] The extensions 2, 4 and 6 that extend between the transparent cover 12 and the inner lens 18 are provided in the automotive lamp 10 according to the first exemplary embodiment. Provision of the extensions 2, 4 and 6 therebetween can reduce the amount of irradiated light, which has reached near the light sources 16, in the sunlight entering the lamp through the transparent cover from above at the predetermined angle relative to the horizontal line. Thus, the sunlight reflected by the inner lens and the like does not overlap with the light emitted from the light sources 16. This allows the driver of the following vehicle to easily determine the lighting state of the light sources.

[0016] FIG. 2 is a schematically illustrated cross-sectional view of an automotive lamp 20, according to a second exemplary embodiment, cut along a vertical plane including an optical axis. Some of the components and constituent members shown in FIG. 2 to FIG. 10 have the reference numbers identical to those of FIG. 1. This indicates that those in FIG. 2 to FIG. 10 identical to those of FIG. 1 have similar structures and functions to those of FIG. 1, and the repeated description thereof will be omitted.

[0017] The automotive lamp 20 according to the second exemplary embodiment is configured such that the substrate 14, on which the light sources 16 are mounted, and the inner lens 22 are provided inside the lamp chamber 15, similarly to the first exemplary embodiment, but such that the non-translucent extensions are not provided therein. Instead, a non-translucent coating material is applied to side surfaces of the inner lens 22, facing the transparent cover 12, except for the side surfaces thereof corresponding to lens portions 24 located near the line of intersections intersecting with optical axes Ax that pass

through the respective light sources 16 and extend in an approximately horizontal direction. Applying the coating material to the side surfaces thereof reduces the amount of irradiated light, which has reached near the light sources 16, in the sunlight entering the lamp through the transparent cover from above at a predetermined angle relative to the horizontal line. This therefore reduces an area where the sunlight reflected by the inner lens and the like and the light emitted from the light sources overlap with each other. Hence, the driver of the following vehicle easily determines the lighting state of the light sources.

[0018] FIG. 3 is a schematically illustrated cross-sectional view of an automotive lamp 30, according to a third exemplary embodiment, cut along a vertical plane including an optical axis. In the third exemplary embodiment, extensions 32, 34 and 36 are disposed between the transparent cover 12 and the inner lens 18, similarly to the first exemplary embodiment. However, the extensions 32, 34 and 36 do not extend toward the transparent cover 12, and merely form openings near the line of intersections intersecting with the optical axes Ax that pass through the respective light sources 16 and extend in an approximately horizontal direction. The extensions 32, 34 and 36 can reduce the amount of irradiated light, which has reached the light sources 16, in the sunlight entering the lamp through the transparent cover from above at a predetermined angle relative to the horizontal line. This therefore reduces an area where the sunlight reflected by the inner lens and the like and the light emitted from the light sources overlap with each other. Hence, the driver of the following vehicle easily determines the lighting state of the light sources.

[0019] Note that the extensions in the first or third exemplary embodiment may be such that the natural colored resin constituting the extensions is used as it is or such that a coating for suppressing reflection may be applied thereto.

[0020] FIG. 4 is a schematically illustrated cross-sectional view of an automotive lamp 40, according to a fourth exemplary embodiment, cut along a vertical plane including an optical axis. In the fourth exemplary embodiment, a bulb 42, such as a halogen lamp or discharge lamp, which has a certain depth as compared with the LED is used as the light source.

[0021] A reflector 44 is arranged in the lamp chamber 15. In the reflector 44, a reflecting surface by which the light, emitted from the bulb 42, is reflected toward a direction opposite to the bulb 42 (namely, toward a rearward area of the vehicle), is formed in the inner surface of the reflector 44. The reflecting surface of the reflector 44 is formed as an approximately rotated-parabolic curved surface with the optical axis Ax as the central axis, and the luminous point of the bulb 42 is located on the focal point of the rotated-parabolic curved surface.

[0022] An upper wall side of the reflector 44 has an extending section 44a. The extending section 44a extends toward the transparent cover 12 up to a position where the upper wall side thereof intersects with a line

extending upward from the luminous point of the bulb 42 by a predetermined angle α . Note here that the line extending upward therefrom by the predetermined angle α is indicated by dotted lines in FIG. 4. The extending section 44a can reduce the amount of sunlight entering the reflector 44 through the transparent cover from above at the predetermined angle relative to the horizontal line.

[0023] A non-translucent member having light shielding parts 46 where a plurality of slits 48 are formed may further be arranged on the opening side of the reflector 44. In this case, the reflecting surface of the reflector 44 is configured such that the light emitted from the bulb 42 is reflected toward the slits 48 and such that the sunlight entering the reflector is reflected toward the light shielding parts 46. Thus, the sunlight reflected by the reflector is not emitted toward a rearward area of the vehicle while the light emitted from the bulb 42 passes through the slits and is irradiated in the rearward area thereof.

[0024] According to the fourth embodiment, as described above, the amount of sunlight entering the reflector 44 is reduced, and the sunlight reflected by the reflecting surface of the reflector 44 is not emitted toward the rearward area of the vehicle. Thus, an area where the sunlight and the light emitted from the bulb overlap with each other is reduced. Thereby, the driver of the following vehicle easily determines the lighting state of the light sources.

[0025] FIG. 5 is a schematically illustrated cross-sectional view of an automotive lamp 50, according to a fifth exemplary embodiment, cut along a vertical plane including an optical axis. In the fifth exemplary embodiment, a bulb 42 and a reflector 54 are arranged in the lamp chamber 15, similarly to FIG. 4. A diffusion structure 56 (e.g., embossment, knurling) is formed in a partial area of the reflecting surface, inside the reflector 54, where the sunlight entering the reflector 54 is reflected. The diffusion structure diffuses the reflected light in directions excluding the direction in which to enter the eyes of the driver of the following vehicle. Thus, an area where the light, emitted from the bulb, and the reflected light of the sunlight overlap with each other is reduced. Thereby, the driver of the following vehicle easily determines the lighting state of the light sources.

45 Second Embodiment

[0026] A second exemplary embodiment of the present invention is characterized by a feature wherein a light shielding structure is provided in a lamp and whereby the visibility of the lamp when the lamp is lit is improved. Specifically, the reflection structure is a structure that reflects at least part of light in directions excluding a predetermined range of angles including an optical axis of the light source; the at least part of light enters the lamp through the transparent cover from above at a predetermined angle relative to the horizontal line.

[0027] FIG. 6 is a schematically illustrated cross-sectional view of an automotive lamp 60, according to a sixth

exemplary embodiment, cut along a vertical plane including an optical axis.

[0028] In the automotive lamp 60, a lamp chamber 15 is formed by a lamp body 13, having an opening in a direction toward the rear of the vehicle, and a transparent cover 12, made of white transparent resin, which is so disposed as to cover the opening. A plurality of light sources 16 mounted on a substrate 62 having a step or steps are provided inside the lamp chamber 15. The light sources 16 are each constituted by a semiconductor light-emitting element such as a light emitting diode (LED). An inner lens 64 made of resin having translucency is placed adjacent to the substrate 62. Lens portions 66 for controlling the distribution of light emitted from the light sources (e.g., for refracting or diffusing the light) are formed in partial areas of the inner lens 64; the partial areas thereof face the light emission surfaces of the light sources 16, respectively. The light emitted from the light sources 16, which has been subjected to the light distribution control performed by the lens portions 66, transmits the transparent cover 12 and is irradiated in a rearward area of the vehicle.

[0029] Adjacent lens portions 66 of the inner lens 64 are connected by a reflective member 68. The reflective member 68 is tilted such that the reflective member 68 is positioned approximately vertical with respect to a direction of light entering the lamp through the transparent cover from above at a predetermined angle α relative to the horizontal line (this direction of light entering the lamp being indicated by solid arrows in FIG. 6). For example, the angle α is set according to the angle of the morning or evening sunlight formed relative to the horizontal line, when it is especially hard to see the emission of light in the automotive lamps, due to the reflected light of sun, for instance. The angle α is preferably set at 10 to 15 degrees. The reflective member 68 reflects the sunlight, which enters the lamp, in a direction approximately identical to the incident direction. Thus, the sunlight reflected by the inner lens 64 does not overlap with the light emitted from the light sources 16. This allows the driver of the following vehicle to easily determine the lighting state of the light sources.

[0030] The angle of the reflective member 68 is not limited to the direction approximately identical to the direction of light entering the lamp and may be an arbitrary angle as long as it is an angle at which the sunlight is reflected in directions excluding a predetermined range β of angles that can directly enter the eyes of the driver of the following vehicle. The predetermined range β of angles is, for example, 15 degrees above or below the optical axis Ax of the light source.

[0031] FIG. 7 is a schematically illustrated cross-sectional view of an automotive lamp 70, according to a seventh exemplary embodiment, cut along a vertical plane including an optical axis.

[0032] In the seventh exemplary embodiment, extensions 72 are provided in addition to the substrate 62, on which the light sources 16 are mounted, and the inner

lens 64. More specifically, the extensions 72 are placed in close proximity to parts of the inner lens 64 excluding the lens portions 66. Each extension 72 is tilted such that the extension 72 is positioned approximately vertical with respect to a direction of light entering the lamp through the transparent cover from above at a predetermined angle α relative to the horizontal line (this direction being indicated by solid arrows in FIG. 7). And the reflecting surface of the extension 72 is formed on a transparent cover 12 side. The reflecting surface thereof is formed by aluminum evaporation or a like processing, for instance, and the reflecting surface thereof reflects the sunlight, which enters the lamp, in a direction approximately identical to the incident direction. Thus, the sunlight reflected by the reflecting surfaces of the extensions 72 does not overlap with the light emitted from the light sources 16. This allows the driver of the following vehicle to easily determine the lighting state of the light sources.

[0033] FIG. 8 is a schematically illustrated cross-sectional view of an automotive lamp 80, according to an eighth exemplary embodiment, cut along a vertical plane including an optical axis. In the eighth exemplary embodiment, a plurality of light sources 16, mounted on a flat substrate 14, and an inner lens 82, made of resin having translucency, which is placed adjacent to the substrate 14 are arranged inside the lamp chamber 15. Lens portions 84 for controlling the distribution of light emitted from the light sources 16 (e.g., for refracting or diffusing the light) are formed in partial areas of the inner lens 82; the partial areas thereof face the light emission surfaces of the light sources 16, respectively. The light emitted from the light sources 16, which has been subjected to the light distribution control performed by the lens portions 84, transmits the transparent cover 12 and is irradiated in a rearward area of the vehicle.

[0034] Many small steps 86 are formed on a surface of the inner lens 82, on the light source side thereof, excluding the partial areas of the inner lens 82 where the lens portions 84 are formed. The small steps formed thereon are so designed that the light, which enters the lamp from above at a predetermined angle α relative to the horizontal line and then enters the inner lens 82, is reflected in directions excluding the aforementioned predetermined range β of angles. Thereby, the internally reflected light of the sunlight entering the inner lens 82 does not overlap with the light emitted from the light sources 16. This allows the driver of the following vehicle to easily determine the lighting state of the light sources.

[0035] FIG. 9 is a schematically illustrated cross-sectional view of an automotive lamp 90, according to a ninth exemplary embodiment, cut along a vertical plane including an optical axis. In the ninth exemplary embodiment, the bulb 42, such as a halogen lamp or discharge lamp, which has a certain depth as compared with the LED is used as the light source.

[0036] A reflector 92 is arranged in the lamp chamber 15. In the reflector 92, a reflecting surface by which the light, emitted from the bulb 42, is reflected toward a di-

rection opposite to the bulb 42 (namely, toward a rearward area of the vehicle), is formed in the inner surface of the reflector 92. The reflecting surface of the reflector 92 is formed as an approximately rotated-parabolic curved surface with the optical axis Ax as the central axis, and the luminous point of the bulb 42 is located on the focal point of the rotated-parabolic curved surface.

[0037] A non-translucent member having reflecting surfaces 94 where a plurality of slits 96 are formed are arranged on the opening side of the reflector 92. Each reflecting surface 94 is tilted such that the reflecting surface 94 is positioned approximately vertical with respect to a direction of light entering the lamp through the transparent cover from above at a predetermined angle α relative to the horizontal line (this direction of light entering the lamp being indicated by solid arrows in FIG. 9). Each reflecting surface 94 reflects the sunlight, which enters the lamp, in a direction approximately identical to the incident direction. Also, the reflecting surface of the reflector 92 is configured such that the light emitted from the bulb 42 is reflected toward the slits 96. Thus, the sunlight reflected by the reflecting surfaces 94 does not overlap with the light emitted from the bulb 42. This allows the driver of the following vehicle to easily determine the lighting state of the light sources.

[0038] FIG. 10 is a schematically illustrated cross-sectional view of an automotive lamp 100, according to a tenth exemplary embodiment, cut along a vertical plane including an optical axis.

[0039] In the tenth exemplary embodiment, an extension 104 is placed between a light source 102 and a transparent cover 12. The extension 103 has a recess 108 in a central part of a curved surface, which is constituted by two convex curved surfaces 106a and 106b on a transparent cover 12 side. And the light source 102 is arranged in a hole 108a formed in a center of the recess 108. Reflecting surfaces are formed on the transparent cover 12 side of the extension 104 by subjecting the surfaces to aluminum evaporation or a like processing, for instance. The light emitted from the light source 102 is irradiated frontward from the recess 108 and it is observed that the area, only covering the light source 102 and the recess 108, emits light. Formation of the recess 108 reduces the amount of irradiated light, which has reached near the light source 102, in the sunlight entering the lamp through the transparent cover from above at a predetermined angle α relative to the horizontal line (this direction of sunlight entering the lamp being indicated by solid arrows in FIG. 10).

[0040] The upper reflecting surface 106a of the extension 104 is formed in such a shape that the sunlight entering the lamp is reflected upward. The lower reflecting surface 106b thereof is formed in such a shape that the sunlight entering the lamp is reflected downward. Thus, the sunlight reflected by the reflecting surfaces of the extension 104 does not overlap with the light emitted from the light source 102. This allows the driver of the following vehicle to easily determine the lighting state of the light

sources. The angle of light reflected by the upper reflecting surface 106a and the lower reflecting surface 106b may be an arbitrary angle as long as it is an angle at which the sunlight is reflected in directions excluding a predetermined range β of angles that can directly enter the eyes of the driver of the following vehicle. The predetermined range β of angles is, for example, 15 degrees above or below the optical axis Ax of the light source.

[0041] As described above, the second embodiments provides a blocking structure or a reflection structure. In other words, in the blocking structure, the sunlight entering the lamp at a predetermined angle is blocked so that the sunlight does not directly hit the light sources or nearby regions of the light sources. In the reflection structure, the sunlight entering the lamp at a predetermined angle is reflected in directions excluding a predetermined range of angles that can directly enter the eyes of the driver of the following vehicle. As a result, even though the sunlight hits the automotive lamps, the driver of the following vehicle easily determines the lighting state of the light sources and therefore the overall safety is improved.

[0042] The present invention is not limited to the above-described embodiments only, and it is understood by those skilled in the art that changes in design may be added to the embodiments based on their knowledge. The structure shown for each Figure is for illustrative purposes only and may be changed, as appropriate, as long as the similar functions can be attained and the similar advantageous effects can also be achieved.

[0043] In each of the above exemplary embodiments, components may be arbitrarily combined and used in between any of the exemplary embodiments as long as they do not contradict with each other in function as well as in structure.

[0044] In each of the above-described exemplary embodiments, the transparent cover may be a smoked lens instead of the white transparent one. In such a case, the reflected amount of sunlight can be reduced.

[Explanation of Reference Numerals]

[0045]

2, 4, 6, 32, 72 Extension
2a, 4a, 6a, 44a Extending section
10, 20, 30, 40, 50, 60, 70, 80, 90 100 Automotive lamp
12 Transparent cover
16 Light source
18, 22 64, 82 Inner lens
42 Bulb
44, 54, 92 Reflector
46 Light shielding part
48, 96 Slit
68, 94, 106a, 106b Reflective member
86 Steps

[Industrial Applicability]

[0046] The present invention improves the visibility for a driver of the following vehicle as to a lighting state of the light source of a lamp, when the sunlight hits the lamp installed at a rear part of the vehicle.

comprising a reflector having a reflecting surface by which the light emitted from the light source is reflected frontward,
wherein a plurality of slits are formed in the non-translucent member, and
the reflecting surface of the reflector is configured such that the light emitted from the light source is reflected toward the slits.

Claims

1. An automotive lamp comprising:

a light source;
a transparent cover, placed in front of the light source, through which light emitted from the light source passes; and
a reflection structure that reflects at least part of light, which enters the automotive lamp, in a direction excluding a predetermined range of angles including an optical axis of the light source, wherein the at least part of light entering the automotive lamp enters the automotive lamp through the transparent cover from above at a predetermined angle relative to a horizontal line.

2. An automotive lamp according to claim 1, wherein the reflection structure is an inner lens at least part of which has translucency, the inner lens being placed between the light source and the transparent cover, and
wherein a part of the inner lens is formed such the part thereof is positioned approximately vertical with respect to a direction of the light entering the automotive lamp.

3. An automotive lamp according to claim 1, wherein the reflection structure is an inner lens at least part of which has translucency, the inner lens being placed between the light source and the transparent cover, and
wherein a step or steps, with which a flux of light entering the automotive lamp is reflected in the direction excluding the predetermined range of angles, is/are formed on a light-source-side surface of the inner lens.

4. An automotive lamp according to claim 1, wherein the reflection structure is a non-translucent member where a reflecting surface of the non-translucent member is formed on the transparent cover side, the non-translucent member being placed between the light source and the transparent cover, and
wherein a part of the non-translucent member is formed such the part thereof is positioned approximately vertical with respect to a direction of the light entering the automotive lamp.

5. An automotive lamp according to claim 4, further

5

10

15

20

25

30

35

40

45

50

55

FIG.1

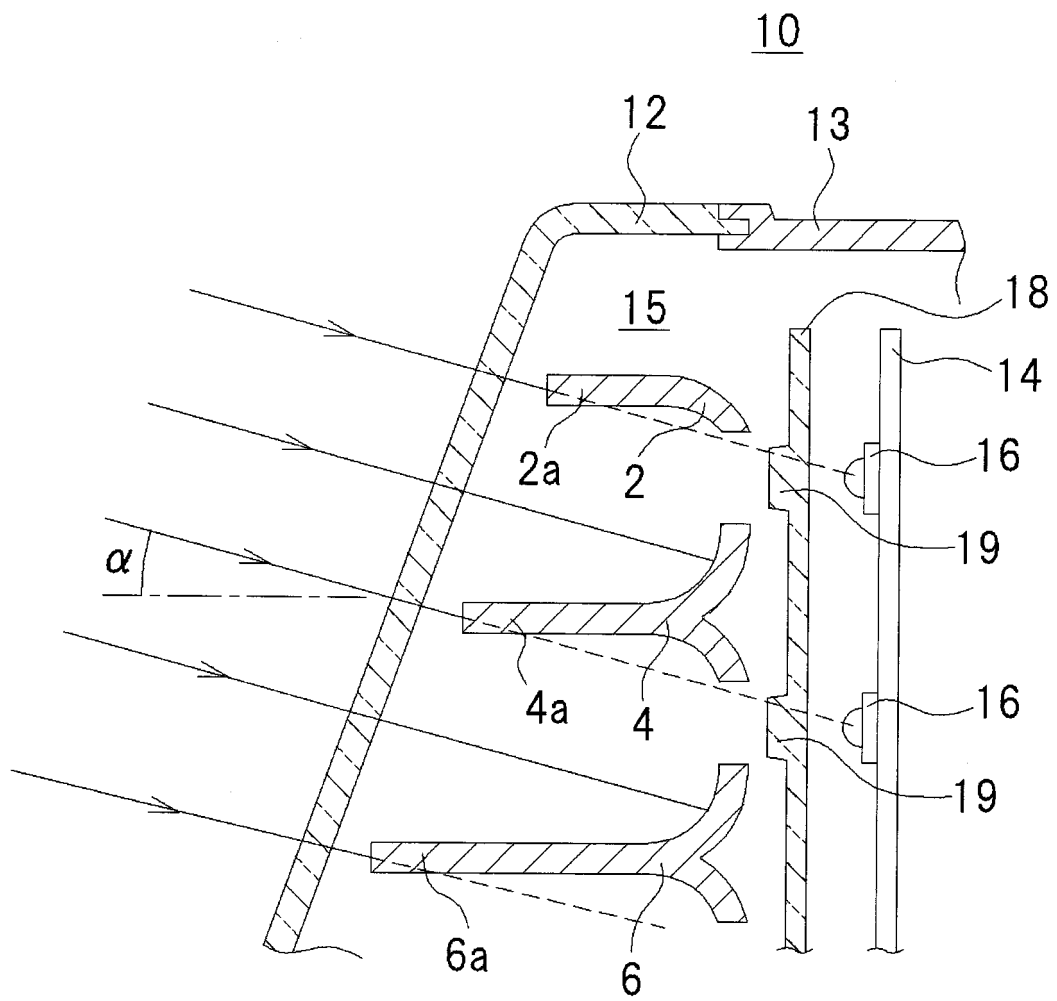


FIG.2

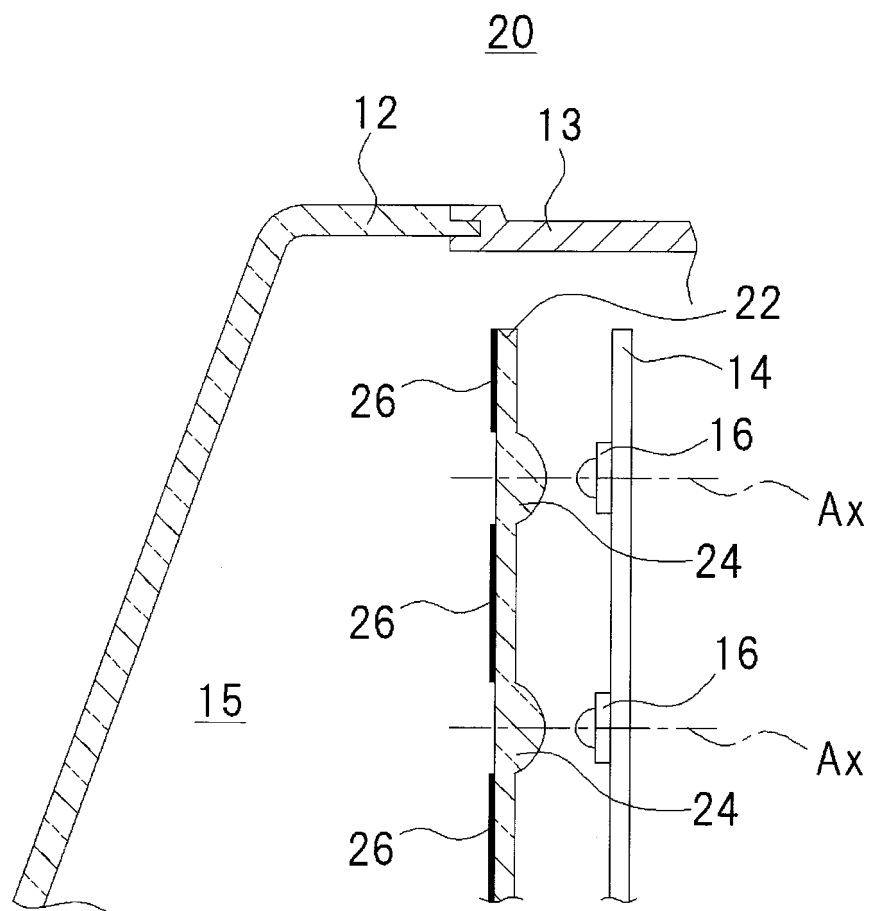


FIG.3

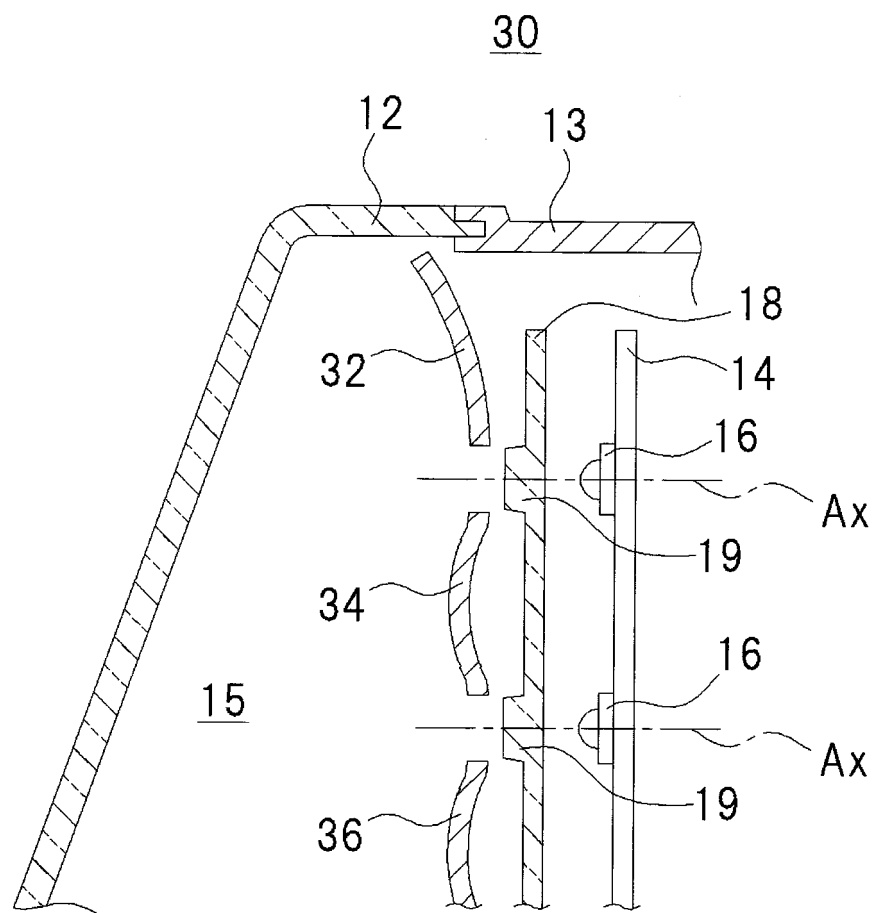


FIG.4

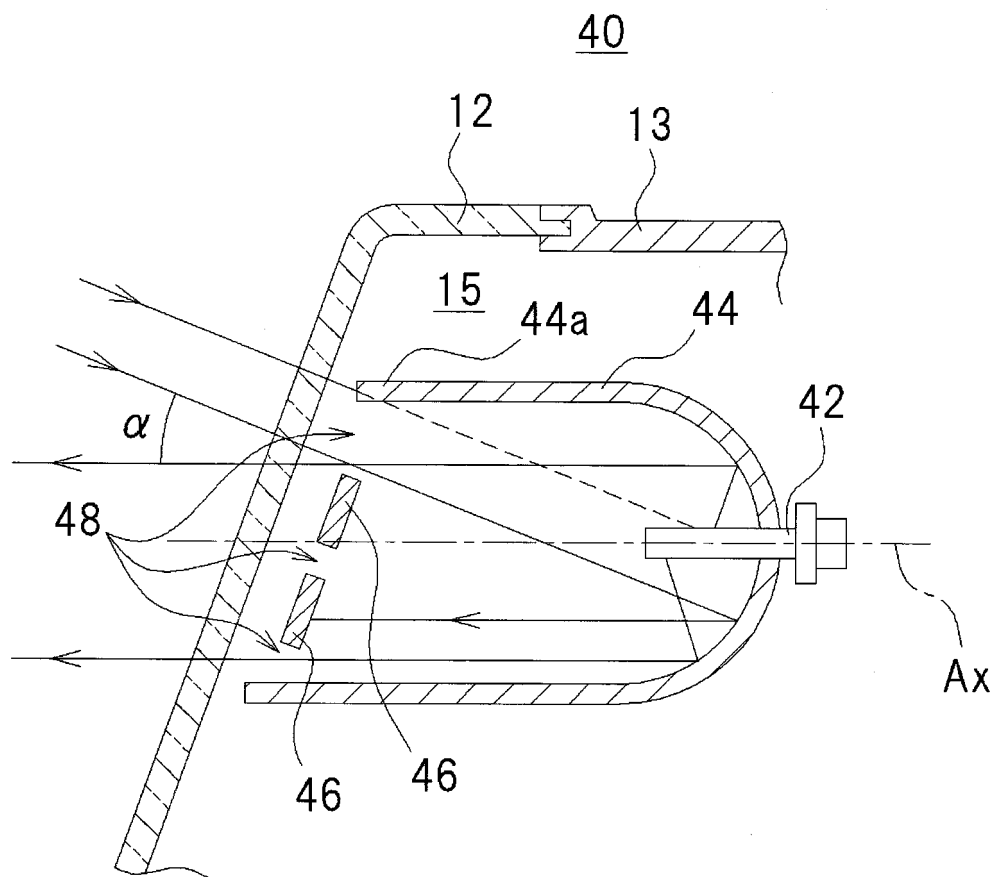


FIG.5

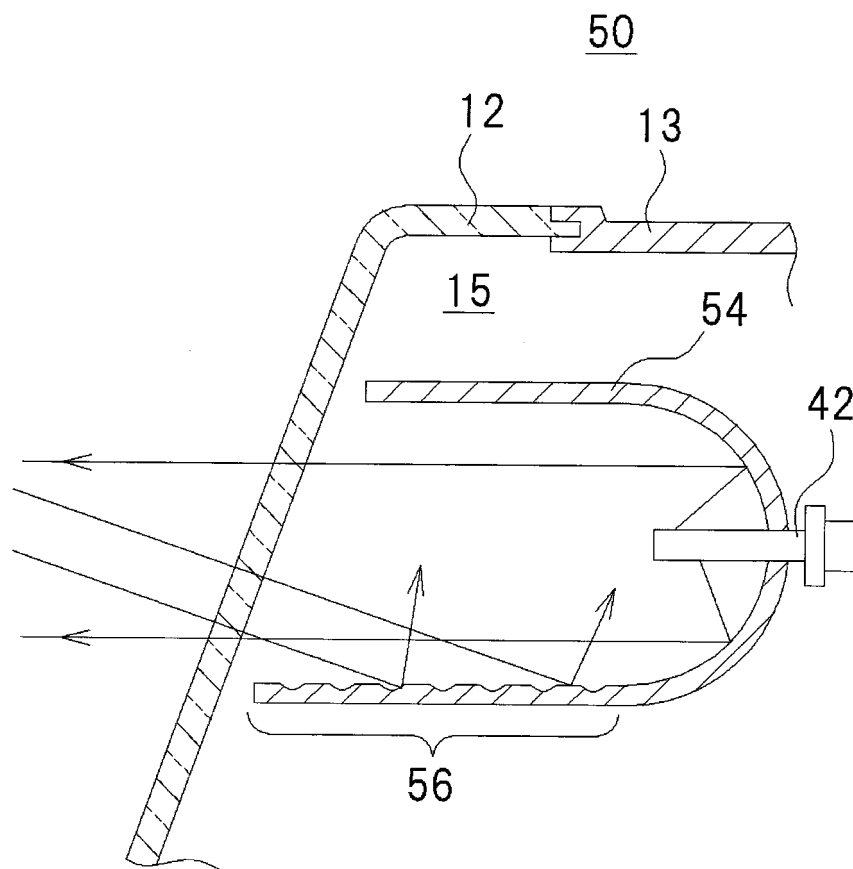


FIG.6

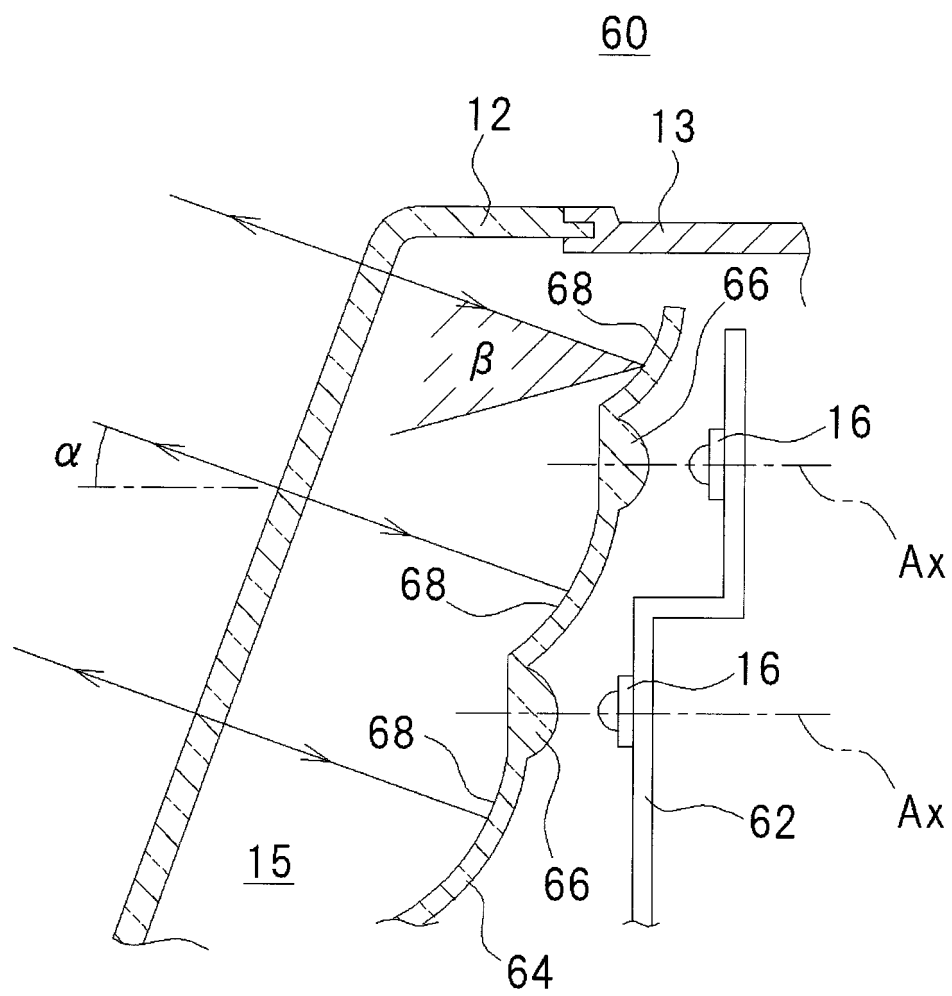


FIG.7

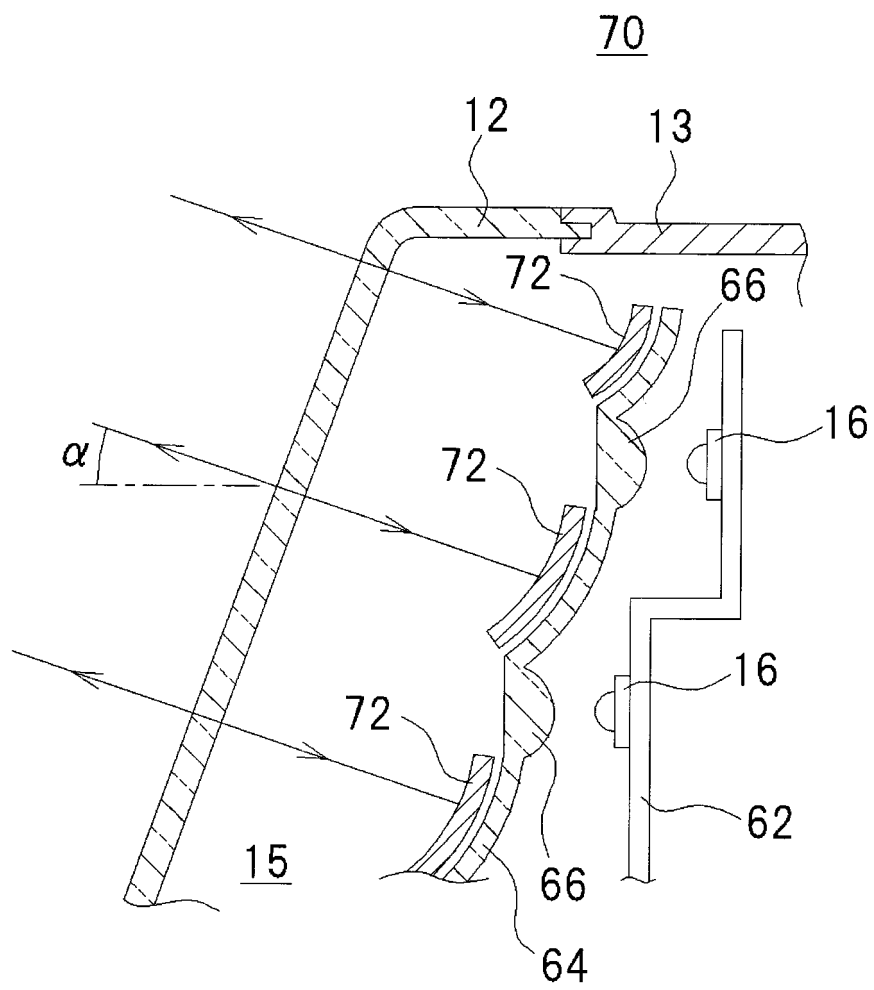


FIG.8

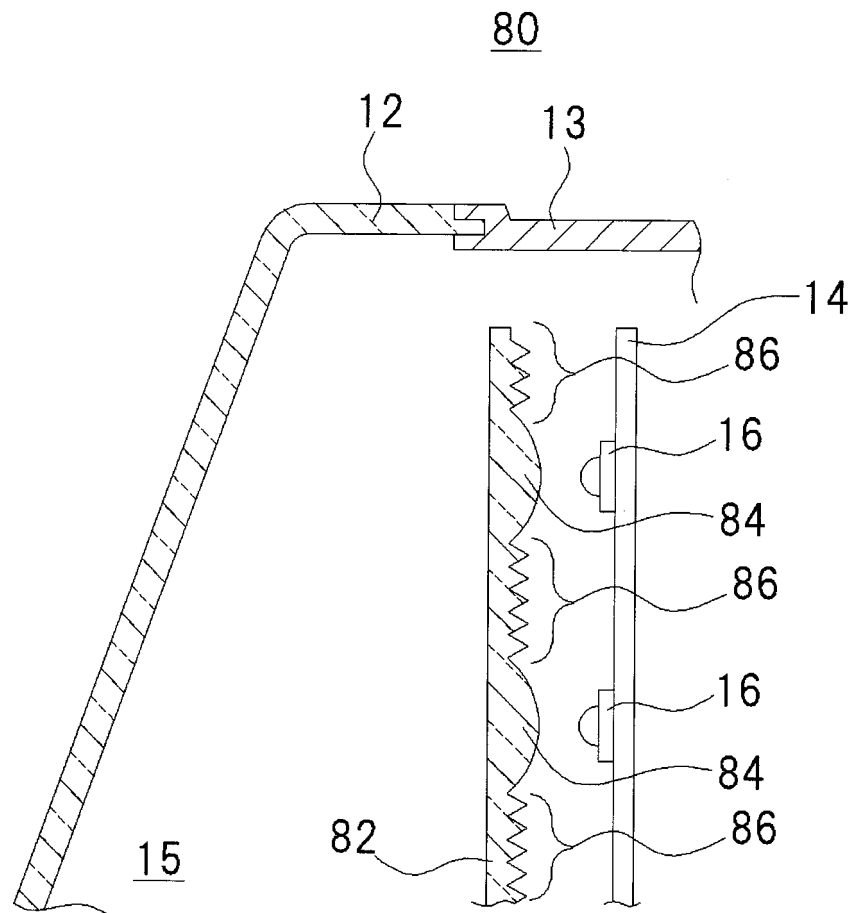


FIG.9

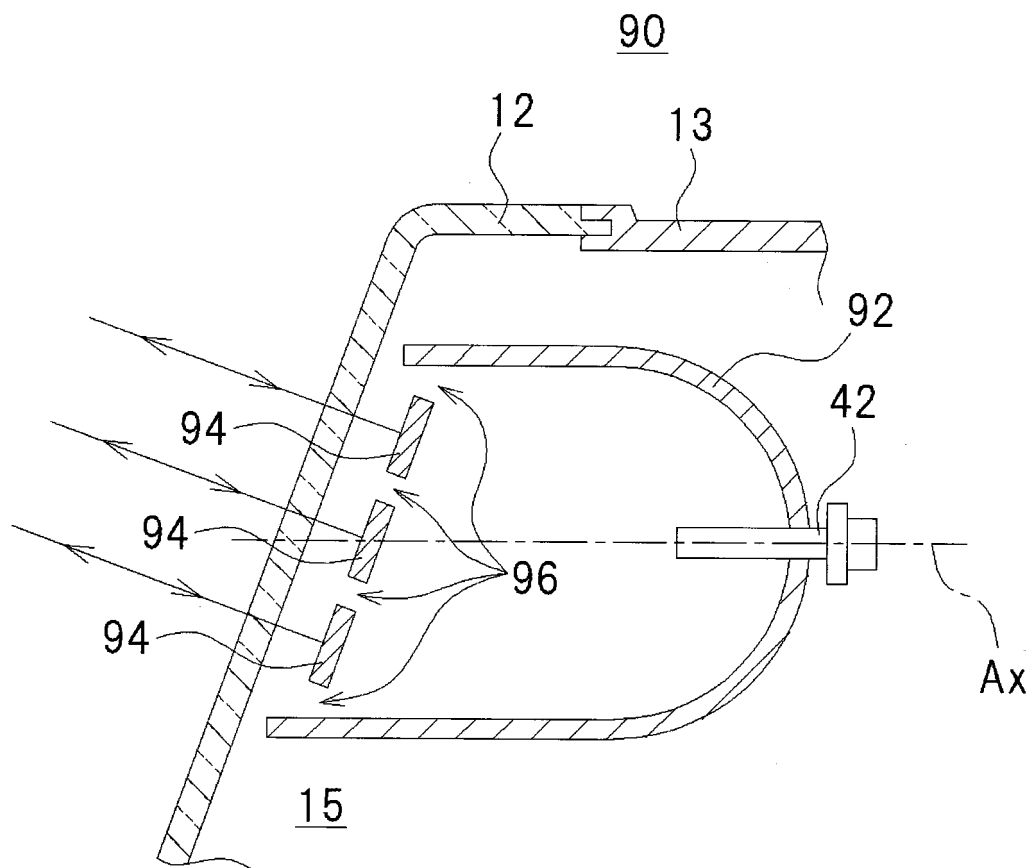
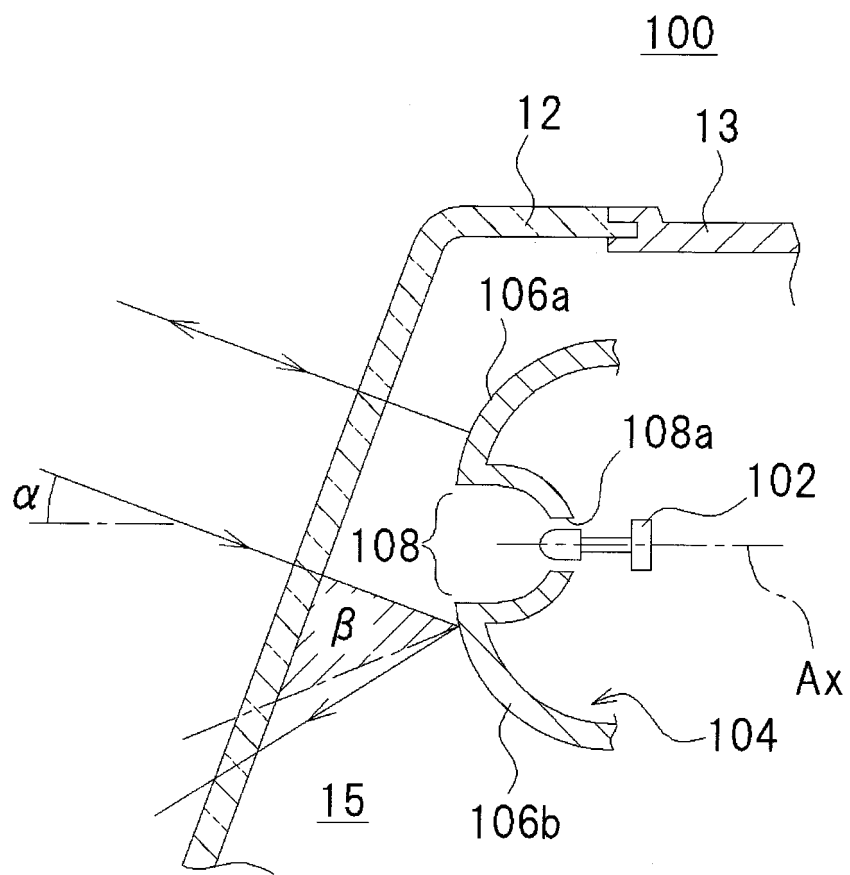


FIG.10



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/000936

A. CLASSIFICATION OF SUBJECT MATTER

F21S8/10(2006.01) i, F21W101/14(2006.01) n, F21Y101/02(2006.01) n

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)

F21S8/10, F21W101/14, F21Y101/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2013

Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 113983/1983(Laid-open No. 22706/1985)	1
Y	(Stanley Electric Co., Ltd.), 16 February 1985 (16.02.1985), page 3, line 1 to page 4, line 7; page 5, lines 9 to 14; fig. 1 to 2 (Family: none)	2-5
Y	JP 9-306206 A (Koito Manufacturing Co., Ltd.), 28 November 1997 (28.11.1997), paragraphs [0009], [0014] to [0016]; fig. 1 to 7 (Family: none)	2, 4-5

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
27 March, 2013 (27.03.13)Date of mailing of the international search report
09 April, 2013 (09.04.13)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/000936

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2001-67905 A (Stanley Electric Co., Ltd.), 16 March 2001 (16.03.2001), paragraph [0027]; fig. 2 (Family: none)	3
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 191184/1982 (Laid-open No. 95516/1984) (Ichikoh Industries Ltd.), 28 June 1984 (28.06.1984), page 5, line 4 to page 6, line 9; fig. 2 to 3 (Family: none)	5

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/000936

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
See extra sheet.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/000936

Continuation of Box No.III of continuation of first sheet (2)

Reference 1 describes a reflective structure; therefore, the invention of claim 1 does not have a special technical feature over that described in Reference 1. Furthermore, an inner lens is described in Reference 1. Therefore, the claims include three inventions (groups) having the following special technical features. Moreover, the invention of claims 1 - 2, which has no special technical feature, is classified in invention 1.

(Invention 1) Invention of claims 1 - 2

This invention relates to forming part of an inner lens so as to be substantially perpendicular.

(Invention 2) Invention of claim 3

This invention relates to a reflective structure formed on a light source side surface of an inner lens.

(Invention 3) Invention of claims 4 - 5

This invention relates to the placement of a non-transparent member.

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2006216455 A [0004]