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(54) Vehicular headlamp comprising a projection lens

Fahrzeugscheinwerfer mit einer Projektionslinse

Phare de véhicule comprenant une lentille de projection

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(73) Proprietor: **Koito Manufacturing Co., Ltd.**
Tokyo 108-8711 (JP)

(72) Inventor: **Tanaka, Hidetada**
Shizuoka-shi, Shizuoka (JP)

(74) Representative: **Grünecker Patent- und Rechtsanwälte**
PartG mbB
Leopoldstraße 4
80802 München (DE)

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Description

FIELD

[0001] The present invention relates to a vehicular headlamp. More specifically, the present invention relates to a vehicular headlamp to generate a projection light as a so-called high beam (upward/long distance beam), and is applied to a technical field for realizing a good light distribution pattern by a surface shape of a projection lens.

BACKGROUND

[0002] Conventional vehicular headlamps are disclosed in the patent applications EP 2 500 628 A2, JP 2011249056 and JP2007294202.

[0003] As a vehicular headlamp, there is known a headlamp in which, as a light source, a semiconductor light emitting element such as an LED (Light Emitting Diode), for example, is disposed at an interior of a lamp outer housing formed by a cover and a lamp body (for example, see above No. 2007-213877).

[0004] Further, as the vehicular headlamp, there is known a headlamp employing an array structure in which a plurality of semiconductor light emitting elements is arranged in a horizontal direction (a left-right direction).

[0005] Fig. 8 and Fig. 9 are explanatory views for explaining a schematic configuration of a vehicular headlamp that includes, as a light source, the semiconductor light emitting elements of the array structure. Fig. 8 is a schematic sectional view of the vehicular headlamp and Fig. 9 is a front view of a light emitting body that is formed by arranging a plurality of semiconductor light emitting elements in an array form. In these figures, an arrow "V" represents a vertical direction (an up-down direction) and an arrow "H" represents a horizontal direction (a left-right direction).

[0006] As shown in Fig. 8, in the vehicular headlamp, the light emitted from a plurality of semiconductor light emitting elements 100 is projected to the vehicle front through a projection lens 101. Although a sectional view in a vertical direction is shown in Fig. 8, the plurality of semiconductor light emitting elements 100 are arranged to have an array form in a horizontal direction, as shown in Fig. 9.

[0007] Here, a conventional projection lens configured to output a parallel light based on the light emitted from a light source has been used as the projection lens 101.

[0008] As a reference, Fig. 10 illustrates a light distribution pattern to be realized by the conventional (ordinary) projection lens 101. As in Fig. 8 and Fig. 9. in Fig. 10, an arrow "V" represents a vertical direction and an arrow "H" represents a horizontal direction.

[0009] Here, in order to realize a so-called high beam (upward/long distance beam), it is requested that the vehicular headlamp causes more light to be distributed to an upper side of a predetermined horizontal reference line Hr shown in Fig. 10.

[0010] As can be seen with reference to Fig. 10, light distribution is substantially uniformly allocated to an upper and lower portion of the horizontal reference line Hr in a case where the conventional (ordinary) projection lens 101 to output a parallel light is used. Accordingly, some means for realizing the high beam is required in a case where the projection lens 101 is used.

[0011] Conventionally, in a vehicular headlamp using the semiconductor light emitting elements arranged in an array form as a light source, reflectors 102 as shown in Fig. 11 and Fig. 12 are used for realizing the high beam. Fig. 11 is a sectional view showing a schematic configuration of the vehicular headlamp and Fig. 12 is a front view of a light emitting body in which the reflectors 102 are individually provided to each of the semiconductor light emitting elements 100 arranged in an array form.

[0012] As shown in Fig. 11, the reflectors 102 are formed at a front side of a light emitting surface of the semiconductor light emitting elements 100 in such a way that reflective surfaces thereof to reflect the light emitted from the semiconductor light emitting elements 100 in each direction of the upper and lower are respectively provided.

[0013] By providing the reflectors 102 in such a way, the light that is emitted from the semiconductor light emitting elements 100 and reflected by the reflective surfaces of the reflectors 102 as well as the direct light from the semiconductor light emitting elements 100 is incident on the projection lens 101. In other words, it is possible to give a change in the light distribution pattern by the reflected light from the reflectors 102.

[0014] By setting an inclination angle and length of the upper and lower reflective surfaces of the reflectors 102, it is possible to adjust the light distribution in an up-down direction of the light emitted from the projection lens 101. That is, in this way, it is possible to realize the high beam.

[0015] However, in a case where the reflectors 102 are provided, a problem may occur due to diffusion of light in the horizontal direction H.

[0016] Specifically, the light emitted from the semiconductor light emitting elements 100 in an oblique direction as indicated by an arrow in Fig. 12 is reflected by the reflectors 102 and therefore the diffusion of light in the horizontal direction H occurs.

[0017] As the diffusion of light in the horizontal direction H occurs in such a way, a problem occurs that it is difficult to shield a desired region properly, in a case where a headlamp system is configured to have a function to shield a portion of light in the horizontal direction H by on/off control of the semiconductor light emitting elements 100, especially. Such a light shielding function can be used in applications for selectively shielding a region corresponding to a location in which an object is present, for example, when the object such as a human is detected in the front of a vehicle.

[0018] Fig. 13 shows a specific example of the relationship between a light distribution pattern and a light

shielding region by a conventional headlamp.

[0019] Also in Fig. 13, an arrow "V" represents a vertical direction and an arrow "H" represents a horizontal direction. Also in Fig. 13, a horizontal reference line "Hr" is shown.

[0020] Only some desired regions in the horizontal direction H as indicated by a region "Ac" in Fig. 13, for example, are required to be shielded selectively by the above-described light shielding function. In other words, ideally, it is considered that, out of a plurality of semiconductor light emitting elements 100 arranged in an array form, only the semiconductor light emitting elements 100 disposed at positions corresponding to the region Ac are turned off and therefore only the region Ac is selectively shielded.

[0021] However, in a case where the reflectors 102 are provided for realization of the high beam, as indicated by "X" in Fig. 13, reflection to the region Ac to be shielded is caused, due to the diffusion of light in the horizontal direction H as shown in Fig. 13. That is, light distribution is made even for a portion of the region Ac.

[0022] As such, in the conventional vehicular headlamp to realize the high beam using the reflectors 102, a problem occurs that it is difficult to shield a desired region appropriately, in the case of assuming a light shielding function.

SUMMARY

[0023] An object of the present invention is to provide a vehicular headlamp which can prevent the reflection to a light shielding region while allowing the generation of a projection light as a so-called high beam. A vehicular headlamp according to the invention is defined in claim 1.

[0024] A vehicular headlamp according to an exemplary embodiment of the invention comprises a semiconductor light emitting element, and a projection lens having an irradiation surface, configured to project light emitted from the semiconductor light emitting clement to the outside from the irradiation surface. Both an upper portion and lower portion of the irradiation surface of the projection lens serve as a control surface configured to emit the light emitted from a focal point upwards relative to a parallel light.

[0025] According to the present invention, it is possible to generate a projection light as a high beam by the surface shape of the projection lens. Accordingly, it is not necessary to provide the reflectors as in the prior art for realizing the high beam and, as a result, it is possible to achieve the prevention of the reflection to the light shielding region.

[0026] According to the vehicular headlamp of the present invention as described above, the vehicular headlamp includes a semiconductor light emitting element as a light source and a projection lens for projecting the light emitted from the semiconductor light emitting element to the outside from an irradiation surface thereof. Further, both an upper portion and lower portion of the irradiation surface of the projection lens serve as a control surface that emits the light emitted from a focal point upwards relative to a parallel light. Accordingly, it is possible to realize a good vehicular headlamp aiming to prevent the reflection to a light shielding region while allowing the generation of a projection light as a high beam.

[0027] Further, in the vehicular headlamp, curvature of the upper portion and lower portion of the irradiation surface are set so that the upper portion and lower portion of the irradiation surface emit the light emitted from the focal point upwards relative to the parallel light. According to this configuration, it is possible to realize a good vehicular headlamp aiming to prevent the reflection to a light shielding region while allowing the generation of a projection light as a high beam, by a relatively simple method of adjusting the curvature of the irradiation surface of the projection lens.

[0028] Further, in the vehicular headlamp, surface shapes of the upper potion and the lower portion are set so that the light emitted through the lower portion has an angle to the parallel light larger than that of the light emitted through the upper portion. The light emitted through the lower portion is more suitable as a high beam since the light is directed more upwards.

[0029] Further, in the vehicular headlamp, the curvature of the upper portion of the irradiation surface becomes smaller toward an outer periphery. Thereby, it is possible to achieve the prevention of the situation where a short wavelength light such as a blue light, in particular, falls on a road side and therefore the light distribution pattern characteristics as a high beam are deteriorated.

[0030] Further, in the vehicular headlamp, the curvature of the lower portion of the irradiation surface becomes larger toward an outer periphery. The light on the lower side is more suitable as a high beam since the light can be largely bent.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031]

Fig.1 is a schematic vertical sectional view of a vehicular headlamp according to an embodiment of invention.

Fig. 2 is a schematic front view of the vehicular headlamp according to the embodiment of invention.

Fig. 3 is a schematic view showing an example of a light distribution pattern as a high beam.

Fig. 4 is a vertical sectional view schematically showing a lens curved surface of a projection lens according to the embodiment of invention.

Fig. 5 is a schematic view for explaining an action by the projection lens according to the embodiment of invention.

Fig. 6 is a view showing a light distribution pattern by the projection lens according to the embodiment of invention.

Fig. 7 is a view for explaining a specific lens design

of the projection lens according to the embodiment of invention.

Fig. 8 is a schematic sectional view of a vehicular headlamp including, as a light source, the semiconductor light emitting elements of an array structure.

Fig. 9 is a front view of a light emitting body that is formed by arranging a plurality of semiconductor light emitting elements in an array form.

Fig. 10 is a view showing an example of a light distribution pattern to be realized by a conventional (ordinary) projection lens.

Fig. 11 is a schematic sectional view showing a configuration for realizing a high beam in a vehicular headlamp using the semiconductor light emitting elements arranged in an array form as a light source.

Fig. 12 is a front view of a light emitting body in which the reflectors are individually provided to each of the semiconductor light emitting elements arranged in an array form.

Fig. 13 is view showing a specific example of the relationship between a light distribution pattern and a light shielding region by a conventional headlamp.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0032] Hereinafter, an exemplary embodiment of the invention will be described with reference to the accompanying drawings.

[0033] Fig. 1 and Fig. 2 are explanatory views showing a configuration of a vehicular headlamp 1 according to an embodiment. Fig. 1 is a schematic vertical sectional view of the vehicular headlamp 1 and Fig. 2 is a schematic front view of the vehicular headlamp 1.

[0034] In the vehicular headlamp 1, an interior of a lamp outer housing 4 configured by a lamp body 2 and a cover 3 attached to a front end of the lamp body 2 is formed as a lamp chamber 5 and a light emitting part including a projection lens 12 and a light emitting body 6 is formed in the lamp chamber 5 (see Fig. 1 and Fig. 2).

[0035] The vehicular headlamp 1 of the present embodiment is a high-beam (upward/long distance beam) headlamp for irradiating a long distance.

[0036] The light emitting part is configured in such a way that each required part is attached to a bracket 7 disposed in the lamp chamber 5.

[0037] The bracket 7 is formed of a metal material having a high thermal conductivity and supported portions 7a, 7a, 7a are provided on both upper and lower end portions thereof. A radiation member (radiation fin) 8 is attached to a rear surface of the bracket 7. A fan 9 for heat dissipation is attached to a rear surface of the radiation member 8.

[0038] The light emitting body 6 is attached to a central portion of a front surface of the bracket 7. The light emitting body 6 includes a base plate 16 attached to the front surface of the bracket 7 and semiconductor light emitting elements 15, 15, ··· mounted to a front surface of the base plate 16 in a state of being spaced apart from each other in a left-right direction (see Fig. 1). The semiconductor light emitting elements 15, 15, ··· serve as a light source.

[0039] Although not shown, the semiconductor light emitting element 15 includes a semiconductor layer located at a rear side thereof and a phosphor layer laminated on a front surface of the semiconductor layer.

[0040] As the semiconductor light emitting elements 15, 15, ···, LEDs (Light Emitting Diode) can be used, for example. In this case, it is assumed that the color of light emitted from the light emitting body 6 is a white color.

[0041] Here, in the case of the present embodiment, a reflector is not provided with respect to the base plate 16. That is, the light emitted from the semiconductor light emitting element 15 is incident on the projection lens 12 (to be described later) without going through the reflection of the reflector.

[0042] A lens holder 11 is attached to the front surface of the bracket 7 (see Fig. 1). The lens holder 11 has a substantially cylindrical shape that is penetrated in a longitudinal direction and is attached to the bracket 7 so as to cover the light emitting body 6.

[0043] The projection lens 12 is attached to a front end of the lens holder 11. The projection lens 12 has a substantially semi-spherical shape that is convex forward and projects forward the light emitted from the semiconductor light emitting elements 15, 15,

[0044] Further, the bracket 7 is coupled in such a way that aiming screws 10, 10, 10 are respectively screwed to the supported portions 7a, 7a, 7a of the bracket 7. The bracket 7 is tiltably supported to the lamp body 2 through the aiming screws 10, 10, 10. When the aiming screw 10 is rotated, the bracket 7 is tilted in a vertical direction or a lateral direction while using, as a supporting point, the supported portions 7a, 7a other than the supported portion screwed by the aiming screw 10 that is rotated, so that adjustment (aiming adjustment) of an optical axis is performed.

[0045] Further, as shown in Fig. 1, extensions (blindfold material) 13, 14 are provided in the lamp chamber 5. Each of these extensions 13, 14 is provided so as to cover mechanism parts regarding the above-described aiming adjustment, e.g., parts that are undesirable when being visible from the outside of the cover 3.

[0046] In the vehicular headlamp 1, a leveling actuator (not shown) may be provided and the bracket 7 may be tilted in a vertical direction by the driving of the leveling actuator, so that a leveling adjustment for adjusting the direction of an optical axis according to the weight of on-vehicle objects may be carried out.

[0047] Further, although not shown, driving current is supplied separately to each of the semiconductor light emitting elements 15, 15, ··· from a lighting circuit. The semiconductor light emitting elements 15, 15, ··· supplied with the driving current are turned on and the semiconductor light emitting elements 15, 15, ··· not supplied with the driving current remain turned off.

[0048] As a result, it is possible to realize the above-

described light shielding function.

[0049] Further, a control for changing the current value of the driving current to be supplied from the lighting circuit can be separately carried out to each of the semiconductor light emitting elements 15, 15, ···.

[0050] Here, the vehicular headlamp 1 of the present embodiment as described above serves as a high-beam headlamp.

[0051] Fig. 3 schematically shows an example of a light distribution pattern TH for a high beam.

[0052] In this case, the light distribution pattern TH is formed by synthesizing distributions T1, T2, ··· of light emitted from each of the semiconductor light emitting elements 15, 15, ···. The light distributions T1, T2, ··· are overlapped with each other in the horizontal direction (a left-right direction) H. In the light distributions T1, T2, ···, a left-right width thereof is the smallest at a central portion in the horizontal direction H and the left-right width is gradually increased outwards in the horizontal direction H. Further, in the light distributions T1, T2, ···, a vertical width thereof is the largest at a central portion in the horizontal direction H and the vertical width is gradually decreased outwards in the horizontal direction H.

[0053] Further, the light distribution pattern TH for the high beam is such that more light distribution is made to an upper side of a predetermined horizontal reference line Hr indicated by a dashed line in Fig. 3.

[0054] When it is intended to shield some predetermined regions in the horizontal direction H using the above-described light shielding function, a plurality of semiconductor light emitting elements 15 corresponding to a plurality of predetermined light distributions T out of the light distributions T1, T2, ··· in Fig. 3 are turned off. For example, when it is intended to shield a region between the light distributions T5 and T2 in Fig. 3, the semiconductor light emitting elements 15 respectively corresponding to the light distributions T4 and T3 are turned off.

[0055] Here, as described above, the conventional vehicular headlamp is configured such that the high beam is realized by the action of the reflectors (reflector 102) provided on a front side of a light source. However, in this case, regarding the light shielding function as described above, the reflection to the light shielding region is caused and therefore a problem occurs that it is difficult to realize an adequate light shielding.

[0056] Accordingly, in the present embodiment, by setting the shape of the irradiation surface of the projection lens 12 as appropriate, the realization of the high beam is achieved by the action of the projection lens 12.

[0057] Specifically, both the upper portion and lower portion of the irradiation surface of the projection lens 12 serve as a control surface that emits the light emitted from a focal point upwards relative to the parallel light, thereby realizing the high beam.

[0058] Fig. 4 is a vertical sectional view schematically showing a lens curved surface of the projection lens 12 of the present embodiment. In Fig. 4 and Fig. 5 to Fig. 7, it is assumed that the upper direction and lower direction in the vertical direction V respectively correspond with the upper direction and lower direction of the paper.

[0059] In Fig. 4, a vertical cross-sectional shape of the irradiation surface of the projection lens 12 in the present embodiment is represented by a solid line and a vertical cross-sectional shape of the irradiation surface of an ordinary projection lens is represented by a broken line. Here, the ordinary projection lens means a projection lens that is designed to emit the light emitted from a focal point as a parallel light.

[0060] Here, Fig. 4 also shows an optical axis P of the light that is emitted from the semiconductor light emitting elements 15 and incident on the projection lens 12.

[0061] As shown in Fig. 4, the irradiation surface of the projection lens 12 of the present embodiment is configured such that the curvature of an upper portion thereof is smaller than that of the ordinary lens curved surface and the curvature of a lower portion thereof is larger than that of the ordinary lens curved surface.

[0062] Fig. 5 is a schematic view for explaining an action by the projection lens 12 where the shape of the irradiation surface is set as described above.

[0063] As shown in Fig. 5, each of the light that is emitted from the light emitting part 6 and passes through the upper portion of the irradiation surface of the projection lens 12 and the light that is emitted from the light emitting part 6 and passes through the lower portion of the irradiation surface can be emitted upwards together, by setting the shape of the irradiation surface as shown in Fig. 4. Thereby, it is possible to realize the high beam.

[0064] Fig. 6 is a view showing a light distribution pattern by the projection lens 12. Meanwhile, Fig. 6 shows a light distribution pattern when some predetermined regions in the horizontal direction H are shielded by the above-described light shielding function.

[0065] It can be seen that a light distribution pattern as a high beam is realized by setting the upper portion and lower portion of the irradiation surface as the control surface as described above. That is, upon realization of the high beam, the conventional reflectors 102 are not necessary. From this fact, according to the projection lens 12 of the present embodiment, it is possible to effectively suppress the diffusion in the horizontal direction H of light by the reflector 102 and therefore it is possible to effectively suppress the occurrence of reflection to the light shielding region, as indicated by an arrow "X" in Fig. 6.

[0066] Here, upon realization of the high beam, it is desired that the light passing through the lower side of the irradiation surface can be emitted more upwardly. Accordingly, the surface shape of the projection lens 12 of the present embodiment is set so that the light emitted through the lower portion of the irradiation surface has an angle to the parallel light larger than that of the light emitted through the upper portion thereof.

[0067] Thereby, it is possible to realize the vehicular headlamp 1 that is more suitable for a high beam.

[0068] By the way, in a convex lens such as the pro-

jection lens 12 of the present embodiment, there is a trend that an emission angle difference between the light of the respective colors becomes large by the influence of chromatic aberration, especially at an outer peripheral portion of the lens. As a specific phenomenon, a short wavelength light such as a blue light, in particular, is emitted while being largely bent at an outer peripheral portion of the lens, as compared to a long wavelength light.

[0069] When the vehicular headlamp 1 is used to emit the high beam, it is desirable that the light passing through the lower portion of the projection lens 12 is largely bent. The reason is that the light on the lower side is emitted more upwardly when the light is largely bent at the lower portion of the projection lens 12.

[0070] On the contrary, when the light passing through the upper portion of the projection lens 12 is largely bent, there is a possibility that the light is emitted downwards relative to a parallel light. That is, as a specific phenomenon, there is a possibility that a blue light with a short wavelength is emitted downwards relative to the parallel light when only the curvature of the upper portion of the projection lens 12 is smaller than that of the ordinary lens curved surface, as described above. As a result, a problem occurs that the blue light passing through the upper portion falls on a road side and therefore the light distribution pattern characteristics as a high beam are deteriorated.

[0071] By taking this point into consideration, in the projection lens 12 of the present embodiment, the curvature of the upper portion of the irradiation surface becomes smaller toward an outer periphery. Thereby, it is possible to achieve the prevention of the situation where a short wavelength light such as a blue light, in particular, passing through near the uppermost portion of the irradiation surface falls on a road side and therefore the light distribution pattern characteristics as a high beam are deteriorated.

[0072] Further, in the projection lens 12 of the present embodiment, the curvature of the lower portion of the irradiation surface becomes larger toward an outer periphery.

[0073] According to this configuration, the light on the lower side is more suitable as a high beam since the light can be more largely bent.

[0074] Fig. 7 is a view for explaining a specific lens design of the projection lens 12 of the present embodiment, as described above.

[0075] As shown in Fig. 7, in this design example, it is assumed that, out of the light flux that is emitted from a focal point F and incident on the projection lens 12, the light at the central portion (hereinafter, referred to as "central light") having the range from the light directed upward by 14° relative to the optical axis P to the light directed downward by 15° relative to the optical axis P is emitted as a parallel light from the irradiation surface. Specifically, this means that the portion of the irradiation surface of the projection lens 12 from which the central light (upward 14° to downward 15°) is emitted has the same surface shape as the ordinary projection lens. In other words, the surface shape of the portion above the portion from which the central light is emitted has curvature smaller than that of the ordinary lens curved surface and the surface shape of the portion below the portion from which the central light is emitted has curvature larger than that of the ordinary lens curved surface. Additionally, in the projection lens 12 of this case, the portion of the irradiation surface above the portion from which the central light is emitted corresponds to "the upper portion" used herein and, similarly, the portion of the irradiation surface below the portion from which the central light is emitted corresponds to "the lower portion" used herein.

[0076] As shown, the projection lens 12 of this case is designed so that the light passing through "the upper portion" of the irradiation surface is emitted to 5.16° upward relative to the parallel light and the light passing through "the lower portion" of the irradiation surface is emitted to 3.06° upward relative to the parallel light. In other words, in the projection lens 12 of this case, the curvatures of "the upper portion" and "the lower portion" of the irradiation surface thereof are respectively set so that such emission angles are obtained.

[0077] For example, by employing such a lens design, it is possible to realize a good light distribution pattern for a high beam, as shown in Fig. 6.

[0078] As described above, the vehicular headlamp 1 according to the present embodiment includes the semiconductor light emitting elements 15 as a light source and the projection lens 12 for projecting the light emitted from the semiconductor light emitting elements 15 to the outside from an irradiation surface thereof. Further, both the upper portion and lower portion of the irradiation surface of the projection lens 12 serve as a control surface that emits the light emitted from a focal point upwards relative to a parallel light.

[0079] Since a projection light as a high beam can be generated by the surface shape of the projection lens 12, it is not necessary to provide the reflectors 102 as in the prior art for realizing the high beam and, as a result, it is possible to achieve the prevention of the reflection to the light shielding region. In this way, it is possible to realize a good vehicular headlamp 1 aiming to prevent the reflection to a light shielding region while allowing the generation of a projection light as a high beam.

[0080] At this time, in the present embodiment, the upper portion and lower portion of the projection lens 12 emit the light emitted from the focal point upwards relative to the parallel light by setting the curvature thereof. Thereby, it is possible to realize a good vehicular headlamp 1 aiming to prevent the reflection to a light shielding region while allowing the generation of a projection light as a high beam, by a relatively simple method of adjusting the curvature of the irradiation surface of the projection lens 12.

[0081] Further, in the present embodiment, the surface shapes of the upper potion and the lower portion are set so that the light emitted through the lower portion of the

irradiation surface has an angle to the parallel light larger than that of the light emitted through the upper portion thereof. In this way, the light emitted through the lower portion is more suitable as a high beam since the light is directed more upwards.

[0082] Further, in the present embodiment, the curvature of the upper portion of the irradiation surface becomes smaller toward an outer periphery. Thereby, it is possible to achieve the prevention of the situation where a short wavelength light such as a blue light, in particular, falls on a road side and therefore the light distribution pattern characteristics as a high beam are deteriorated.

[0083] Further, in the present embodiment, the curvature of the lower portion of the irradiation surface becomes larger toward an outer periphery. The light on the lower side is more suitable as a high beam since the light can be largely bent.

[0084] In the above description, an array of a plurality of semiconductor light emitting elements 15, 15, ··· arranged in a row is used as a light source. However, it is not essential to use a plurality of semiconductor light emitting elements 15, 15, ··· as a light source. For example, one semiconductor light emitting element 15 may be used.

[0085] The shapes and structures of the respective parts described above are merely examples for carrying out the embodiment of the present invention. While the invention has been described with respect to a limited number of embodiments, those skilled in the art will appreciate that other embodiments can be devised without departing from the scope of the invention as disclosed herein. Accordingly, the scope of the invention should be limited only by the attached claims.

Claims

1. A high-beam vehicular headlamp (1) comprising:

   a semiconductor light emitting element (15); and
   a projection lens (12) having an irradiation surface, configured to project light emitted from the semiconductor light emitting element (15) to the outside from the irradiation surface,
   wherein the irradiation surface has an upper portion, a central portion and a lower portion,
   wherein light emitted from a focal point (F) of the central portion and incident on the projection lens (12) is emitted as parallel light from the central portion of the irradiation surface, and
   wherein a curvature of the lower portion of the irradiation surface of the projection lens (12) is set so that the lower portion of the irradiation surface emits the light emitted from the focal point (F) upwards relative to the parallel light,

   characterized in that
   a curvature of the upper portion of the irradiation surface of the projection lens (12) is set so that the upper portion of the irradiation surface emits the light emitted from the focal point (F) upwards relative to the parallel light.

2. The vehicular headlamp according to claim 1, wherein surface shapes of the upper potion and the lower portion are set so that the light emitted through the lower portion has an angle to the parallel light larger than that of the light emitted through the upper portion.

3. The vehicular headlamp according to claim 2, wherein the curvature of the upper portion of the irradiation surface becomes smaller toward an outer periphery.

4. The vehicular headlamp according to claim 2 or 3, wherein the curvature of the lower portion of the irradiation surface becomes larger toward an outer periphery.

Patentansprüche

1. Fernlicht-Fahrzeugscheinwerfer (1), der umfasst:

   ein Halbleiter-Lichtemissionselement (15); und
   eine Projektions-Linse (12) mit einer Strahlungs-Fläche, die so eingerichtet ist, dass sie von dem Halbleiter-Lichtemissionselement (15) emittiertes Licht von der Strahlungs-Fläche nach außen projiziert,
   wobei die Strahlungs-Fläche einen oberen Abschnitt, einen mittleren Abschnitt und einen unteren Abschnitt hat,
   Licht, das von einem Brennpunkt (F) des mittleren Abschnitts emittiert wird und auf die Projektions-Linse (12) auftrifft, als paralleles Licht von dem mittleren Abschnitt der Strahlungs-Fläche emittiert wird, und
   eine Krümmung des unteren Abschnitts der Strahlungs-Fläche der Projektions-Linse (12) so eingestellt ist, dass der untere Abschnitt der Strahlungs-Fläche das von dem Brennpunkt (F) emittierte Licht relativ zu dem parallelen Licht nach oben emittiert,
   dadurch gekennzeichnet, dass
   eine Krümmung des oberen Abschnitts der Strahlungs-Fläche der Projektions-Linse (12) so eingestellt ist, dass der obere Abschnitt der Strahlungs-Fläche das von dem Brennpunkt (F) emittierte Licht relativ zu dem parallelen Licht nach oben emittiert,

2. Fahrzeugscheinwerfer nach Anspruch 1, wobei Oberflächenformen des oberen Abschnitts und des unteren Abschnitts so festgelegt sind, dass das über den unteren Abschnitt emittierte Licht einen Winkel

zu dem Parallellicht hat, der größer ist als der des über den oberen Abschnitt emittierten Lichts.

3. Fahrzeugscheinwerfer nach Anspruch 2, wobei die Krümmung des oberen Abschnitts der Strahlungs-Fläche zu einem Außenumfang hin abnimmt.

4. Fahrzeugscheinwerfer nach Anspruch 2 oder 3, wobei die Krümmung des unteren Abschnitts der Strahlungs-Fläche zu einem Außenumfang hin zunimmt.

Revendications

1. Phare de véhicule pour feux de croisement (1) comprenant :

   un élément d'émission de lumière semi-conducteur (15) ; et
   une lentille de projection (12) ayant une surface de rayonnement, configurée pour projeter la lumière émise par l'élément d'émission de lumière semi-conducteur (15) à l'extérieur depuis la surface de rayonnement,
   dans lequel la surface de rayonnement a une partie supérieure, une partie centrale et une partie inférieure,
   dans lequel la lumière émise à partir d'un point focal (F) de la partie centrale et incidente sur la lentille de projection (12), est émise sous la forme d'une lumière parallèle à partir de la partie centrale de la surface de rayonnement, et
   dans lequel une courbure de la partie inférieure de la surface de rayonnement de la lentille de projection (12) est déterminée de sorte que la partie inférieure de la surface de rayonnement émet la lumière émise depuis le point focal (F) vers le haut par rapport à la lumière parallèle,
   caractérisé en ce que :
   une courbure de la partie supérieure de la surface de rayonnement de la lentille de projection (12) est déterminée de sorte que la partie supérieure de la surface de rayonnement émet la lumière émise à partir du point focal (F) vers le haut par rapport à la lumière parallèle.

2. Phare de véhicule selon la revendication 1, dans lequel les formes de surface de la partie supérieure et de la partie inférieure sont déterminées de sorte que la lumière émise par la partie inférieure a un angle par rapport à la lumière parallèle supérieur à celui de la lumière émise par la partie supérieure.

3. Phare de véhicule selon la revendication 2, dans lequel la courbure de la partie supérieure de la surface de rayonnement devient moins importante vers une périphérie externe.

4. Phare de véhicule selon la revendication 2 ou 3, dans lequel la courbure de la partie inférieure de la surface de rayonnement devient plus importante vers la périphérie externe.

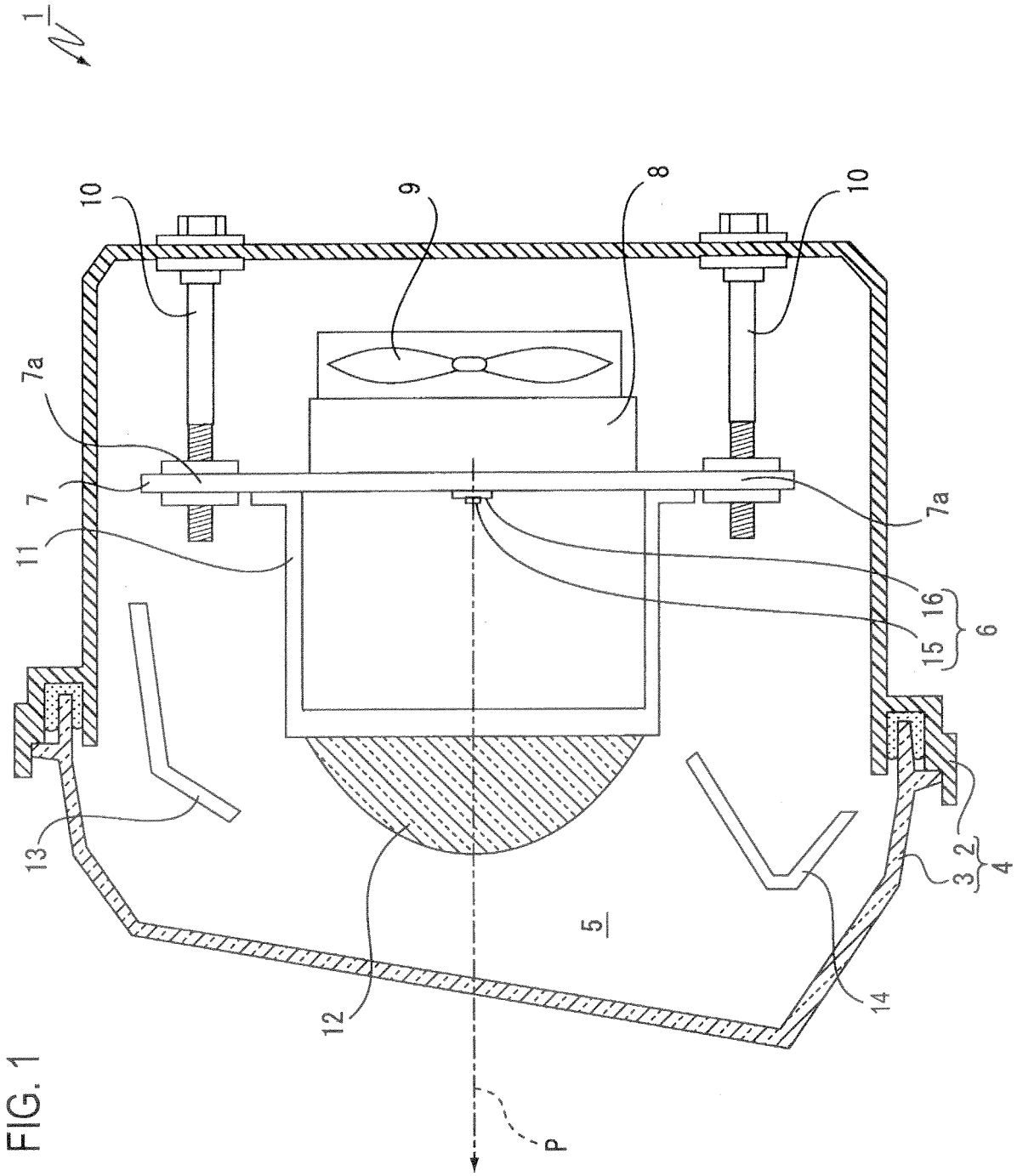


FIG. 1

FIG. 2

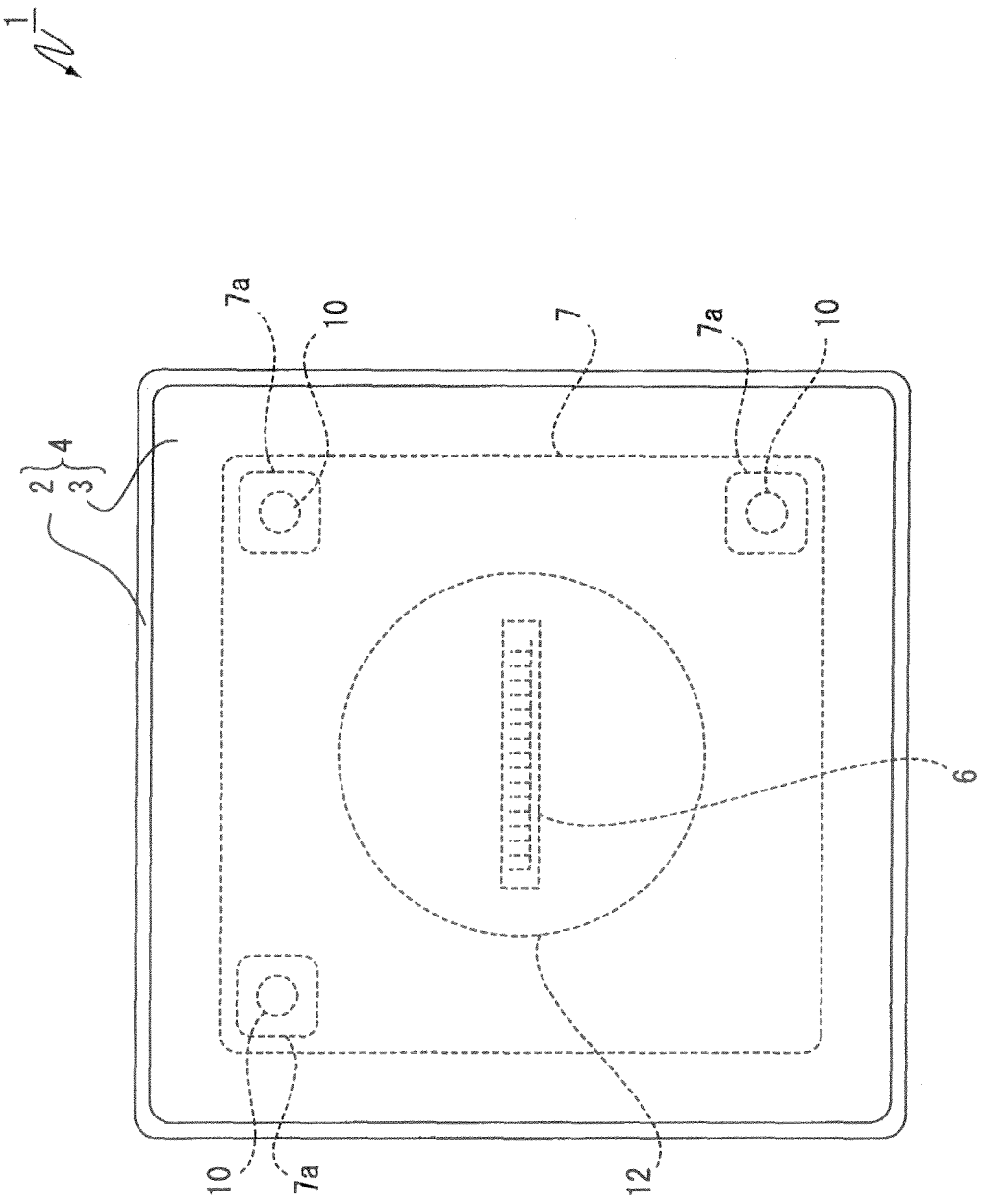


FIG. 3

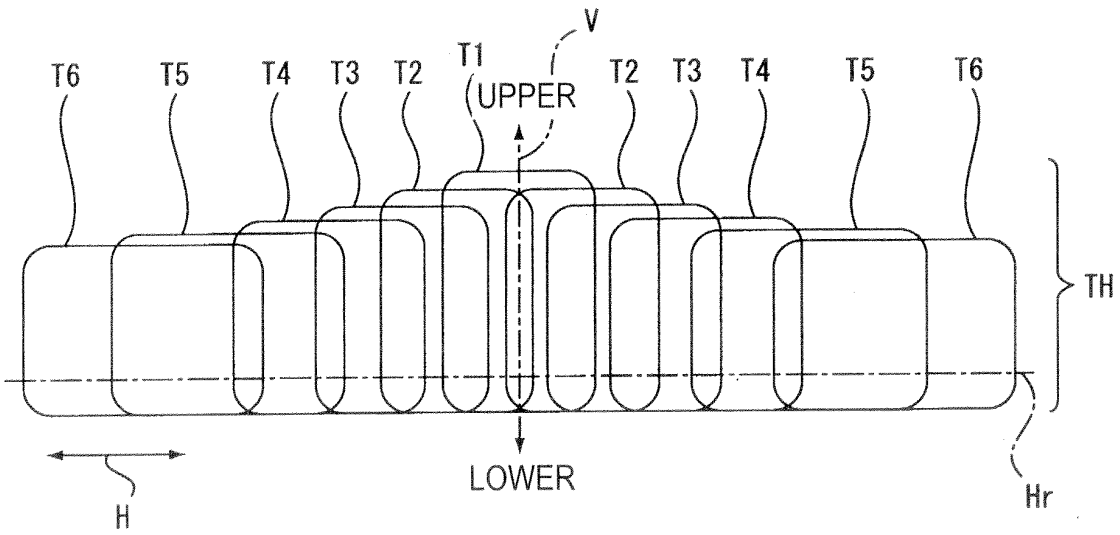

V
T6
T5
T4
T3
T2
T1
UPPER
T2
T3
T4
T5
T6
TH
LOWER
H
Hr

FIG. 4

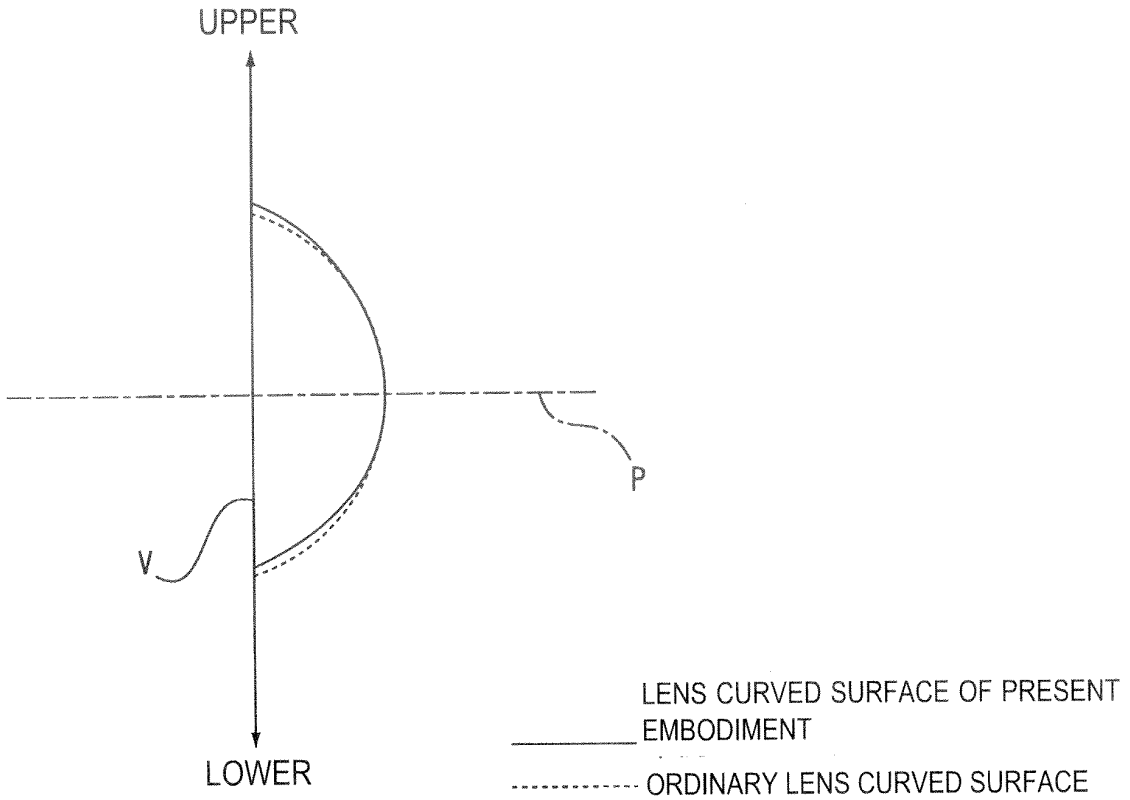

UPPER
P
V
LOWER
LENS CURVED SURFACE OF PRESENT EMBODIMENT
ORDINARY LENS CURVED SURFACE

FIG. 5

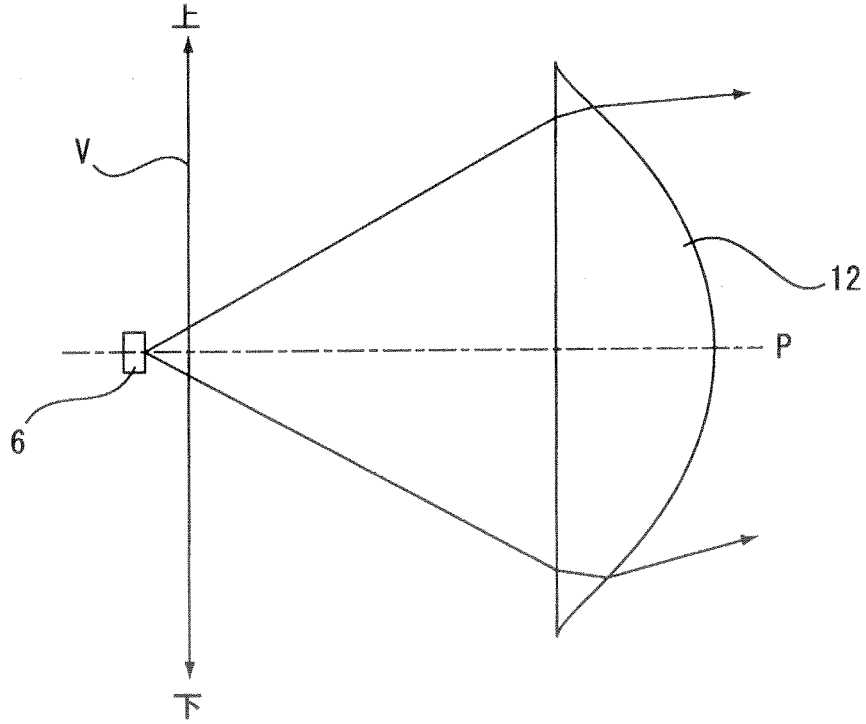


FIG. 6

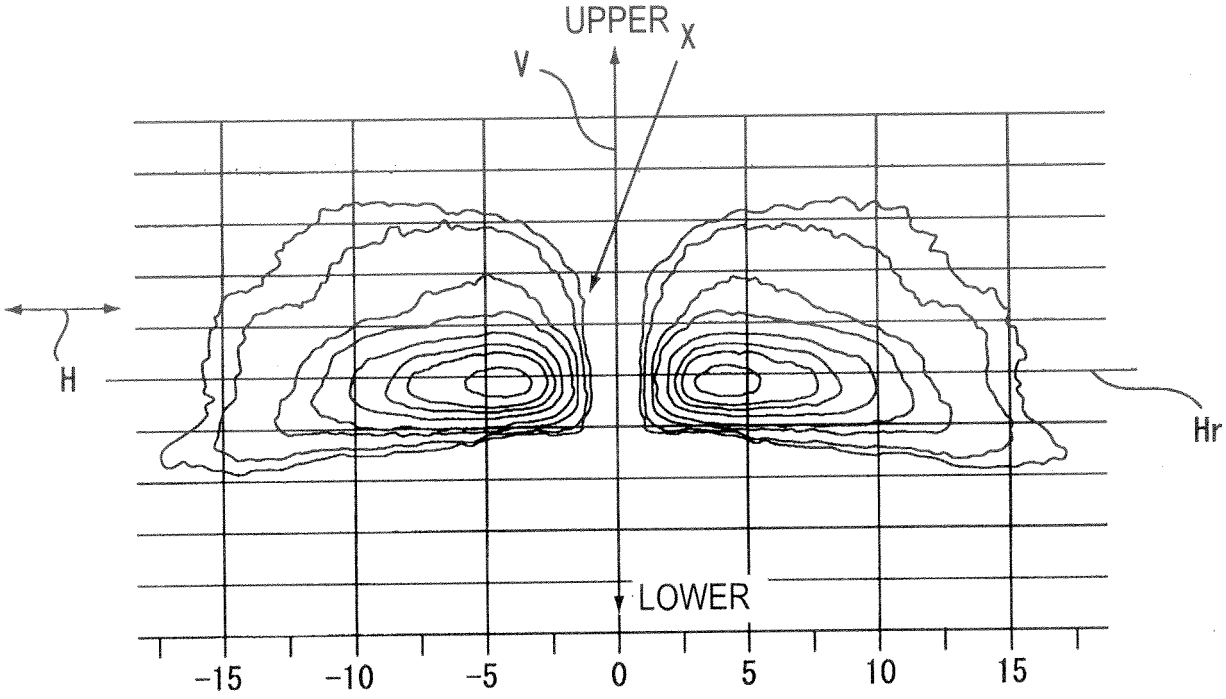


FIG. 7

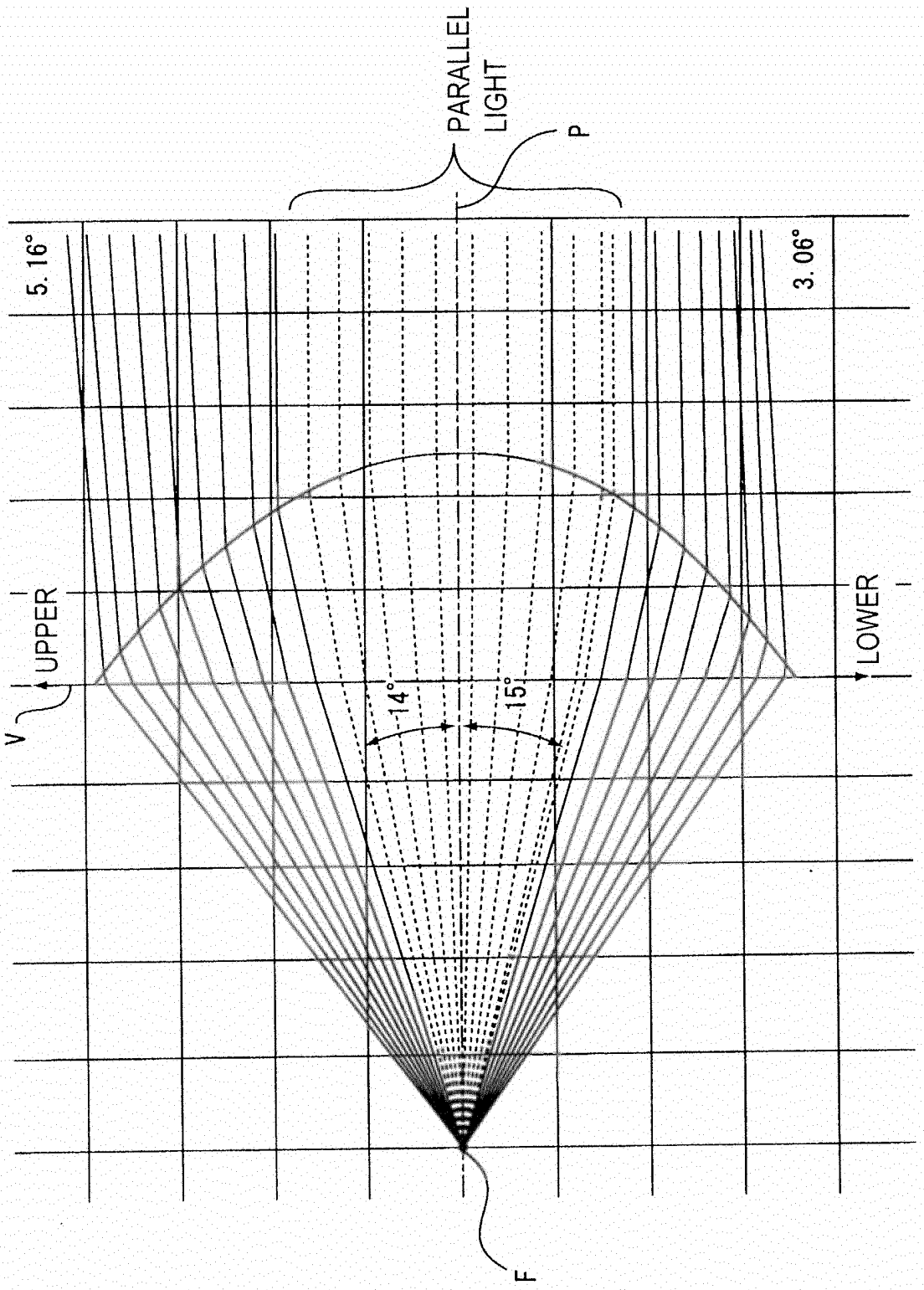


FIG. 8

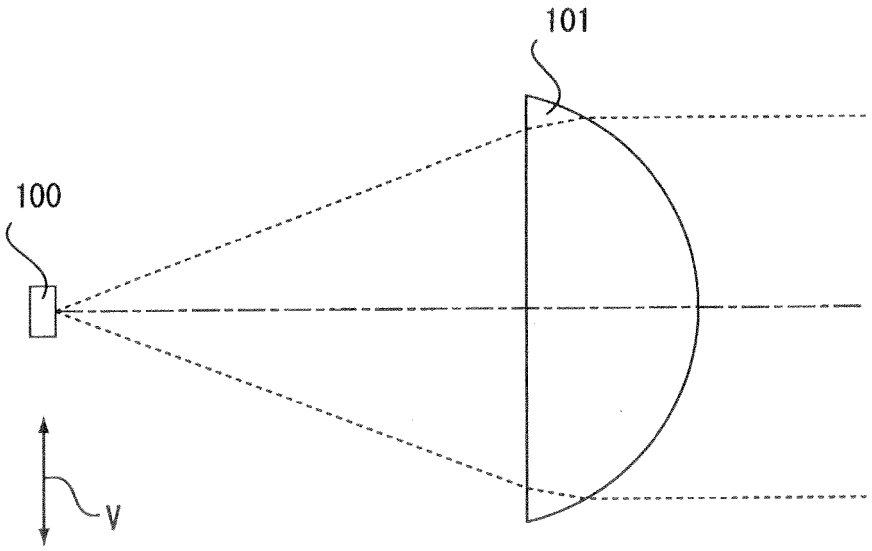


FIG. 9

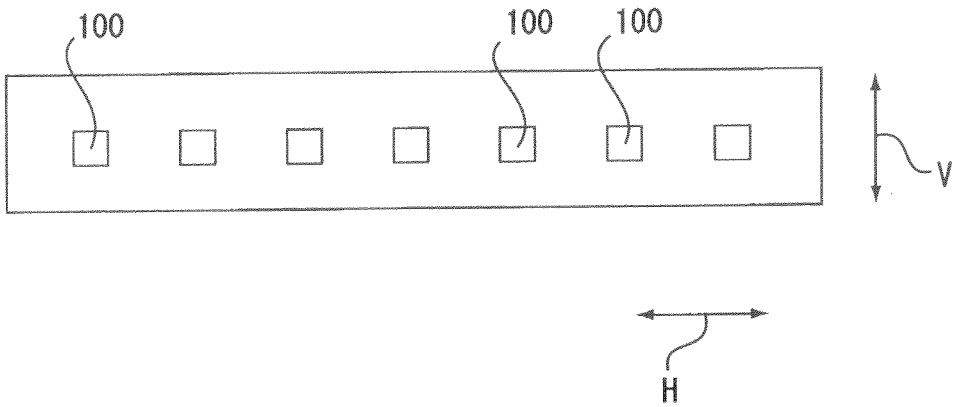


FIG. 10

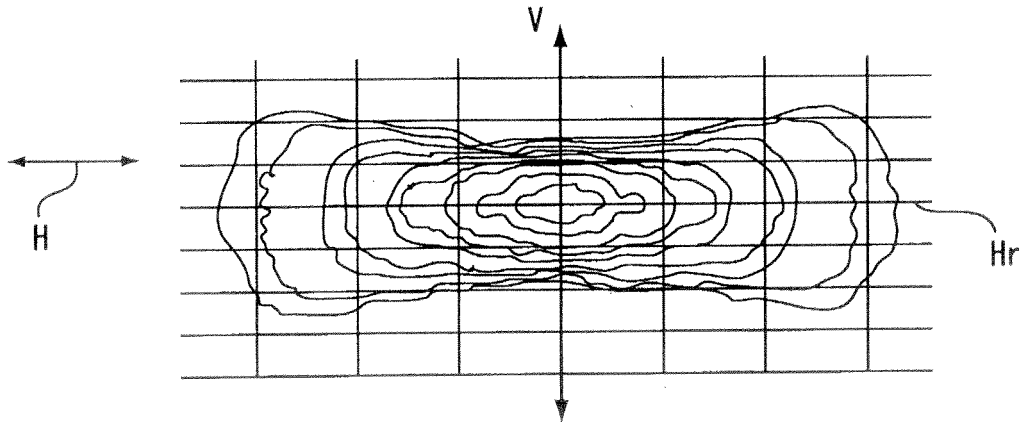


FIG. 11

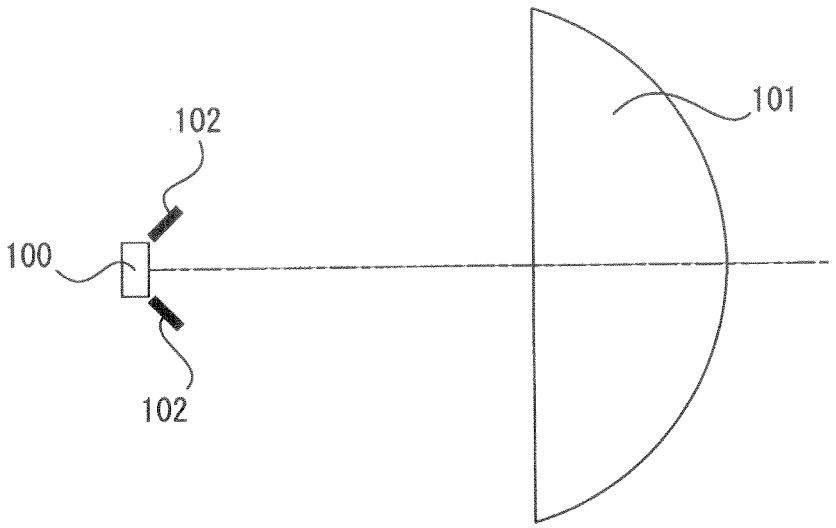


FIG. 12

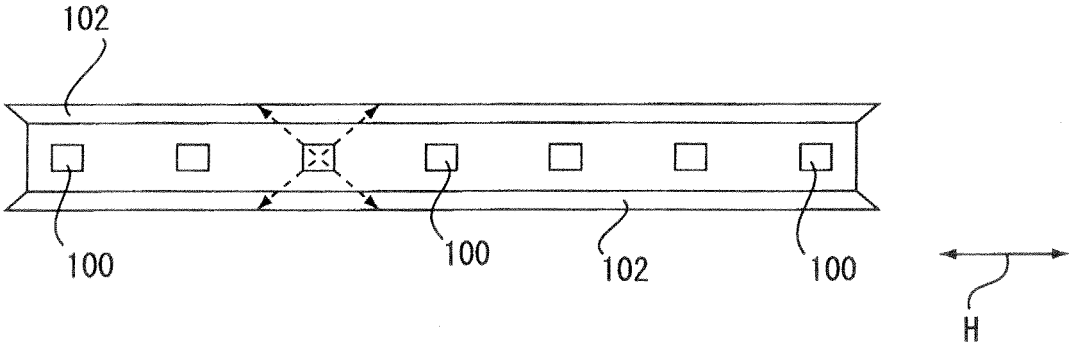
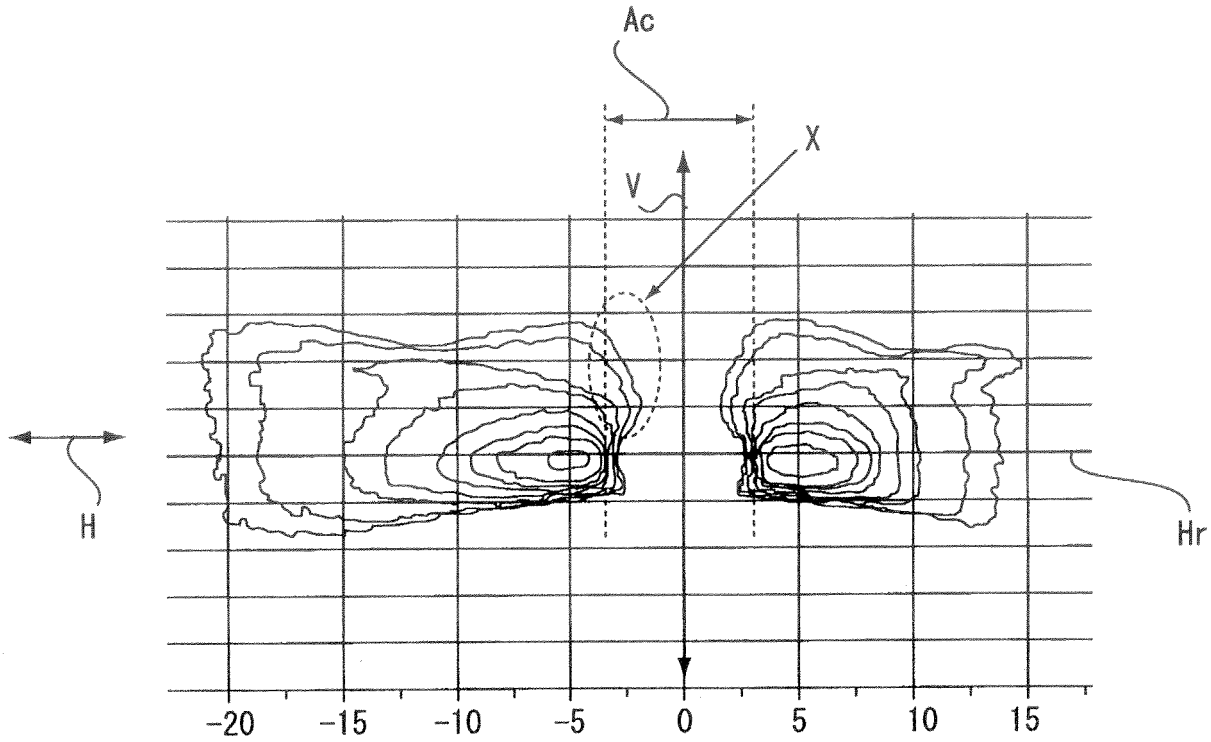


FIG. 13



REFERENCES CITED IN THE DESCRIPTION

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