(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 028 414 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.02.2009 Bulletin 2009/09

(51) Int Cl.:
F21V 14/08 *(2006.01)* ***F21V 11/16*** *(2006.01)*

(21) Application number: **08162775.4**

(22) Date of filing: **21.08.2008**

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

(30) Priority: **22.08.2007 JP 2007216319**

(71) Applicant: **KOITO MANUFACTURING CO., LTD**
Tokyo (JP)

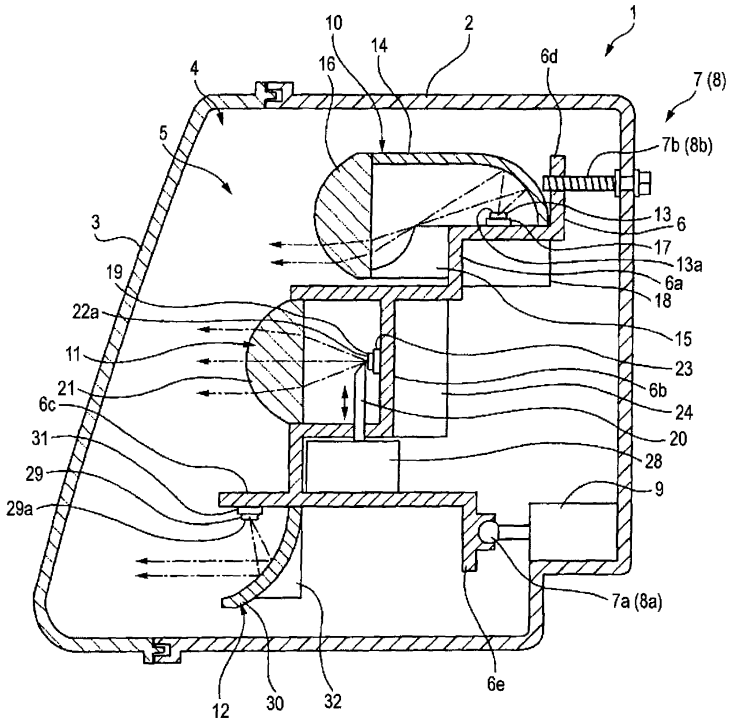
(72) Inventor: **Komatsu, Motohiro,c/o KOITO MANUFACTURING CO., LTD**
Shizuoka-shi, Shizuoka (JP)

(74) Representative: **Intes, Didier Gérard André et al**
Cabinet Beau de Loménie
158, rue de l'Université
75340 Paris Cedex 07 (FR)

(54) **Vehicle headlamp**

(57) A vehicle headlamp is provided. The vehicle headlamp includes at least one light source module (11) comprising a substrate (23) and a light emitting diode (19) mounted on the substrate; a shade (20) for shielding a part of light emitted from a light emitting surface (22a) of the light emitting diode; a projection lens (21) through which the light passes, wherein a focal point of the projection lens is located on or near the light emitting surface (22a); and a shade driving unit (28) configured to move the shade (20) to a light shielding position in which the part of the light emitted from the light emitting surface is shielded, and to an open position in which the light emitted from the light emitting surface is unshielded.

FIG. 1



EP 2 028 414 A1

Description

BACKGROUND

Technical Field

[0001] Apparatuses and devices consistent with the present invention relate to a vehicle headlamp. More specifically, the apparatuses and devices consistent with the present invention relate to a vehicle headlamp capable of selecting a light distribution pattern.

Description of the Related Art

[0002] In a related art vehicle headlamp, a lamp unit comprising a projection lens and a light emitting diode as a light source is disposed in a lamp chamber formed by a lens cover and a lamp body (*see* e.g., JP-A-2005-44683).

[0003] In the related art vehicle headlamp described in JP-A-2005-44683, in order to form a certain light distribution pattern of light emitted from the light source, a shade is disposed in front of the light source with a gap therebetween so as to shield a part of the light emitted from the light source.

[0004] Additionally, in the related art vehicle headlamp, a position or a slope of a shade for shielding a part of light is changed so as to select a long-distance light distribution pattern that irradiates a long-distance area or a short-distance light distribution pattern that irradiates a short-distance area in accordance with the position or the slope of the shade.

[0005] In this way, it is possible to form different light distribution patterns using one lamp unit in such a manner that the slope or the position of the shade changes, and thus it is possible to decrease a size of the vehicle headlamp and to improve a function of the vehicle headlamp.

[0006] However, in the related art vehicle headlamp, since the shade is disposed in front of the light source with a given gap therebetween, a length of the vehicle headlamp becomes long in a light axis direction (longitudinal direction) in accordance with the gap, and thus a disadvantage arises in that it is difficult to realize a decrease in size of the headlamp.

[0007] In addition, in the related art vehicle headlamp, although it is advantageous to make a clear cut line of the short-distance light distribution pattern from the viewpoint of ensuring satisfactory visibility and preventing glare with respect to an oncoming vehicle, when a distance between the light source and the shade in a light axis direction becomes long, positional precision therebetween easily deteriorates, and thus a disadvantage arises in that the cut line may be unclear.

SUMAMRY OF THE INVENTION

[0008] Exemplary embodiments of the present invention address the above disadvantages and other disadvantages not described above. However, the present invention is not required to overcome the disadvantages described above, and thus, an exemplary embodiment of the present invention may not overcome any of the problems described above.

[0009] Accordingly, it is an aspect of the present invention to provide a size-reduced vehicle headlamp capable of selecting a light distribution pattern and forming a light distribution pattern having a clear cut line.

[0010] According to one or more illustrative aspects of the present invention, a vehicle headlamp includes at least one light source module comprising a substrate and a light emitting diode mounted on the substrate; a shade for shielding a part of light emitted from a light emitting surface of the light emitting diode; a projection lens through which the light passes, wherein a focal point of the projection lens is located on or near the light emitting surface; and a shade driving unit configured to move the shade to a light shielding position in which the part of the light emitted from the light emitting surface is shielded, and to an open position in which the light emitted from the light emitting surface is unshielded.

According to one or more illustrative aspects of the present invention, a vehicle headlamp is provided which includes a substrate; a light emitting diode comprising a light emitting surface, the light emitting diode being mounted on the substrate; a shade which is movable between a first position in which a portion of the shade is positioned adjacent to the light emitting surface and a part of the light emitted from the light emitting surface of the light emitting diode is blocked by the shade, and a second position in which the light emitted from the light emitting surface is unblocked; and a shade controller, which is configured to move the shade between the first position and the second position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Fig. 1 is a schematic longitudinal sectional view of a vehicle headlamp according to an exemplary embodiment of the present invention;

Fig. 2 is a schematic front view of the vehicle headlamp of Fig. 1;

Fig. 3 is an enlarged perspective view of a shade of the vehicle headlamp of Fig. 1, showing a state in which the shade is in a light-shielding position;

Fig. 4 is a view showing an exemplary light distribution pattern of a low beam produced by the vehicle headlamp of Fig. 1;

Fig. 5 is a view showing an exemplary light distribution pattern of a high beam produced by the vehicle headlamp of Fig. 1;

Fig. 6 is an enlarged front view showing a shade and a second light emitting diode of a vehicle headlamp according to another exemplary embodiment of the present invention;

Fig. 7 is a view showing an exemplary light distribution pattern when light is emitted from the second light emitting diode shown in Fig. 6;

Fig. 8 is an enlarged side view showing a shade according to another exemplary embodiment of the present invention;

Fig. 9 is an enlarged side view showing a shade according to yet another exemplary embodiment of the present invention;

Fig. 10 is a schematic perspective view a shade according to yet another exemplary embodiment of the present invention in which the shade rotates; and

Fig. 11 is a schematic perspective view showing another exemplary embodiment of the present invention in which the shade rotates.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS OF THE PRESENT INVENTION

[0012] Hereinafter, a vehicle headlamp according to exemplary embodiments of the present invention will be described with reference to the drawings.

[0013] A vehicle headlamp 1 is attached to both left and right end portions in a front end portion of a vehicle body. In other words, a vehicle headlamp 1 is provided for each of the left and right end portions of the vehicle body.

[0014] As shown in Figs. 1 and 2, the vehicle headlamp 1 includes a lamp body 2 having a concave portion opened forward and a cover 3 closing an opening surface of the lamp body 2, and the lamp body 2 and the cover 3 form an inner space as a lamp chamber 4.

[0015] A first lamp unit 5 is disposed in the lamp chamber 4. The first lamp unit 5 is configured by attaching, for example, four lamp units, which will be described later, to a bracket 6.

[0016] The bracket 6 is provided with a first attachment portion 6a, a second attachment portion 6b, and a third attachment portion 6c in a sequential order from the top to the bottom of lamp body 2. The bracket 6 is provided with a first supported portion 6d protruding forward from the rear end portion of the first attachment portion 6a and a second supported portion 6e protruding backward from the rear end portion of the third attachment portion 6c.

[0017] The bracket 6 is supported to the lamp body 2 by an aiming adjustment mechanism 7 and a leveling adjustment mechanism 8 so as to be tiltable.

[0018] The aiming adjustment mechanism 7 includes, for example, one pivot support point 7a located at a lower side and two adjusting screws 7b located at an upper side. The pivot support point 7a is connected to the second supported portion 6e of the bracket 6, and the adjusting screws 7b are respectively connected to the first supported portion 6d of the bracket 6 via the lamp body 2.

[0019] In the aiming adjustment mechanism 7, when the adjusting screws 7b are rotated, the bracket 6 is tilted in a certain direction about the pivot support point 7a. In accordance with the tilting action of the bracket 6, the four lamp units are tilted so as to perform a light axis adjustment (aiming adjustment) of the head light.

[0020] The leveling adjustment mechanism 8 includes, for example, one pivot support point 8a located at a lower side and two adjusting screws 8b located at an upper side. The pivot support point 8a serves as the pivot support point 7a of the aiming adjustment mechanism 7, and the adjusting screws 8b serve as the adjusting screws 7b of the aiming adjustment mechanism 7. The pivot support point 8a is capable of moving in a longitudinal direction and is used as a driving shaft of a leveling actuator 9 fixed to an inner surface of the lamp body 2.

[0021] In the leveling adjustment mechanism 8, when the pivot support point 8a moves in a longitudinal direction by a driving action of the leveling actuator 9, the bracket 6 is tilted in a certain direction with respect to the lamp body 2 with the adjusting screws 8b, 8b as the support points. In accordance with the tilting action of the bracket 6, the four lamp units are tilted so as to perform a light axis adjustment (leveling adjustment) of the head light.

[0022] As described above, the bracket 6 is attached with four lamp units, that is, first lamp units 10, 10, a second lamp unit 11, and a third lamp unit 12.

[0023] Each of the first lamp units 10 is attached to the first attachment portion 6a and includes a first light emitting diode 13, a reflector 14, a light shielding member 15, and a projection lens 16. The first light emitting diode 13 is disposed on a substrate 17, and a first light source module is configured by disposing the first light emitting diode 13 on the substrate 17. The first light emitting diode 13 is disposed such that a light emitting surface 13a faces upward.

[0024] Radiating fins 18, 18 are provided on the rear surface side of the first attachment portion 6a, and heat generated when emitting light from the first light emitting diodes 13, 13 is radiated by the radiating fins 18, 18.

[0025] In the first lamp units 10, 10, light emitted from the first light emitting diodes 13, 13 is reflected by the reflectors 14, 14. Subsequently, a part of light is shielded by the light shielding members 15, 15. The light is collected by the projector lenses 16 and then is irradiated forward via the cover 3. A so-called low beam for irradiating a short-distance area is emitted from the first light emitting diodes 10.

[0026] The second lamp unit 11 is attached to the second attachment portion 6b, and includes a second light emitting diode 19, a shade 20, and a projection lens 21. The second light emitting diode 19 is configured by, for example, two light emitting portions 22, which are disposed at left and right sides (*see* Fig. 3). The second light emitting diode 19 is disposed on a substrate 23, and a second light source module is configured by disposing the second light emitting diode 19 on the substrate 23. The light emitting portions 22 are disposed such that light emitting surfaces 22a face forward.

[0027] A radiating fin 24 is provided on the rear surface side of the second attachment portion 6a, and heat gen-

erated when emitting light from the second light emitting diode 19 is radiated by the radiating fin 24.

[0028] The shade 20 is formed into a plate shape and faces in a longitudinal direction so that the upper end portion serves as a light shielding portion 25 (*see* Figs. 1 and 3). The light shielding portion 25 is formed into a film shape and has a slope surface 26 inclined downward in a forward direction, in which the rear edge of the slope surface 26 is located at the topmost portion to thereby form a top portion 27. The slope surface 26 includes an intermediate portion 26a located at the center in a horizontal direction, a first side portion 26b and a second side portion 26c with the intermediate portion 26a interposed therebetween. The intermediate portion 26a is inclined in a horizontal direction. The first side portion 26b and the second side portion 26c are elongate in a horizontal direction.

[0029] In addition, the slope surface 26 may be subjected to, for example, a reflection process such as an aluminum deposition.

[0030] Turning back to Fig. 1, a shade driving unit 28 is disposed below the second attachment portion 6a of the bracket 6. The shade driving unit 28 is configured by, for example, a driving motor, a flange, and the like. The shade 20 is moved, for example, in a vertical direction by the shade driving unit 28.

[0031] The shade 20 moves between a light shielding position (*see* Fig. 3) corresponding to an upper movement end and an open position corresponding to a lower movement end. When the shade 20 moves to the light shielding position, the light shielding portion 25 is located at a position adjacent to the front side of the second light emitting diode 19 (*see* Figs. 1 and 3), and the top portion 27 of the light shielding portion 25 is located above the lower ends of the light emitting surfaces 22a. When the shade 20 is in the light shielding position, a part of light emitted from the second light emitting diode 19 is shielded, and a so-called low beam for irradiating a short-distance area is emitted from the second light emitting diode 19. When the shade 20 is in the open position, the whole part of the light emitting surfaces 22a of the second light emitting diode 19 is opened, and a so-called high beam for irradiating a long-distance area is emitted from the second light emitting diode 19.

[0032] For example, a focal point of the projection lens 21 is located on the light emitting surfaces 22a of the second light emitting diode 19, near the light emitting surfaces 22a, or at the top portion 27 of the slope surface 26 when the shade 20 is located at the light shielding position.

[0033] The third lamp unit 12 is attached to the third attachment portion 6c, and includes third light emitting diodes 29 and a reflector 30. Each of the third light emitting diodes 29 is disposed on a substrate 31, and a third light source module is configured by disposing the third light emitting diodes 29 on the substrate 31. The third light emitting diodes 29 are disposed such that the light emitting surfaces 29a face downward. Radiating fins 32, 32 are provided on the rear surface side of the reflector 30, and heat generated when emitting light from the third light emitting diodes 29 is radiated by the radiating fins 32, 32.

[0034] In the third lamp unit 12, light emitted from the third light emitting diodes 29, 29 is reflected by the reflector 30 and is irradiated forward via the cover 3. A so-called low beam for irradiating a short-distance area is emitted from the third light emitting diodes 29, 29.

[0035] In the lamp chamber 4, a second lamp unit 33 is disposed to the side of the first lamp unit 5 (*see* Fig. 2). The second lamp unit 33 includes a light source 34 and a reflector 35 for reflecting light emitted from the light source 34 forward. The second lamp unit 33 may also be manipulated to perform the aiming adjustment or the leveling adjustment by use of an aiming adjustment mechanism 36 and a leveling adjustment 37 which operate similarly to the aiming adjustment mechanism 7 and the leveling adjustment mechanism 8 described above.

[0036] The aiming adjustment mechanism 36 includes one pivot support point 36a and two adjusting screws 36b. The pivot support point 36a is located at a lower side. The two adjusting screws 36b are located at an upper side and a lower side, respectively.

[0037] In the aiming adjustment mechanism 36, when the adjusting screws 36b are rotated in a desired direction, the second lamp unit 33 is tilted with respect to the lamp body 2 in a certain direction with the pivot support point 36a as supporting point, thereby performing the aiming adjustment.

[0038] The leveling adjustment mechanism 37 includes, for example, one pivot support point 37a located at a lower side and two adjusting screws 37b located at an upper side and a lower side, respectively. The pivot support point 37a serves as the pivot support point 36a of the aiming adjustment mechanism 36, and the adjusting screws 37b serve as the adjusting screws 36b of the aiming adjustment mechanism 36.

[0039] In the leveling adjustment mechanism 37, when the pivot support point 37a moves in a longitudinal direction by a driving action of a leveling actuator (not shown), the second lamp unit 33 is tilted with respect to the lamp body 2 in a certain direction with the adjusting screws 37b as support points, thereby performing the leveling adjustment.

[0040] In the second lamp unit 33, light emitted from the light source 34 is reflected by the reflector 35 and then is irradiated forward via the cover 3. A so-called high beam for irradiating a long-distance area is emitted from the light source 34.

[0041] In the vehicle headlamp 1, when the low beam is irradiated, light is emitted from the first light emitting diodes 13 of the first lamp units 10, the second light emitting diode 19 of the second lamp unit 11, and the third light emitting diodes 29 of the third lamp unit 12, respectively. At this time, the shade 20 of the second lamp unit 11 is moved to the light shielding position, and a part of

light emitted from the second light emitting diode 19 is shielded by the shade 20.

[0042] Fig. 4 is a view showing a light distribution pattern when irradiating the low beam. In Fig. 4, 'H' indicates a horizontal cut line, 'P1' indicates a pattern formed by light emitted from the first light emitting diodes 13, 'P2' indicates a pattern formed by light emitted from the second light emitting diode 19, and 'P3' indicates a pattern formed by light emitted from the third light emitting diodes 29.

[0043] In the vehicle headlamp 1, when the high beam is irradiated, light is emitted from the second light emitting diode 19 of the second lamp unit 11 and the light source 34 of the second lamp unit 33. At this time, the shade 20 of the second lamp unit 11 is moved into the open position, and light emitted from the second light emitting diode 19 is not shielded by the shade 20.

[0044] Fig. 5 is a view showing a light distribution pattern when irradiating the high beam. In Fig. 5, 'H' indicates a horizontal cut line, 'P2' indicates a pattern formed by light emitted from the second light emitting diode 19, and 'Pw' indicates a pattern formed by light emitted from the light source 34.

[0045] In addition, while the above exemplary embodiment describes a configuration in which the second light emitting diode 19 of the second lamp unit 11 comprises two light emitting portions 22 capable of selecting the low beam or the high beam, the number of the light emitting portions 22 of the second light emitting diode 19 is not limited to two. The number of the light emitting portions 22 may alternatively be one or three or more. In other words, the number of the light emitting portions may be arbitrarily determined. For example, as shown in Fig. 6, the number of light emitting portions 22 may be four.

[0046] Likewise, in a configuration in which the second light emitting diode 19 comprises, for example, four light emitting portions 22, as shown in Fig. 6, an elongate light distribution pattern in a horizontal direction may be formed, as shown in Fig. 7. In Fig. 7, 'P1' indicates a pattern at the low beam emitted from the second light emitting diode 19 and 'Ph' indicates a pattern at the high beam emitted from the second light emitting diode 19.

[0047] In addition, in the second light emitting diode 19 shown in Fig. 6, it is possible to separately control the four light emitting portions 22. For example, the two left light emitting portions 22 may be controlled together and the two right light emitting portions 22 may be controlled together. Thus, for example, it is possible to turn on the two light emitting portions 22 on the left and to turn off the two light emitting portions 22 on the right. Alternatively, it is possible to singularly control the light emitting portions 22 to turn the light emitting portions 22 on or off individually.

[0048] For example, when the high beam is irradiated, by turning on the two left light emitting portions 22 and turning off the two right light emitting portions 22, it is possible to ensure satisfactory visibility with respect to a traffic lane and to prevent glare light with respect to an oncoming vehicle.

[0049] In addition, it is possible to perform a control in which the two light emitting portions 22 on one side are darkened with respect to the two light emitting portions 22 on the other side.

[0050] In addition, in such a control in which the light emitting portions are turned on or off, or when the two light emitting portions on one side are darkened, when the second light emitting diode 19 comprises the plurality of light emitting portions 22, it is possible to perform such a control regardless of the number of the light emitting portions 22.

[0051] Hereinafter, the shade according to additional exemplary embodiments will be described *(see* Figs. 8 and 9).

[0052] As shown in Fig. 8, a shade 20A according to another exemplary embodiment is formed in a flat-pate shape, in which a slope surface is not formed in a light shielding portion 25A. The shade 20A, for example, moves in a vertical direction so as to select the low beam or the high beam.

[0053] As shown in Fig. 9, a shade 20B according to yet another exemplary embodiment is formed into a flat-plate shape, in which a slope surface is not formed in a light shielding portion 25B. An upper surface of the light shielding portion 258 is configured as a reflection surface 25a through an aluminum deposition. The shade 20B, for example, moves in a vertical direction so as to select the low beam or the high beam.

[0054] In the shade 20B, light emitted from the reflection surface 25a is reflected forward and the emitted light is efficiently used.

[0055] In addition, by forming the light shielding portion into a wedge shape (*see* Fig. 3), it is possible to ensure a high light intensity and a high light flux, and thus to efficiently use the emitted light.

[0056] As described above, while the above exemplary embodiments have been described in connection with the case in which the shade 20 (or 20A or 20B) moves in a vertical direction so as to select the low beam or the high beam, a movement direction of the shades 20, 20A or 20B is not limited to a vertical direction.

[0057] For example, as shown in Fig. 10, according to another exemplary embodiment, the shade 20 (or 20A or 20B) may be rotated into the light shading position. In this exemplary embodiment, the shade driving unit 28A is disposed in a direction such that a rotation driving shaft 28a extends in a longitudinal direction. Accordingly, it is possible to select the low beam or the high beam by rotating the shade 20 (20A or 20B).

[0058] According to another exemplary embodiment, the shade 20 (or 20A or 20B) may be rotated along an axis which runs parallel to a plane of the substrate 23, as shown in Fig. 11. In this exemplary embodiment, the shade driving unit 28B is disposed in a direction such that a rotation driving shaft 28b extends in a horizontal direction (i.e., parallel to a plane of the substrate 23). Accordingly, it is possible to select the low beam or the

high beam by rotating the shade 20 (20A or 20B) from a position in which the shade 20 (or 20A or 20B) is orthogonal to the plane of the substrate 23 to a position in which the shade 20 (or 20A or 20B) is parallel to the plane of the substrate 23. In this configuration, it is possible to improve positional precision of the shade 20 (or 20A or 20B) with respect to the second light emitting diode 19. For example, stopper walls 29 may be disposed on the left and right sides of the second light emitting diode 19, and the shade 20 (or 20A or 20B) is rotated into the light shielding position such that the shade 20 (or 20A or 20B) makes contact with the stopper walls 29, 29, thus allowing for more precision.

[0059] As described above, in the vehicle headlamp 1, a focal point of the projection lens 21 is located on or near the light emitting surface 22a of the second light emitting diode 19. The shade 20 (or 20A or 20B) is caused to move between the light shielding position and the open position, and the shade 20 (or 20A or 20B) is caused to be located near the second light emitting diode 19 at the light shielding position. Accordingly, it is possible to provide a size-reduced vehicle headlamp 1 capable of selecting a light distribution pattern, and forming a light distribution pattern having a clear cut line.

[0060] Although particular exemplary embodiments of the present invention have been described, it will be readily evident to those skilled in the art that various changes and modification may be made therein without departing from the present invention. Accordingly, other implementations are within the scope of the claims.

Claims

1. A vehicle headlamp (1) comprising:

at least one light source module (11) comprising a substrate (23) and a light emitting diode (19) mounted on the substrate;
a shade (20) for shielding a part of light emitted from a light emitting surface (22a) of the light emitting diode;
a projection lens (21) through which the light passes, wherein a focal point of the projection lens is located on or near the light emitting surface; and
a shade driving unit (28, 28B) configured to move the shade (20) to a light shielding position in which the part of the light emitted from the light emitting surface (22a) is shielded, and to an open position in which the light emitted from the light emitting surface is unshielded.

2. The vehicle headlamp according to Claim **1**, wherein the shade (20) is formed into a plate like shape, and the shade is located adjacent to the light emitting surface (22a) at the light shielding position.

3. The vehicle headlamp according to Claim **1 or 2**, wherein the shade (20) comprises a light shielding portion (25), which is formed into a wedge shape and shields the part of the light, and
wherein the focal point is located at an upper end portion of the light shielding portion (25) at the light shielding position.

4. The vehicle headlamp according to any one of Claims **1 to 3,** wherein the shade (20) comprises a light shielding portion (25) which shields the part of the light, and
the light shielding portion comprises a reflection surface (26).

5. The vehicle headlamp according to any one of Claims **1 to 4**, wherein the light emitting diode (19) comprises a plurality of light emitting portions (22),
wherein the plurality of light emitting portions (22) are arranged such that light emitting surfaces of the light emitting portions face a same direction, and
wherein the plurality of light emitting portions are independently controlled so as to be turned on or off.

6. The vehicle headlamp according to any one of Claims **1 to 5**, wherein the shade (20) is rotatable, and the shade driving unit (28B) rotates the shade into the light shielding position.

7. A vehicle headlamp comprising:

a substrate (23);
a light emitting diode (19) comprising a light emitting surface (22a), the light emitting diode being mounted on the substrate;
a shade (20) which is movable between a first position in which a portion of the shade is positioned adjacent to the light emitting surface (22a) and a part of the light emitted from the light emitting surface of the light emitting diode (19) is blocked by the shade, and a second position in which the light emitted from the light emitting surface is unblocked; and
a shade controller (28, 28B), which is configured to move the shade between the first position and the second position.

8. The vehicle headlamp according to Claim **7**, wherein the shade (20) comprises a reflective surface (26).

9. The vehicle headlamp according to Claim **7 or 8**, wherein the shade (20) is rotatably mounted and the shade controller (28, 28B) rotates the shade (20) between the first position and the second position.

FIG. 1

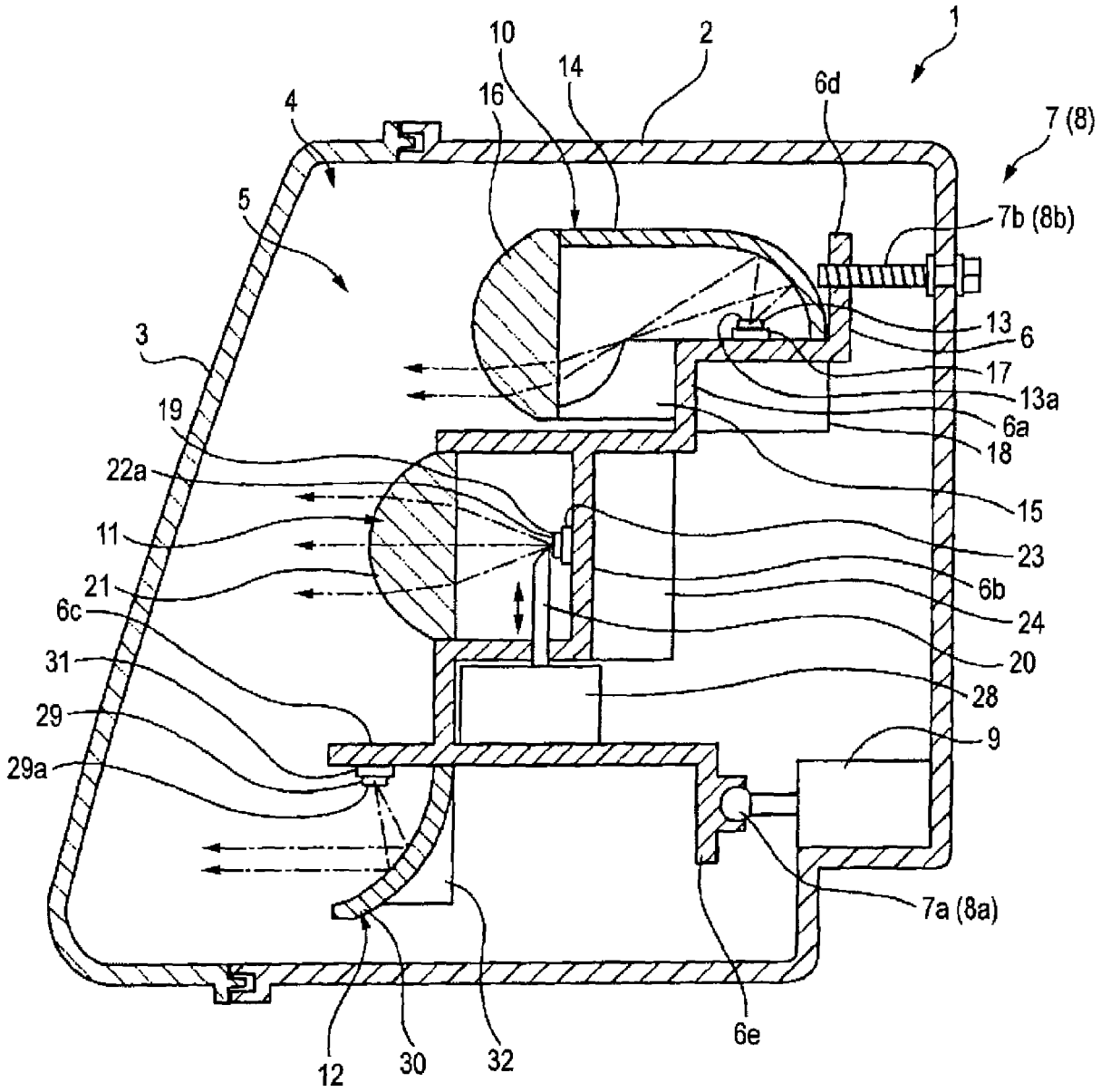

1
10
2
14
16
6d
4
7 (8)
5
7b (8b)
3
13
6
17
13a
19
6a
18
22a
15
11
23
21
6b
6c
24
31
20
29
28
29a
9
7a (8a)
12
30
32
6e

FIG. 2

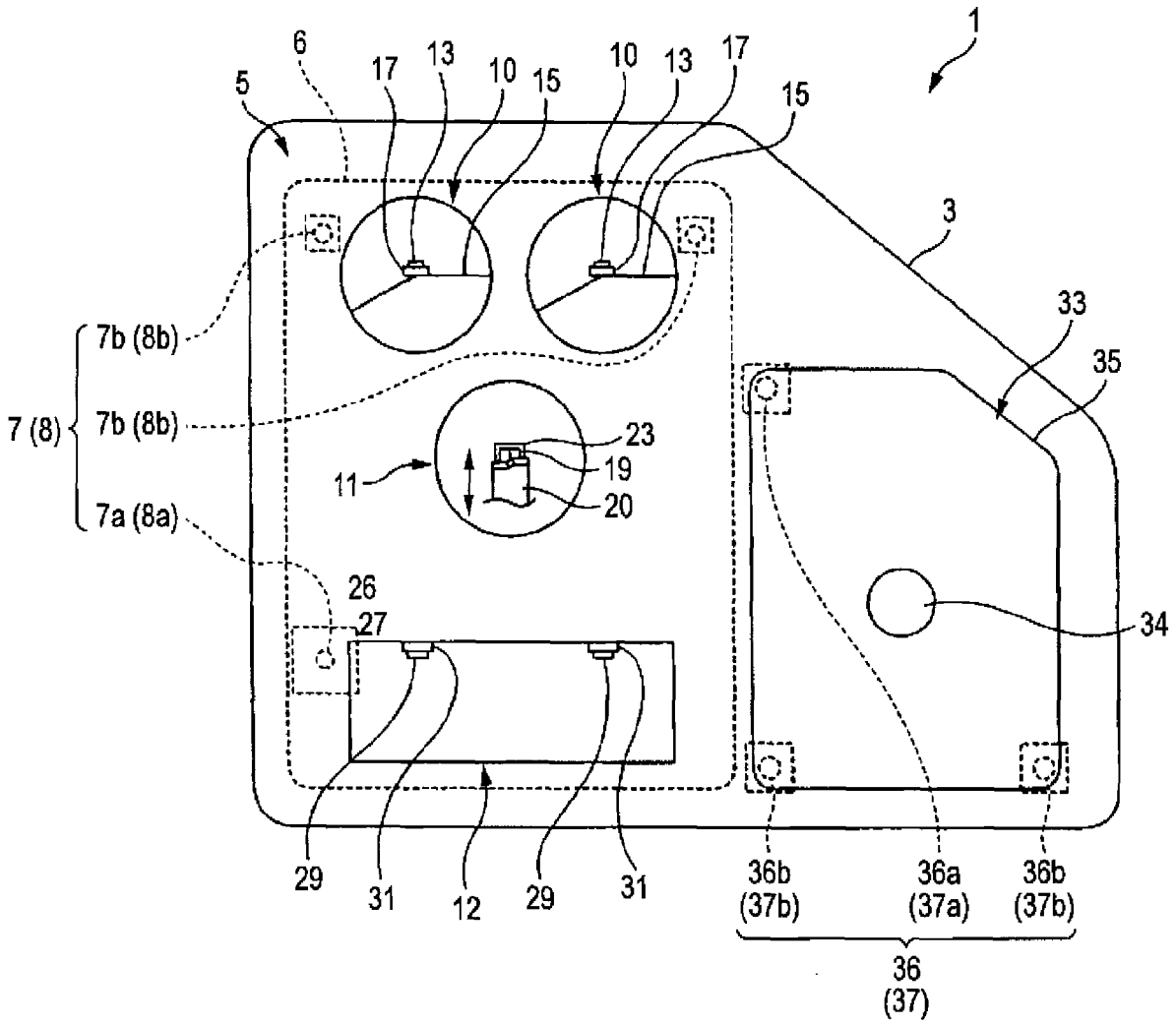

1
6
5
17
13
10
15
10
13
17
15
3
33
35
7b (8b)
7 (8)
7b (8b)
7a (8a)
11
23
19
20
26
27
34
29
31
12
29
31
36b
(37b)
36a
(37a)
36b
(37b)
36
(37)

FIG. 3

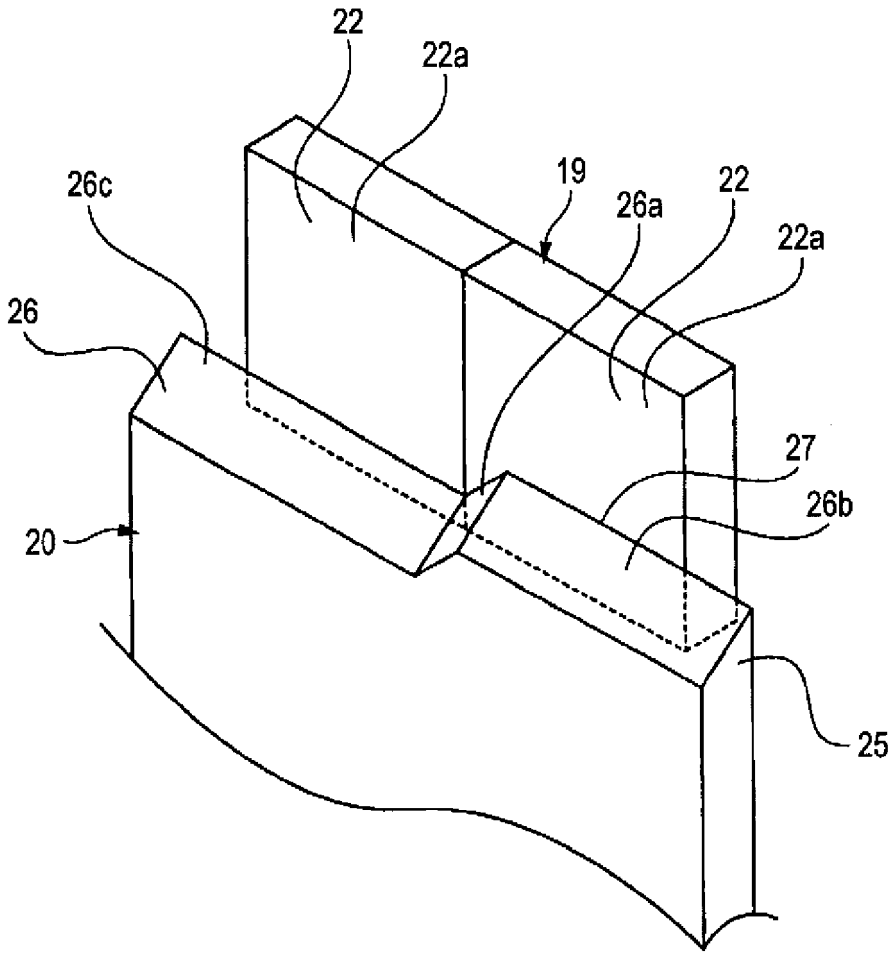


FIG. 4

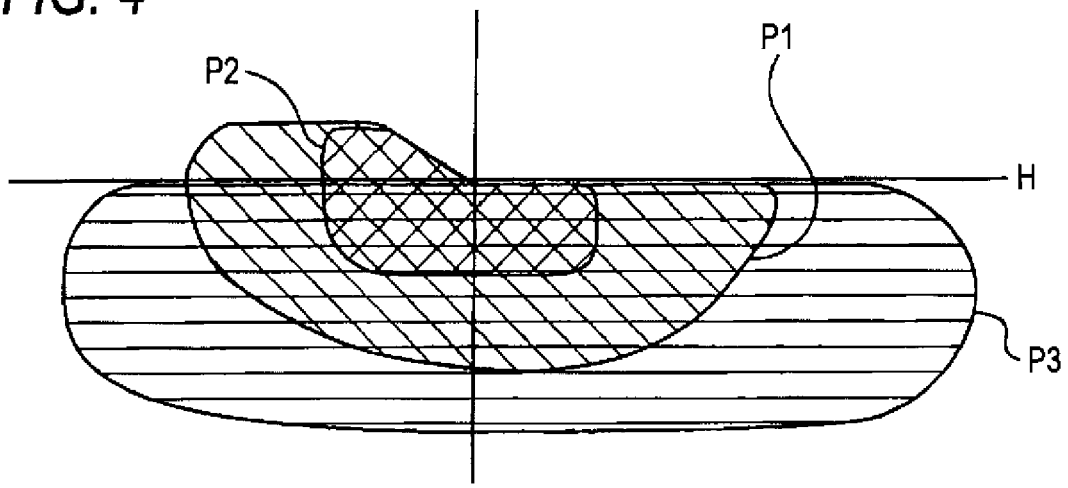


FIG. 5

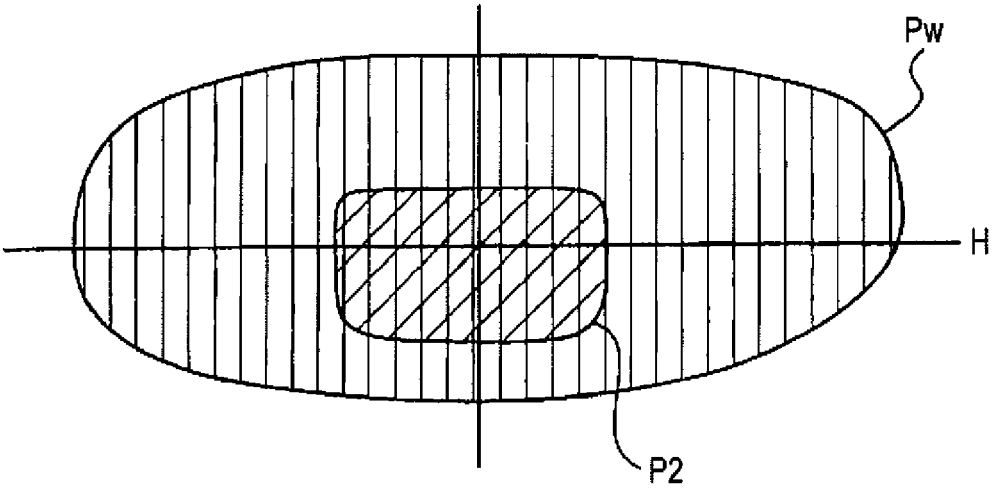


FIG. 6

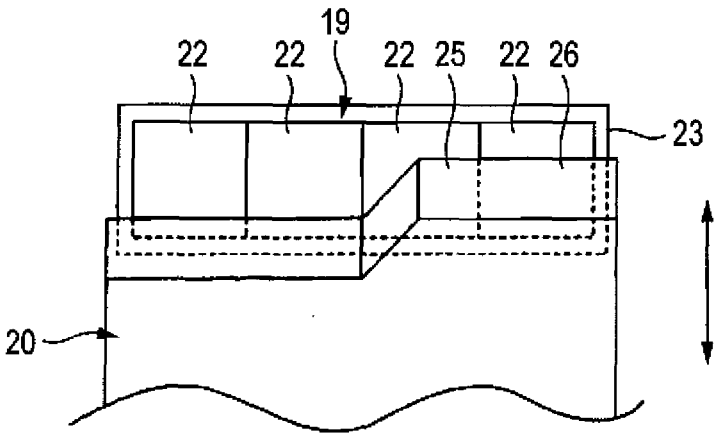


FIG. 7

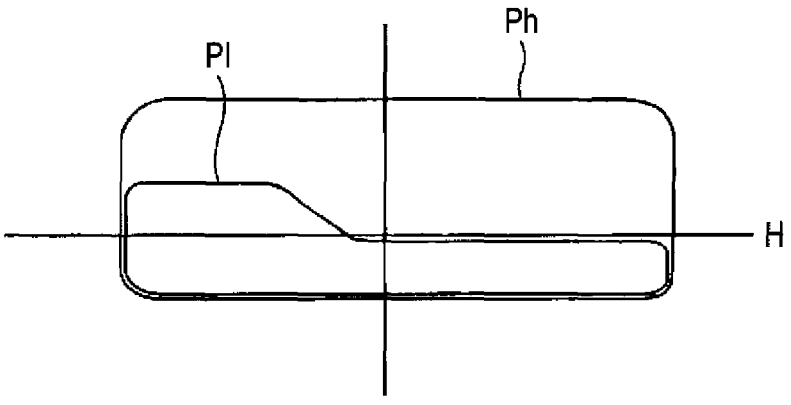


FIG. 8

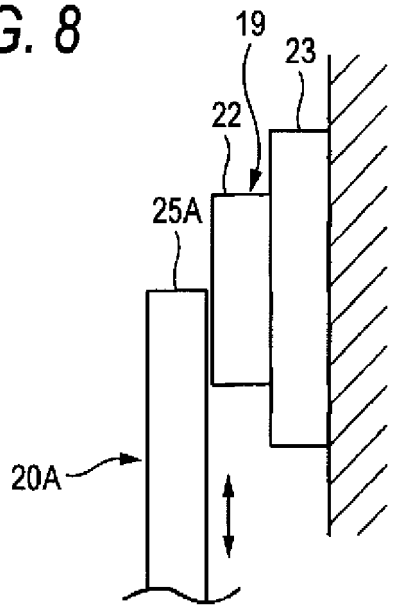


FIG. 9

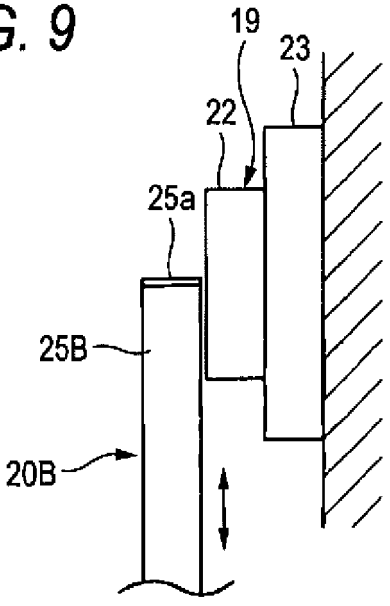


FIG. 10

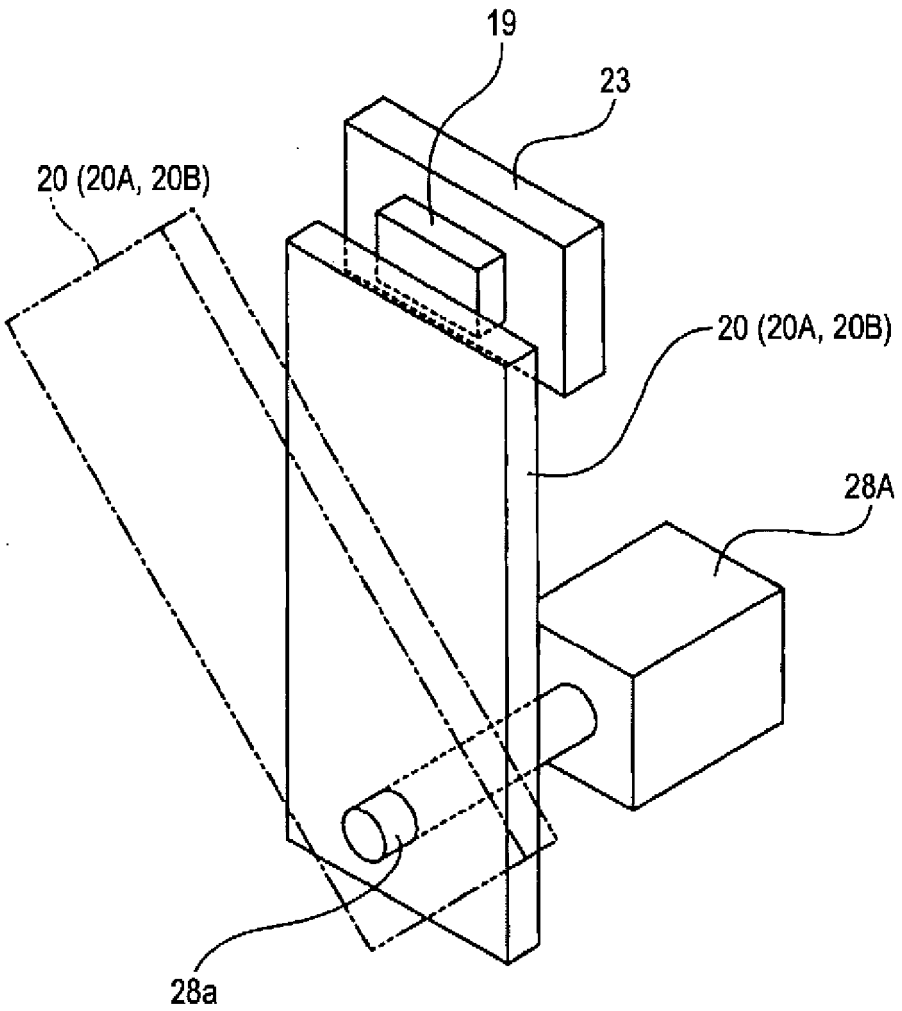
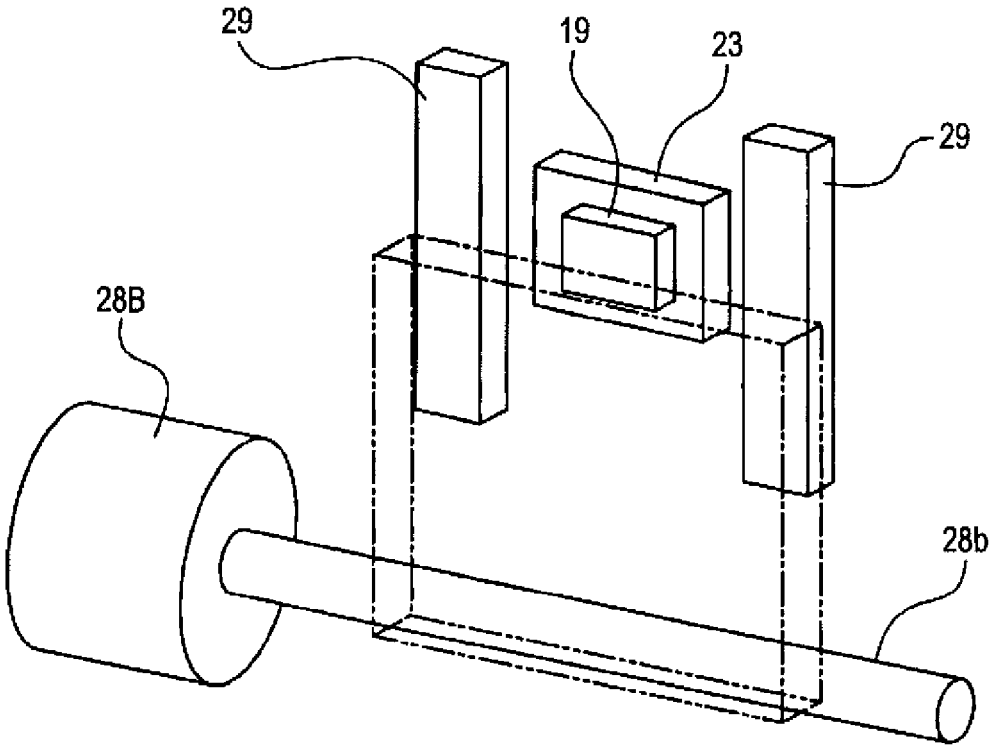


FIG. 11



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 08 16 2775

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 103 08 703 A1 (AUDI NSU AUTO UNION AG [DE]) 11 November 2004 (2004-11-11) * page 4, paragraphs 17,18 * * claims 1-9 * * figures 1,2 *	1	INV. F21V14/08 F21V11/16
Y		3,4	
A		2,6,7,9	

X	EP 0 794 382 A (PAGANI SPA [IT] FLII PAGANI S P A [IT]) 10 September 1997 (1997-09-10) * column 2, line 17 - line 35 * * column 2, line 52 - line 54 * * claims 1-3,7 * * figures 1,2 *	1,2,6,7,9	
Y		8	
A		5	

X	EP 1 422 472 A (VALEO VISION [FR]) 26 May 2004 (2004-05-26) * column 5, paragraph 32 - paragraph 36 * * column 5, paragraph 39 * * figures 1-3 *	1,2,6,7,9	
	-----		TECHNICAL FIELDS SEARCHED (IPC)
X	GB 2 277 579 A (BOSCH GMBH ROBERT [DE]) 2 November 1994 (1994-11-02) * page 7, paragraph 3 * * page 8, paragraph 2 - page 9, paragraph 1 * * figures 1-4,7 *	1,2,7,9	F21V
A		3,5	

Y	US 2007/064438 A1 (ISHIDA HIROYUKI [JP]) 22 March 2007 (2007-03-22) * page 4, paragraph 60 - paragraph 66 * * figures 4-12 *	3	
A		1,7	

	-/--		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 October 2008	Lange, Christian

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

2

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 08 16 2775

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	GB 2 279 452 A (BOSCH GMBH ROBERT [DE]) 4 January 1995 (1995-01-04) * page 5, paragraph 1 * * figure 1 *	4,8	
A		1,7	

			TECHNICAL FIELDS SEARCHED (IPC)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	10 October 2008	Lange, Christian

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 16 2775

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-10-2008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 10308703 A1	11-11-2004	NONE	
EP 0794382 A	10-09-1997	AT 201925 T	15-06-2001
		DE 69705082 D1	12-07-2001
		DE 69705082 T2	07-02-2002
		DK 794382 T3	24-09-2001
		ES 2159781 T3	16-10-2001
		GR 3036555 T3	31-12-2001
		IT MI960429 A1	05-09-1997
		JP 9330603 A	22-12-1997
		PT 794382 T	30-11-2001
EP 1422472 A	26-05-2004	FR 2847657 A1	28-05-2004
GB 2277579 A	02-11-1994	DE 4313914 A1	03-11-1994
		FR 2704625 A1	04-11-1994
US 2007064438 A1	22-03-2007	DE 102006042750 A1	29-03-2007
		JP 2007080606 A	29-03-2007
GB 2279452 A	04-01-1995	DE 4407108 A1	12-01-1995
		FR 2708335 A1	03-02-1995

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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 2005044683 A **[0002] [0003]**