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

(11) EP 0 864 803 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.09.1998 Bulletin 1998/38

(51) Int Cl.[6]: **F21M 3/08**

(21) Application number: **98301949.8**

(22) Date of filing: **04.03.1998**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **14.03.1997 CZ 78797**

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(54) Headlights for motor vehicles

(57) Headlights for motor vehicles having a refractor (4) that is either entirely without any deviation elements or it is provided with optical elements of low deviation, whereby above the horizontal line (z) a reflector (3) is provided with facets (11, 12, 21, 22) having the shape of parabolic cylinders with a creating profile (B, C) which is situated in the basic parabolic shape (31) of the reflector (3), whereby their inclination with regard to the vertical line (y) of a headlight is in case of the headlight (1) which is adjacent to the nearer road boundary for (α_{11}) 5° to 18°, for (α_{12}) 0° to 12°, in case of the headlight (2) which is adjacent to the road central line for (α_{21}) 0° to 15°, for (α_{22}) 0° to 9°, whereby (α_{11}) is greater then (α_{12}), (α_{11}) is greater or equal to (α_{21}), (α_{22}) is greater or equal to (α_{12}), whereby the widths (w_{11}, w_{12}) of the facets (11, 12) of the headlight (1), adjacent to the nearer road boundary are on the same side with regard to the vertical line (y) of the headlight lower then the widths (w_{21}, w_{22}) of the facets (21, 22) of the headlight (2) adjacent to the road central line and the dimmed light source (5) is situated at a distance Δf from the focus (F) of the reflector (3) and it is integrated in the assembly together with the distance light source (6).

Section A-A

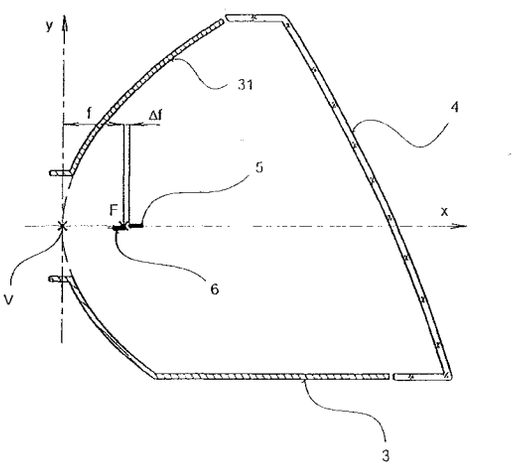

Fig. 2

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Description

Field of the Invention

The invention relates to headlights for motor vehicles where the system with a light source, a refractor and a complex reflector provided with facets of parabolic cylinder shape is solved which forms a boundary of light and darkness towards to which the light beam is concentrated. A side diffusion of the light beam can be made by the reflector directly without any actions of the refractor optical elements for light diffusion.

Background of the Invention

The prior art headlights with a complex reflector without any optical deviation elements on the refractor use such facets of parabolic cylinder shape where a vertical deviation component is absent. A disadvantage of this solution is that a light beam is formed which does not illuminate sidewise the space up to the maximal visibility distance but to a shorter distance. This decreases the visibility distance of such a headlight, namely the visibility space to sides.

Deviation characteristics of a common headlight are roughly symmetric on the side of the nearer road boundary and the side of the more distant one. In case of a dimmed light it causes ununiform road illumination as a conseguence of imaging two brilliant light tracks on the road. Probability of a higher dazzling by dimmed lights also increases if the headlight which is nearer to the central line and eyes of the oncoming driver is virtually of the same luminous intensity as the more distant one.

Also, in case of the same luminous intensity level and distribution of both usual headlights, the intensity of the space illumination of the nearer road boundary is relatively lower, what decreases the visibility distance and decreases optical guiding of a driver as a consequence of a lower luminance of this space if illuminated by dimmed and distance lights.

Summary of the Invention

The above mentioned drawbacks are removed in headlights according to the present invention, whereby each of them consists of a refractor, a light source and a reflector provided above the horizontal line with facets having the shape of parabolic cylinders with the forming profile situated in the basic paraboloidal reflector shape. Axes of the parabolic cylinders are not horizontal, but they are turned out of the headlight horizontal line. The parabolic cylinder length determines the side diffusion rate. At a certain length of parabolic cylinders, in a limit case, the refractor does not need to be provided with any optical elements for light diffusion, what is advantageous namely if the refractor is very inclined horizontally and vertically. In case of a headlight adjacent to the nearer road border, the facets on the side nearer to the road boundary are less inclined then the facets nearer to the road central line in relation to the headlight vertical line. The light beam formed by said facets is below the eyes level of an ongoing driver and so it does not cause any dazzling of ongoing traffic participants.

The facets that are nearer to the road central line in the headlight adjacent to the central line are less inclined then the facets that are nearer to the central line in the headlight adjacent to the nearer road border for the reason to prevent dazzling in a rear mirror and also to prevent dazzling of an ongoing driver by the headlight adjacent to the central line. The facets nearer to the road boundary in the headlight adjacent to the nearer road boundary are less inclined then the facets nearer to the road boundary in the headlight adjacent to the central line, also for the reason to prevent dazzling of an ongoing driver.

The so designed system of inclined facets forms a global light image in front of an automobile. The side space on the side of the nearer road boundary is illuminated more intensively by the headlight adjacent to the nearer road boundary and the side space on the side of the more distant road boundary by the headlight adjacent to the central line, whereby, visibility is increased in the space of the nearer and the more distant road boundaries and optical guiding of a driver is so improved.

Each facet, divided by the contact line of the basic paraboloid profile is unsymmetric. The part which is nearer to the headlight vertical line is broader. From this follows that the light beam diffusion obliquely upwards is greater then that obliquely downwards, whereby dimmed light reach is improved, namely at sides of the light beam and road brightness is decreased at a small distance in front of the vehicle.

The headlight adjacent to the nearer road boundary has smaller facets width at the same sides with regard to the headlight vertical line and consequently a lower diffusion and a higher light concentration then the headlight adjacent to the central line. Thereby, visibility is increased in the space of the nearer road boundary and danger of dazzling a driver of an ongoing vehicle is decreased during an overshoot of the dimmed lights. The light beam homogeneity and light brightness distribution on the road are also improved.

A single-filament or a twin-filament lamp or lighting arch of a gas discharge lamp can be used as the light source.

Brief Description of the Drawings

The invention is further illustrated with reference to the accompanying drawings, in which Figure 1 shows a front view of a pair of headlight reflectors with facets, Figure 2 shows a vertical section of a headlight, Figure 3 shows a lateral section of facets and Figure 4 shows a contour of a light track made by the facets on a testing wall,

Examples of the Invention Embodiment

Figure 1 shows a perspective view of the nearer road boundary and the central line. The headlight 1 is adjacent to the nearer road boundary and headlight 2 is adjacent to the road central line. Above the horizontal line z, the headlights are provided with facets 11, 12, 21, 22 having the shape of parabolic cylinders with creating profile B, C, situated in the basic parabolic reflector shape. In case of the headlight 1 adjacent to the nearer road boundary their inclination to the vertical line y is, α_{11}, α_{12} and in case of the headlight 2 adjacent to the road central line is α_{21}, α_{22}, whereby the following is valid:

$$\alpha_{11} = 5° \div 18°$$

$$\alpha_{12} = 0° \div 12°$$

$$\alpha_{21} = 0° \div 15°$$

$$\alpha_{22} = 0° \div 9° \qquad (1)$$

and

$$\alpha_{11} > \alpha_{12}$$

$$\alpha_{11} \geq \alpha_{21}$$

$$\alpha_{22} \geq \alpha_{12} \qquad (2)$$

Figure 2 shows the vertical section A-A of a headlight composed of a reflector 3 with a basic paraboloidal shape 31 with a focal distance f and an apex V. The refractor 4 can be without any deviation elements and the dimmed light source 5 is placed so that the light source face 5 is at a distance Δf from the focus F of the reflector 3:

$$\Delta f = (0.01 \div 0.26) \cdot f \qquad (3)$$

The light beam diffusion is given by the width of the direct line of facets w_{11}, w_{12}, w_{21}, w_{22}. The partial facet width on the side adjacent to the vertical line y of the headlight is greater then that on the opposite side. Consequently, according to Fig. 3 it follows that diffusion of the light beam obliquely upwards β, ε is greater than that obliquely downwards γ, δ;

$$\beta > \gamma$$

$$\varepsilon > \delta \qquad (4)$$

The facet widths w_{11}, w_{12} of the headlight 1 which is adjacent to the nearer road boundary are lower at the same side then those of facets w_{21}, w_{22} of the headlight 2 adjacent to the central line.

$$w_{11} < w_{21}$$

$$w_{12} < w_{22} \qquad (5)$$

The light beam diffusion coming from the headlight 1 is lower then that coming from the headlight 2. Thereby, illumination in the space of the nearer road boundary and optical guiding of a driver are improved and possibility to dazzle ongoing traffic participants is decreased.

In the above described example, the light source 5 is integrated in an assembly with a distance light source 6, which is situated in the vicinity of the focus F of the headlight 3.

In this headlights geometry layout, a global image is obtained showing increased photometric reach of the light beam and a more intensive illumination of the road boundaries, what makes possible to improve visibility distance, improvement of probability that an obstruction in the automobile trajectory will be registered and prolongation of the time necessary for the driver's reaction to said obstruction.

Industrial Use

The headlight with a complex reflector according to this invention is determined to be used in illumination systems of motor vehicles, operated on road communications.

Claims

1. Headlights for motor vehicles consisting of a light source, a reflector and a refractor, characterised in that the refractor (4) is either entirely without any deviation elements or it is provided with optical elements of low deviation, the reflector (3) is provided above the horizontal line (z) with facets (11, 12, 21, 22) in the shape of parabolic cylinders with a creating profile (B, C) situated in the basic parabolic shape (31) of the reflector (3), with a focus distance (f) of the reflector (3), whereby their inclination with regard to the vertical line (y) of a headlight is in case of the headlight (1) adjacent to the nearer road boundary;

$$\alpha_{11} = 5° \div 18°$$

$$\alpha_{12} = 0° \div 12°$$

in case of the headlight (2) adjacent to the road central line:

$$\alpha_{21} = 0° \div 15°$$

$$\alpha_{22} = 0° \div 9° \qquad (1)$$

where:

$$\alpha_{11} > \alpha_{12}$$

$$\alpha_{11} \geq \alpha_{21}$$

$$\alpha_{22} \geq \alpha_{12} \qquad (2)$$

and the dimmed light source (5) is at a distance Δf from the focus (F) of the reflector (3):

$$\Delta f = (0.01 \div 0.26) \cdot f \qquad (3)$$

2. Headlights according to claim 1, characterised in that the diffusion of a light beam (β, ε), formed by the width of the direct line of a part of the facets (11, 12, 21, 22) nearer to the vertical line (y) of the headlight is greater than the diffusion (γ, δ) formed by the facet parts (11, 12, 21, 22) more distant from the vertical line (y) of the headlight considering the penetration of the creating profile (B, C) of facets and of the basic paraboloide shape (31 of reflector (3):

$$\beta > \gamma$$

$$\varepsilon > \delta \qquad (4)$$

3. Headlights according to claims 1 and 2, characterised in that the widths (w_{11}, w_{12}) of facets (11, 12) of the headlight (1) adjacent to the nearer road boundary are smaller at the same side with regard to the vertical line (y) of the headlight, then the widths (w_{21}, w_{22}) of facets (21, 22) of the headlight (2) adjacent to the road central line:

$$w_{11} < w_{21}$$

$$w_{12} < w_{22} \qquad (5)$$

4. Headlights according to claims 1, 2 or 3, characterised in that in the proximity of the focus (F) of the reflector (3) a source (6) of distance light is placed.

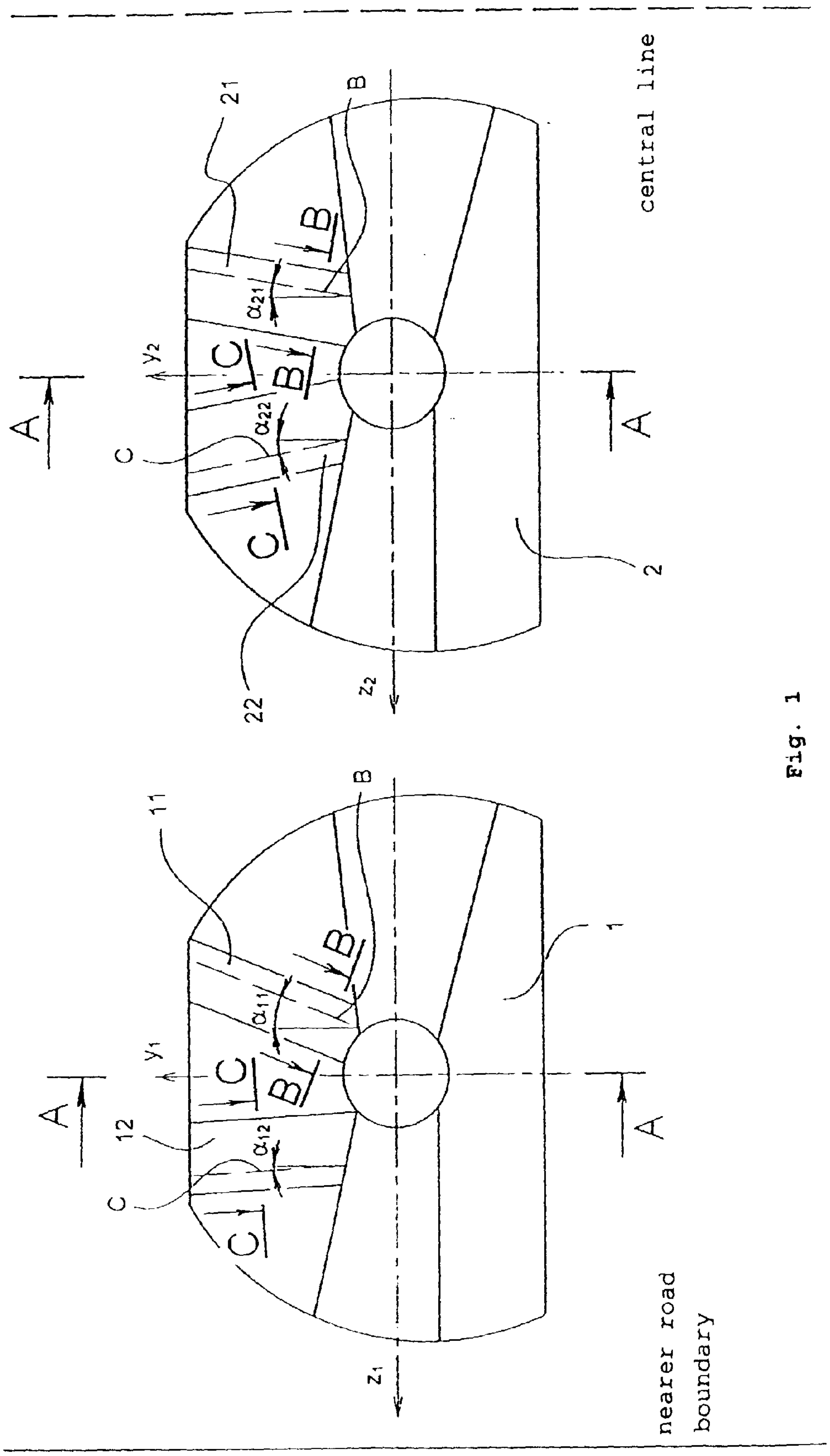

central line
nearer road
boundary
A
B
C
21
22
2
11
12
1
y_1
y_2
z_1
z_2
α_{11}
α_{12}
α_{21}
α_{22}

Fig. 1

Section A-A

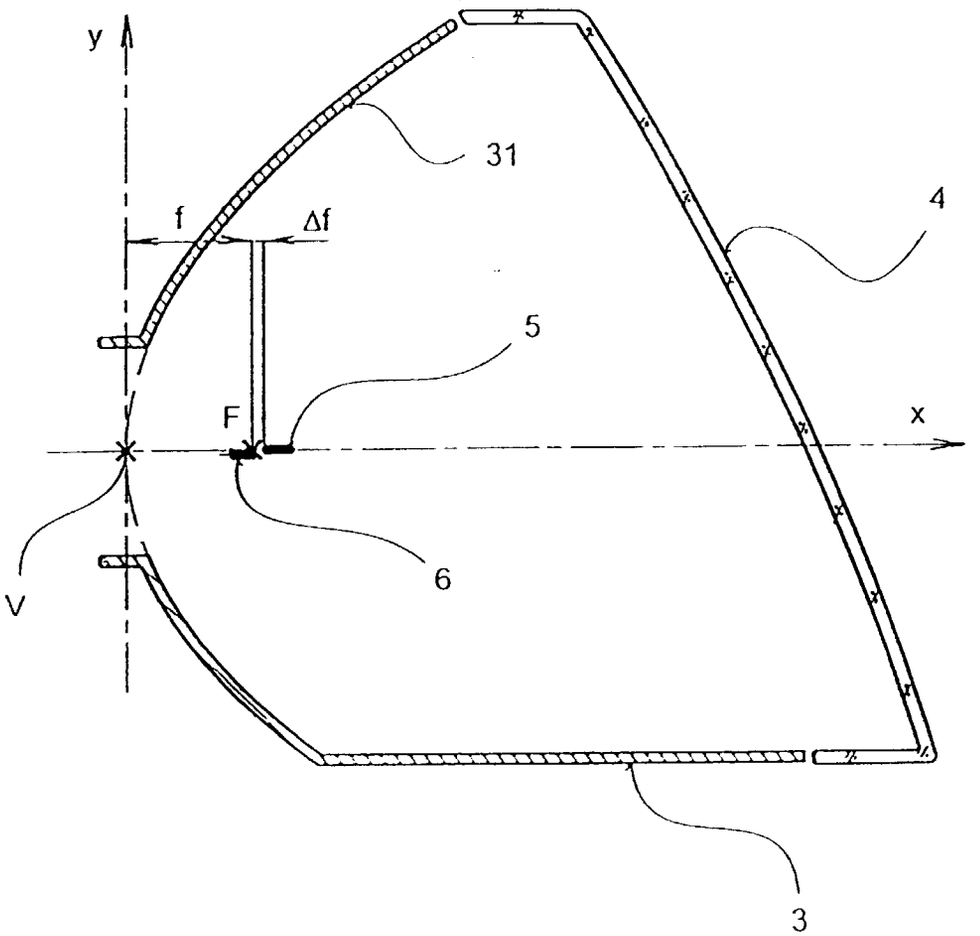
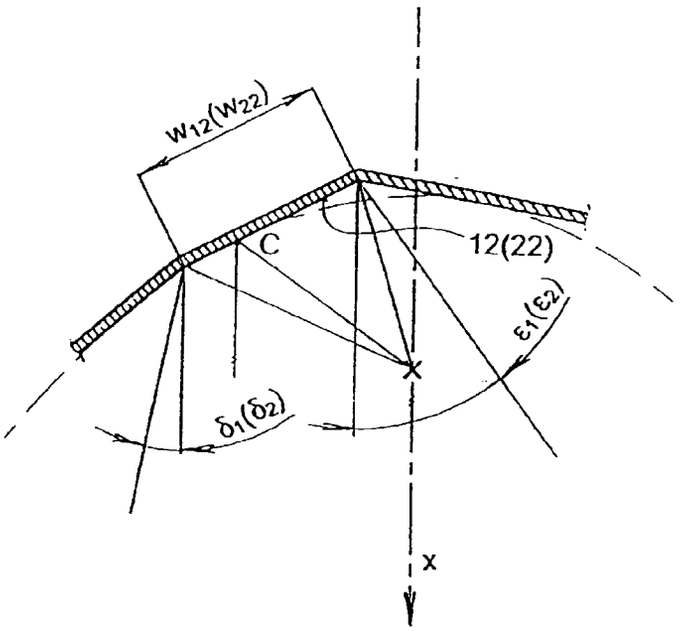


Fig. 2

Section C-C



Section B-B

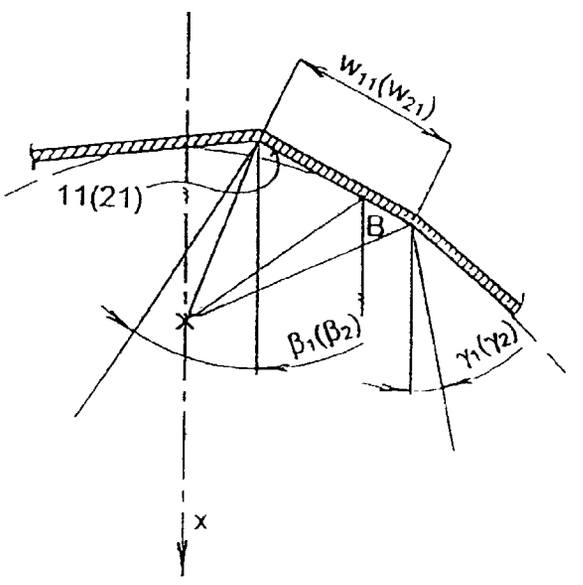


Fig. 3

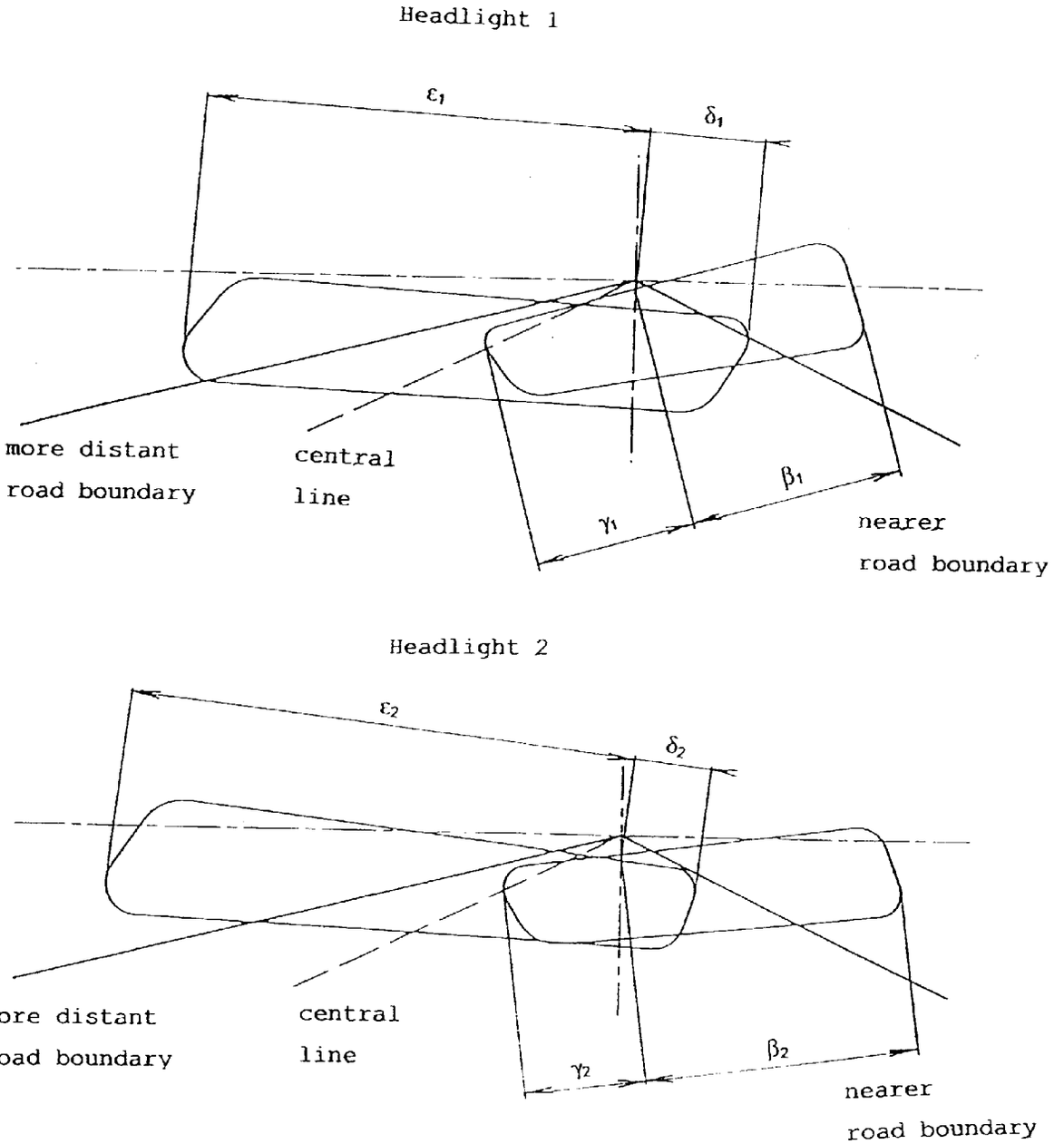

Headlight 1
ε_1
δ_1
more distant
road boundary
central
line
γ_1
β_1
nearer
road boundary
Headlight 2
ε_2
δ_2
more distant
road boundary
central
line
γ_2
β_2
nearer
road boundary

Fig. 4