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54 **Rear fog lamp for motor vehicles.**

57 A rear fog lamp comprises a light source (3) and a transparent element (4) having a prismatic internal surface (5) for directing the light rays emitted by the source into an outwardly-directed beam of light. The prismatic surface (5) includes a central zone (9) with first refractors and a plurality of peripheral zones (11, 12, 14, 15, 17, 18, 20, 21, 23-30) with refracting and refracting-reflecting prisms shaped and arranged so that adjacent peripheral pairs of zones reflect the light rays in intersecting directions.

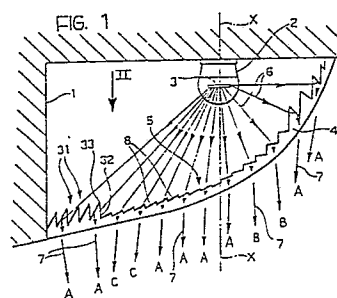
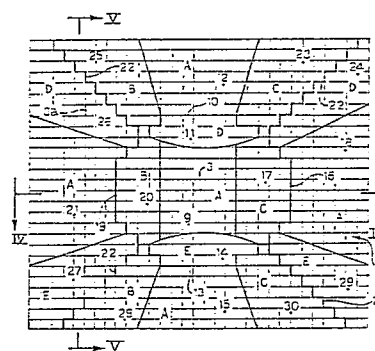


FIG. 2



Description

Rear fog lamp for motor vehicles.

The present invention relates to rear fog lamps for motor vehicles, of the type comprising a light source and a transparent element having an internal

prismatic surface for directing the light rays emitted by the source into an outwardly-directed light beam. The object of the present invention is to produce a compact rear fog lamp which has a simple and economical structure but nevertheless has a high optical efficiency.

In order to achieve this object, the subject of the invention is a rear fog lamp of the above type, characterised in that the prismatic surface of the transparent element includes a central zone with refracting prisms and a plurality of peripheral zones with refracting and refracting-reflecting prisms shaped and arranged so that adjacent pairs of peripheral zones reflect the light rays in intersecting directions.

Studies and experiments have shown that the intersecting distribution of the light rays in the beam emerging from the transparent element maximises the efficiency of each individual prism of the transparent element, that is, the ratio between the useful light and the total light incident on the prism.

The prismatic surface of the transparent element is shaped so that the outwardly-directed light beam defines on a screen placed at a distance from the transparent element - in a plane perpendicular to the optical axis of the lamp - a cross-shaped region of greater illumination, having a central part and four ends arranged on a vertical axis and a horizontal axis.

Around its central zone, the prismatic surface comprises an upper region, a lower region, a right-hand region, a left-hand region, and four corner regions, each of these regions comprising two zones which are side by side and reflect the light rays in intersecting directions.

In particular, each of the upper, lower, right-hand and left-hand regions includes an inner zone adjacent the central zone of the prismatic surface, and an outer zone; the central zone and the four outer peripheral zones illuminate the central part of the cross-shaped area on the screen, whilst the four inner peripheral zones illuminate the four ends of the cross-shaped area.

According to a further characteristic, each of the corner regions is divided by a substantially radial line of separation into an upper corner region and a lower corner region, which illuminate the two ends of the cross-shaped area defining the corresponding corner of the screen. As a result of the intersection of the rays, the upper and lower corner zones illuminate respectively the lower and upper ends defining the particular corner of the screen.

Further characteristics and advantages of the present invention will become clear from the description which follows with reference to the appended drawings, provided purely by way of non-limiting example, in which:

Figure 1 is a schematic view of a rear fog lamp

according to the invention, sectioned in a horizontal plane,

Figure 2 is a front view of the internal prismatic surface of the transparent element of the lamp, taken on the arrow II of Figure 1,

Figure 3 illustrates diagrammatically the photometric distribution of the light beam emitted by the lamp, and

Figures 4 and 5 are sections taken on the lines IV-IV and V-V of Figure 2.

Figure 1 shows a rear fog lamp for motor vehicles, having a body 1 (illustrated only schematically in the drawing), a bulb 2 with a horizontally extending filament 3, and a transparent element 4 made, for example, of plastics material, and having an internal prismatic surface 5 which receives the light rays 6 emitted by the bulb 2 and directs them into an outwardly-directed beam of light rays 7.

With reference to Figure 2, the prismatic surface 5 is constituted by a "matrix" of prisms which has a rectangular shape in plan and is divided into a central zone and a plurality of peripheral zones. The central zone, indicated 9, comprises refracting prisms 9 (see Figures 1, 4, 5) which cause a single deviation to the light rays from the lamp 2. The prismatic surface then includes an upper region divided by a line of separation 10 into an inner zone 11 adjacent the central zone 9, and an outer zone 12; a lower region divided by a line 13 into an inner zone 14 adjacent the central zone 9, and an outer zone 15; a right-hand region divided by a line of separation 16 into an inner zone 17 adjacent the central zone 9, and an outer zone 18; and a left-hand region divided by a line of separation 19 into an inner zone 20 adjacent the central zone 9, and an outer zone 21. The prismatic surface finally comprises four corner regions, each divided into two adjacent zones by substantially radial lines of separation 22. In particular, the upper right-hand corner includes an upper zone 23 and a lower zone 24; the upper left-hand corner includes an upper zone 25 and a lower zone 26; the lower left-hand corner includes an upper zone 27 and a lower zone 28; the lower right-hand corner includes an upper zone 29 and a lower zone 30.

The peripheral zones comprise some prisms of the refracting type 8 and some prisms of the refracting-reflecting type 31 of Figure 1. The prisms 31 have a surface 32 which faces the optical axis X-X of the lamp and causes a first refractive deviation of the light rays emitted by the lamp, and a second surface 33 which causes a second deviation of the light rays by reflection.

If a screen is placed at a predetermined distance from the lamp, in a plane perpendicular to the optical axis X-X, the lamp according to the invention produces thereon a cross-shaped region of greater illumination. This region is indicated 34 in Figure 3. The cross-shaped region 34 includes a central part A and four ends B,C,D,E arranged on a horizontal axis and a vertical axis.

The part A of the cross-shaped region 34 receives the light rays deflected by the central zone 9 and by the peripheral zones 12, 15, 18, 21 of the prismatic surface of the transparent element of the lamp (see Figure 2). In order to demonstrate this effect, these zones have also been marked with the letter A in Figure 2.

The end B of the cross-shaped region 34 receives the light rays deflected by the peripheral zones 20, 25, 28 of the prismatic surface (see Figure 2). The end C is illuminated by the zones 17, 23, 30. The end D is illuminated by the zones 11, 26, 22, 24. Finally, the end E is illuminated by the zones 14, 27, 29.

From the above, it can be seen that the various peripheral zones of the prismatic surface are distributed in pairs of adjacent zones which deflect the light rays in intersecting directions. Thus, for example, the zone 12, which is above the zone 11, illuminates the region A, which is below the region D illuminated by the zone 11. The same is true of the two zones 14, 15 and for the other pairs of adjacent zones 20, 21; 17, 18; 25, 26; 27, 28; 30, 29, and 23, 24.

Studies and experiments conducted by the Applicant have shown that the intersection of the light rays deflected by the prisms enables the efficiency of each individual prism to be improved, efficiency meaning the ratio between the useful light and the total light incident on the prism.

A further characteristic of the prisms forming parts of the zones 24, 26, 27, 29 lies in the fact that they rotate the image of the linear filament 3 through 90°, as indicated 3a by way of example for one of the prisms of the zone 26.

In Figure 1, the light rays emerging from the lamp are marked with the symbol of the zone of the screen which they illuminate.

In one embodiment, a lamp was produced with a matrix of 31 x 27 prisms, each 3 x 3 mm wide. The distance between the filament 3 of the bulb and the transparent element 5 (with reference to the centre of the outer surface of the transparent element) was approximately 32 mm. This distance was found to be optimal in that lesser distances increase the solid angle of the useful light but worsen the projection of the image of the filament on the screen, the image becoming larger, more diffuse and less bright. In this way, a good compromise is achieved between the requirement for the lamp to be compact and the requirement for a high efficiency.

Claims

1. A rear fog lamp for motor vehicles, comprising a light source (3) and a transparent element (4) having an internal prismatic surface (5) for directing the light rays emitted by the source (3) into an outwardly-directed light beam, characterised in that the prismatic surface (5) of the transparent element (4) comprises a central zone (9) with refracting prisms and a plurality of peripheral zones (11, 12, 14, 15, 17, 18, 20, 21,

23 -30) with refracting and refracting-reflecting prisms, the prisms being shaped and arranged so that adjacent pairs of peripheral zones deflect the light rays in intersecting directions.

2. A lamp according to Claim 1, characterised in that the prismatic surface (5) of the transparent element (4) is formed so that the outwardly-directed light beam defines on a screen placed at a distance from the transparent element (4) - in a plane perpendicular to the optical axis (X-X) of the lamp - a region of greater illumination, having a cross-shaped configuration with a central part (A) and four ends (B,C,D,E) arranged on a horizontal axis and a vertical axis.

3. A lamp according to Claim 2, characterised in that, around the central zone (9), the prismatic surface (4) comprises an upper region (11,12), a lower region (14, 15), a right-hand region (17,18), a left-hand region (20,21), and four corner regions (23, 24; 25, 26; 27, 28; 29, 30), each of these regions comprising two zones which are side by side and reflect the light rays in intersecting directions.

4. A lamp according to Claim 3, characterised in that each of the upper, lower, right-hand and left-hand regions include an inner zone (11, 14, 17, 20) adjacent the central zone (9), and an outer zone (12, 15, 18, 21), and in that the central zone (9) and the four outer peripheral zones (18, 21, 12, 15) illuminate the central part (A) of the cross-shaped region, whilst the four inner peripheral zones (11, 14, 17, 20) illuminate the four ends (B, C, D and E) of the cross-shaped region.

5. A lamp according to Claim 3, characterised in that each of the corner regions is divided by a substantially radial line of separation (22) into an upper corner zone and a lower corner zone which illuminate the two ends of said cross-shaped area (34) defining the corresponding corner of the screen, said upper corner zone and said lower corner zone illuminating respectively the lower and upper ends defining the corner of the screen.

6. A lamp according to Claim 5, characterised in that the light source is a bulb (2) having a filament (3) which is horizontally elongate.

7. A lamp according to Claim 6, characterised in that the image of the filament (3) reflected by the peripheral corner zones which illuminate the ends of the cross-shaped region arranged along the vertical axis is rotated through 90°.

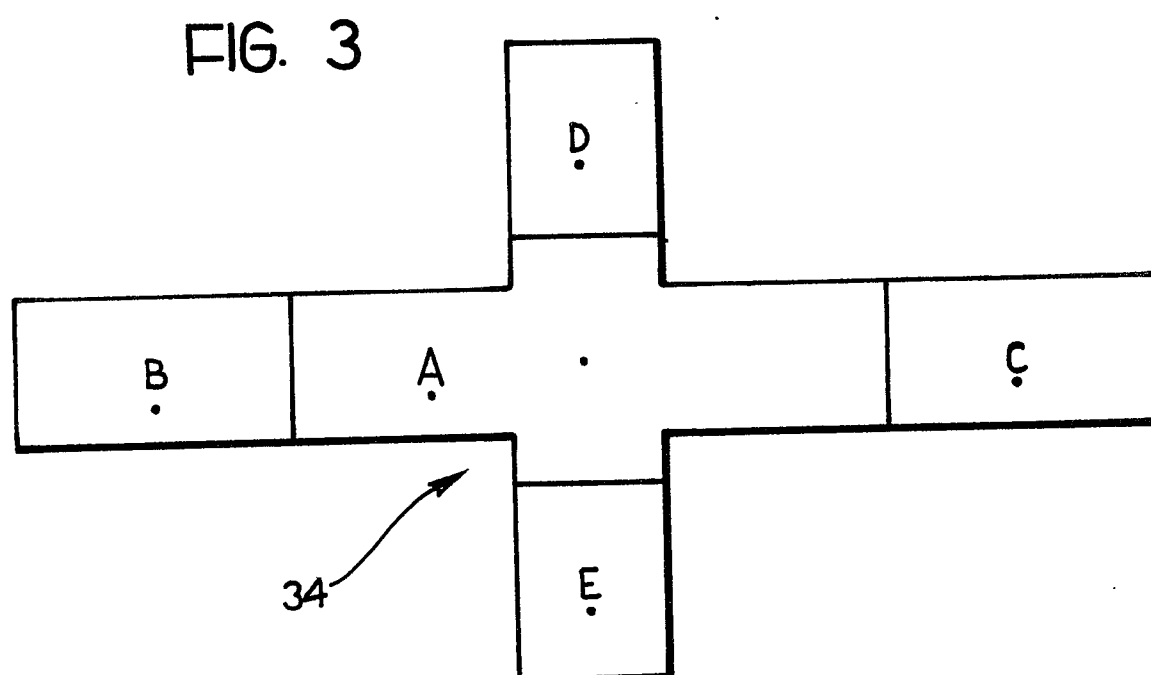
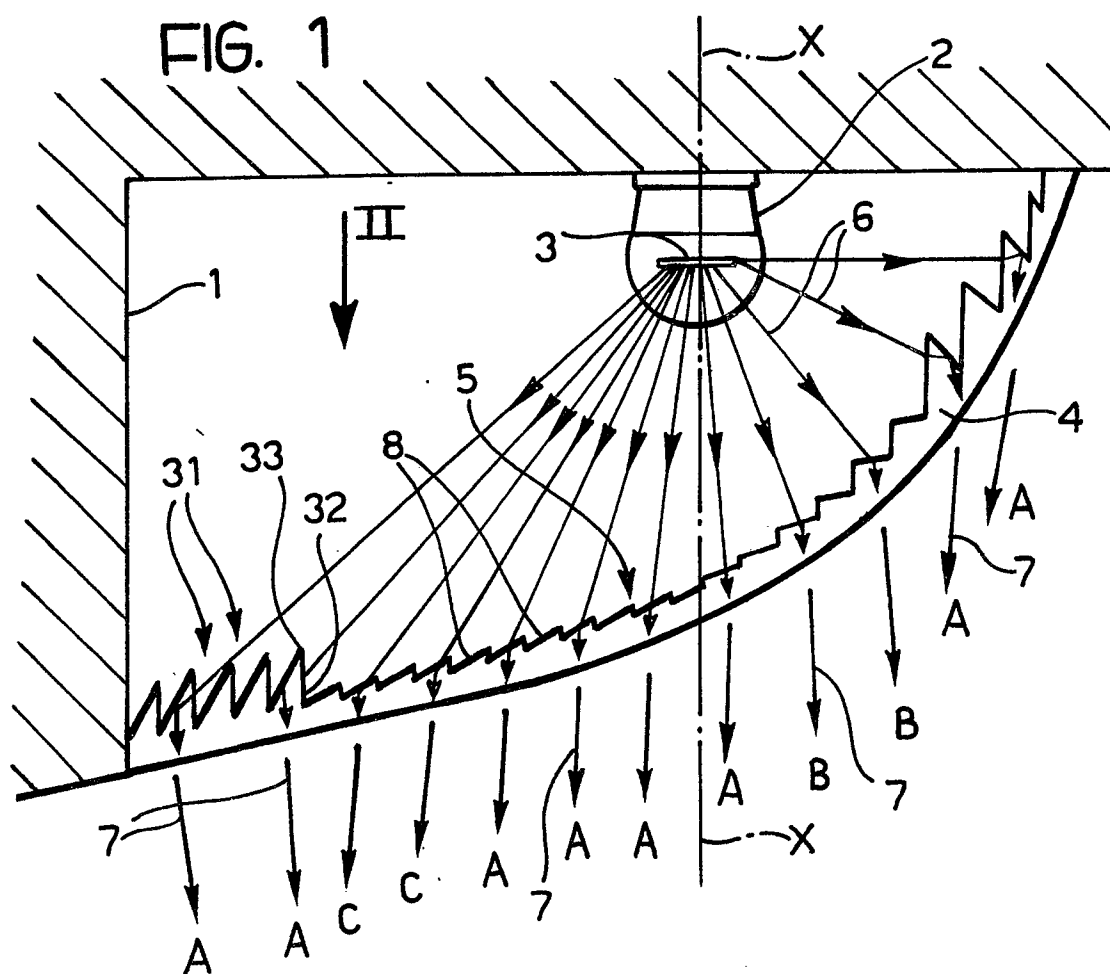


FIG. 2

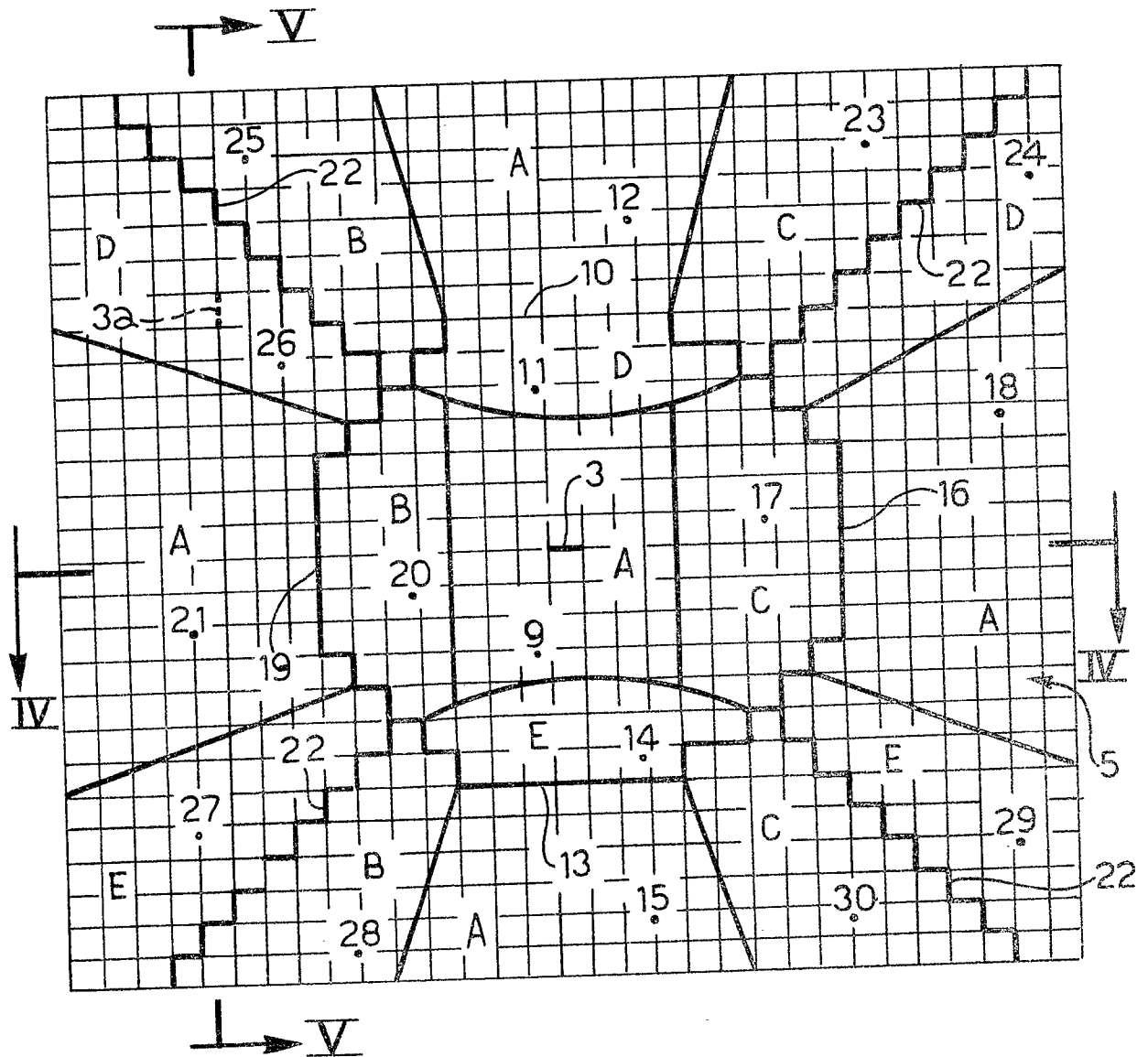


FIG. 4

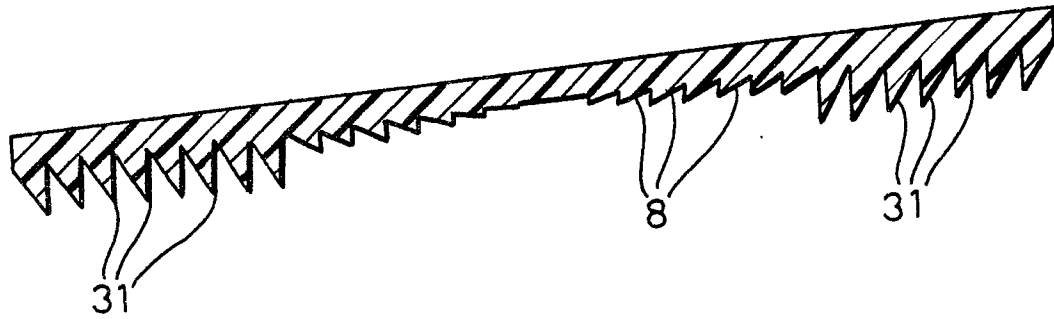
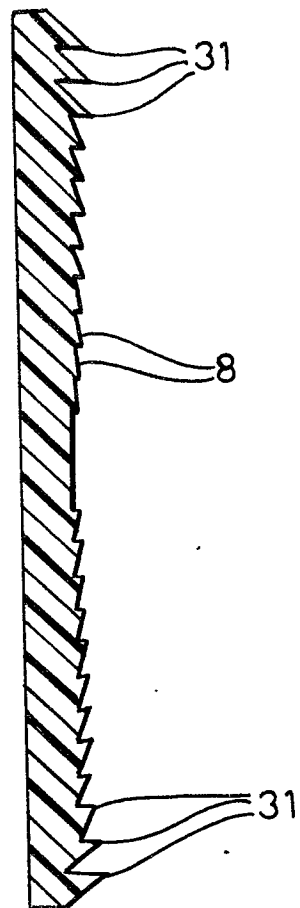


FIG. 5





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	DE-B-1 179 164 (HEENAN) * Whole document * ---	1	F 21 Q 1/00 F 21 M 3/12
A	FR-A-1 575 749 (PROJEC TEURS CIBIE) * Whole document * -----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			F 21 Q F 21 M
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 07-02-1989	Examiner FOUCRAY R.B.F.
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			