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(54) Reflector for a headlight for road vehicles

(57) Reflector (1) for headlights for vehicles, especially dipped headlights or fog lights, having a reflecting surface (5) composed: of a single continuous surface portion or of a plurality of surface portions (9,10,13,14,15,16,18) which are geometrically dissimilar to one another but which are such that they are joined to one another, along respective junction lines, without interruption of continuity; and of a reflecting zone (20) which is disposed inside said single continuous surface portion or one of said surface portions (18) which are dissimilar to one another but joined with continuity, and which is defined by a surface sector (21) which is translated forwards in relation to the respective surface portion (18) and partially rotated towards an optical axis (A) of the reflector (1) and linked to the respective surface portion (18), along at least part of the perimeter of said reflecting zone (18), by means of a step (22).

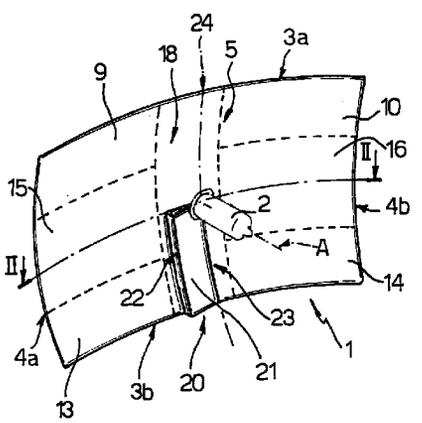

Fig.1

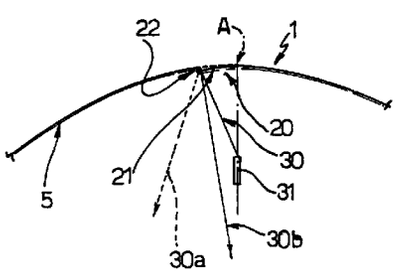

Fig.2

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Description

The present invention relates to a reflector for headlights for vehicles, especially dipped headlights or fog lights.

It is known that headlights for vehicles for providing dipped beams (dipped headlights) and/or fog lights must, by law, concentrate the light beam below an ideal line, referred to as the bright-dark boundary line or "cut-off", in order to avoid dazzling oncoming vehicles. By way of example, French Patent No. 2,536,502 discloses a headlight for providing a dipped beam for road vehicles, in which headlight the reflector is defined not by a single reflecting surface of revolution, for example parabolic or elliptical, as is the custom in headlights, but instead by a so-called "complex" reflecting surface formed by the joining, without interruption of continuity, of numerous (in the case under discussion, four) reflecting surface portions which are geometrically dissimilar to one another, and which in the case under discussion are defined by differing equations. On the other hand, French Patent No. 1,546,689 discloses a headlight having a reflector of geometry similar to the foregoing one, but in which the various surface portions, geometrically dissimilar to one another, forming the reflecting surface are not joined to one another, but are linked by steps, which consequently form zones of discontinuity on the reflecting surface.

By virtue of the differing optical specialization which may be imparted to the different surface portions, both of the above described constructions produce the cut-off without the use of darkening screens and, consequently, permit better utilization of the light energy emitted by the lamp of the headlight, forming headlights which, as compared with conventional ones, have a greater illuminating power for equal power of the lamp, or use lamps of lower power (or reflectors of smaller dimensions) to deliver equal illumination.

However, reflectors of the type described are not free from disadvantages. In particular, reflectors in which extensive discontinuities are present, such as that of the patent FR-A-1,546,698, show a decline of the optical performance levels of the headlight, as they inevitably distort some of the reflected rays. On the other hand, reflectors such as that of the patent FR-A-2,536,502, which represents a development of the foregoing one, which development is made possible by the new computing and automatic design techniques, which permit specifically the creation of continuous "complex" surfaces, have the disadvantage of producing a light beam distribution which is not optimized and which may leave one or more zones poorly illuminated, or may allow some rays, albeit of weak intensity, to emerge above the cut-off. In both cases, the effect is to create a measure of visual discomfort for the driver of the vehicle or for that of another vehicle which is travelling in the opposite direction.

The object of the innovation is to provide a reflector which permits the retention of the advantages associated with the reflectors of the described head-lights and which, at the same time, permits an improvement in the visual comfort of the user and/or of drivers of other vehicles coming in the opposite direction at the moment of passing.

According to the invention, there is accordingly provided a reflector for a headlight for road vehicles, especially for a dipped headlight or fog light, having a reflecting surface comprising a single continuous surface portion or a plurality of surface portions which are geometrically dissimilar to one another but which are such that they are joined to one another, along respective junction lines, without interruption of continuity; characterized in that said reflecting surface further comprises a reflecting zone which is disposed inside said single continuous surface portion or one of said surface portions which are dissimilar to one another but joined with continuity, and which is defined by a surface sector which is translated forwards in relation to the respective said surface portion inside which it is disposed and linked to the latter, along at least part of the perimeter of said reflecting zone, by means of a step.

In particular, said surface sector defining said reflecting zone disposed inside a respective said surface portion of the reflecting surface of the reflector is at least partially rotated relative to said reflecting surface and is joined with continuity to the latter along at least one side of its perimeter.

In this way, it becomes possible to "correct" the light distribution obtainable by a continuous complex reflector without having to resort to external means (for example, to prism configurations on the lens of the headlight, a technique which cannot be put into practice on headlights having highly inclined lenses) and without introducing extensive discontinuities and, therefore, producing optical distortions of such a nature as to reduce the efficiency of the headlight.

Preferably, said surface sector is oriented in such a manner as to intercept some of the light rays directed towards said surface portion relative to which said sector is translated, in order to concentrate the reflected images of said rays along the optical axis and below the same, and is disposed substantially along a vertical centre line of said reflector, centred relative to the same or disposed to one side.

In this way, the rays distorted by the step junction of limited extent and of defined position present on the reflecting surface are nevertheless projected well below the cut-off and, accordingly, they are not able to reduce the visual comfort, while also contributing to the illumination. The result is a greater concentration of the light beam in the lower central zone of the test screen at 25 m, i.e. specifically in that zone which improves the visual comfort.

Finally, emphasis should be placed upon the fact that, according to the invention, a limited and defined step discontinuity is formed on a surface zone which would not per se have any need therefor, as the equations which describe the surface ensure per se a first or second order continuity of all the points of the reflecting

surface in full compliance with the regulations in force concerning illumination. The step provided according to the invention is therefore entirely different from those shown in the patent FR-A-1,546,689, both because it is not required by the geometry of the various surface portions which form the reflecting surface, and because the steps referred to are ones which are disposed on the junction lines of the various surfaces, whereas that of the present invention is a step formed inside a surface portion which is per se continuous.

Further features and advantages of the innovation will become clear from the description, which follows, of non-limiting embodiments thereof with reference to the figures of the accompanying drawings, in which:

- Figure 1 diagrammatically illustrates, in three-quarters front perspective, a reflector constructed according to the invention;
- Figure 2 is a diagrammatic cross section along a tracing line II-II of the reflector of Figure 1;
- Figures 3 and 4 illustrate, in perspective, two variants of the reflector according to the invention;
- Figure 5 diagrammatically illustrates a vertical cross section of the reflector of Figures 3 and 4, in which cross section both the variants of the invention are shown for the sake of simplicity, and
- Figure 6 illustrates the photometric image reflected onto a screen at 25 m by a known reflector and Figure 7 that produced by the same reflector modified in accordance with one of the variants of the invention shown in Figures 3 and 4.

With reference to Figures 1 and 2, there is indicated by 1 a reflector for a dipped headlight (known and not illustrated, for the sake of simplicity) for road vehicles, especially motor vehicles, comprising the reflector 1, a light source constituted by a lamp 2, a housing to accommodate the reflector 1 and a lens which closes the housing in front of the reflector 1, the housing and the lens being known and not illustrated for the sake of simplicity. The reflector 1 may be of any shape (in the non-limiting case under discussion which is illustrated, it is of substantially rectangular shape, being bounded by respective sides 3 and 4, which are substantially parallel in pairs) and has a reflecting surface 5 and an optical axis A, along which the lamp 2 is substantially aligned, and which serves as a reference for the computation of the surface 5.

In the case under discussion which is illustrated, the surface 5 is a complex surface of the same type as that described in Italian Patent Application No. TO94A000733 of the same Applicant, which was filed on 20.09.1994 and the content of which is incorporated herein, as regards the necessary parts, by simple reference, and comprises a plurality of surface portions which are all joined to one another substantially with continuity, but each one of which is defined by a (reflecting or deflecting) surface having optical characteristics different from those of the surfaces of the adjacent surface portions.

In particular, the surface 5 comprises seven different surface portions: two upper lateral portions 9 and 10 aligned on opposite sides with respect to the axis A along an upper edge 3a of the reflector 1, two lower lateral portions 13 and 14 aligned on opposite sides with respect to the axis A along a lower edge 3b of the reflector 1 and below the portions 9 and 10 respectively, two intermediate lateral portions 15 and 16, the first one of which is disposed between the portions 9 and 13 and the second between the portions 10 and 14, joining the same, and a central portion 18, centred on the axis A and extending over the entire height of the reflector 1, joining the portions 9, 15 and 13 disposed along one side 4a of the reflector 1, to the opposite portions 10, 16 and 14 disposed along the opposite side 4b of the reflector 1.

Each surface portion is furthermore given a specialized shape designed to create a predetermined distribution of the reflected images on the test screen at 25 m as prescribed by the pertinent regulations. In particular, the two intermediate lateral portions 15 and 16 of the reflector 1 are capable of distributing the reflected images exclusively below the optical axis A, in such a manner as to obtain the concentration of the light beam emitted by the headlight below the bright-dark boundary line or "cut-off", while the upper lateral portion 9 and the lower lateral portion 14, which is situated diagonally opposite the portion 9, are capable of obtaining a broadened distribution of the beam and of defining, in conjunction with respective prism configurations of the aforementioned lens (not illustrated) of the headlight, an oblique part of the bright-dark boundary line.

The horizontal part of the cut-off line is, on the other hand, obtained by means of the images reflected by the surface portions 10 and 13, again possibly in combination with suitable prism configurations of the lens, while the central sector 18 is capable of distributing the light below the optical axis A and centrally. According to the invention, although the surface portions 9, 10, 18, 15, 16, 13 and 14 are all of equation such that they are continuous and are joined to one another along ideal junction lines, which are illustrated in broken lines in Figure 1, without interruption of continuity, in such a manner as to define on the reflector 1 a continuous overall reflecting surface, which avoids any distorting effect and at the same time generates the described light distribution, in full compliance with the pertinent regulations, the effective reflecting surface 5 of the reflector 1 further comprises an anomalous reflecting zone 20, which is disposed inside the joining central portion 18, in the case under discussion in the lower quarter of the same, adjacent to the portion 13.

The reflecting zone 20 is defined, according to the invention, by a surface sector 21 of optical and geometric characteristics which may be identical to or different from those of the surface of the portion 18, but which is translated forwards with respect to the latter and linked to the same, along at least part of its perimeter, by means of a

step 22, which consequently generates a desired, bounded and defined discontinuity on the otherwise continuous surface 5. The surface of the sector 21 is also partially rotated towards the optical axis A and the associated lamp 2 in relation to the surface of the portion 18, and is joined with continuity with the latter along one side 23 of its perimeter, which is disposed along a vertical centre line 24 of the reflector 1, relative to which centre line the sector 21 is disposed to one side, on the same side as the portion 13.

As illustrated in Figure 2, the consequence of the presence of the sector 21 is that some of the light rays, one of which is indicated by 30, which are emitted by a filament 31 of the lamp 2, which would normally be reflected along the broken-line path indicated by 30a from the surface 18, are instead intercepted by the surface 21 and reflected along the path 30b, converging towards the optical axis A, with the effect of a greater contribution of light to the bright-dark boundary line or cut-off. In other words, the reflected images of the rays intercepted by the surface sector 21 are concentrated along the optical axis A and immediately below the latter.

This permits, according to the invention, a great improvement in the sensation of visual comfort of the user of a vehicle equipped with a headlight provided with the reflector 1, while having virtually no disadvantageous effect on the optical performance levels of the reflector 1, because the step 22, owing to the fact that the surface sector 21 is translated and rotated relative to the surface 18, is obtained inside a surface portion, specifically the portion 18, the reflected images of which are situated below the cut-off line.

With reference to Figures 3, 4 and 5, these figures illustrate two possible variants of the reflector of the invention, which variants are applied to reflectors for anti-fog headlights (fog lights); details which are similar to or the same as those already described are indicated, for the sake of simplicity, by the same numerals.

As illustrated in Figures 3 and 4, 100 and 101 indicate, overall, two respective reflectors for fog headlights; the reflectors 100 and 101 have a reflecting surface 5 which may be defined, without distinction, by a single continuous surface portion or by a plurality of reflecting surface portions which are different and which are joined to one another with continuity, as in the case of the surface 5 of the reflector 1 of Figure 1. In each case, the surface 5, which would per se be continuous, also comprises an anomalous reflecting zone (20a in the case of the reflector 100, 20b in the case of the reflector 101) defined by a surface sector 21 which has the same or different geometric characteristics and which is translated and rotated with respect to the axis A relative to the remainder of the surface 5. This sector 20a or 20b is disposed substantially along a vertical centre line 24 of the reflector, centred relative to the same, and forms a step 22 on the reflecting surface 5.

In the case of the reflector 101 of Figure 4 (as in the case of the reflector 1 of Figure 1), the step 22 is towards the optical axis A of the reflector; in the case under discussion, it is aligned on a horizontal centre line 34, while the surface 21 is joined to 5 along one side 32 of the perimeter of the reflecting zone 20, which perimeter is aligned with the lower side 3b of the reflector 101; on the other hand, in the case of the reflector 100 of Figure 3, the step 22 is away from the optical axis A; in the case under discussion it is formed in line with the upper horizontal side 3a of the reflector 100, while the surface 21 is joined to 5 along one side 23 of the perimeter of the reflecting zone 20, which perimeter is disposed along the horizontal centre line 34 of the reflector 100.

In both cases (Figure 5), the result is a deviation of the rays 30 emitted by the filament 31 of the lamp 2 and intercepted by the surface 21 of the reflecting zones 20a or 20b along the paths 30b, which are more inclined downwards (or more angled relative to the axis A) as compared with the paths 30a which the rays 30 would have followed as a result of reflection on the surface 5 in the absence of the projecting reflecting zones 20a and 20b.

The practical consequence can be seen in Figures 6 and 7. Where the light distribution effected by the surface 5 in the absence of the projecting zones 20a and 20b was insufficient (as a result of the need to maintain a geometric continuity on said surface) to generate on the test screen at 25 m isolux curves only below the cut-off line indicated by 40 (Figure 6 - the presence of isolux curves of low intensity above the cut-off 40 is clear), the presence of the surface sectors 21 appropriately translated and oriented relative to the axis A permits (Figure 7) all the isoluxes to be brought, every other condition and geometry of the surface 5 being otherwise equal, below the cut-off 40 and with an increase in the luminosity in the central position, thus simultaneously eliminating any possibility of even the very slight dazzling of other vehicles permitted by the regulations, and increasing the visual comfort of the user of the headlight equipped with the reflector 100 or 101.

Claims

1. Reflector for a headlight for road vehicles, especially for a dipped headlight or fog light, having a reflecting surface comprising a single continuous surface portion or a plurality of surface portions which are geometrically dissimilar to one another but which are such that they are joined to one another, along respective junction lines, without interruption of continuity; characterized in that said reflecting surface further comprises a reflecting zone which is disposed inside said single continuous surface portion or one of said surface portions which are dissimilar to one another but joined with continuity, and which is defined by a surface sector which is translated forwards in relation to the respective said surface portion inside which it is disposed and linked to the latter, along at least part of the perimeter of said reflecting zone, by means of a step.

2. Reflector according to Claim 1, characterized in that said surface sector defining said reflecting zone disposed inside a respective said surface portion of the reflecting surface of the reflector is at least partially rotated relative to said surface portion of the reflecting surface, towards the optical axis of the reflector.

3. Reflector according to Claim 1 or 2, characterized in that said surface sector translated relative to said surface portion inside which it is disposed, is joined with continuity with the latter along at least one side of its perimeter.

4. Reflector according to one of the preceding claims, characterized in that said surface sector is disposed substantially along a vertical centre line of said reflector, centred relative to the same or disposed to one side.

5. Reflector according to one of the preceding claims, characterized in that said step is towards the optical axis of the reflector.

6. Reflector according to one of the preceding claims, characterized in that said step is away from the optical axis of the reflector.

7. Reflector according to one of the preceding claims, characterized in that said surface sector is oriented in such a manner as to intercept some of the light rays directed towards said surface portion relative to which said sector is translated, in order to concentrate the reflected images of said rays along the optical axis and below the same.

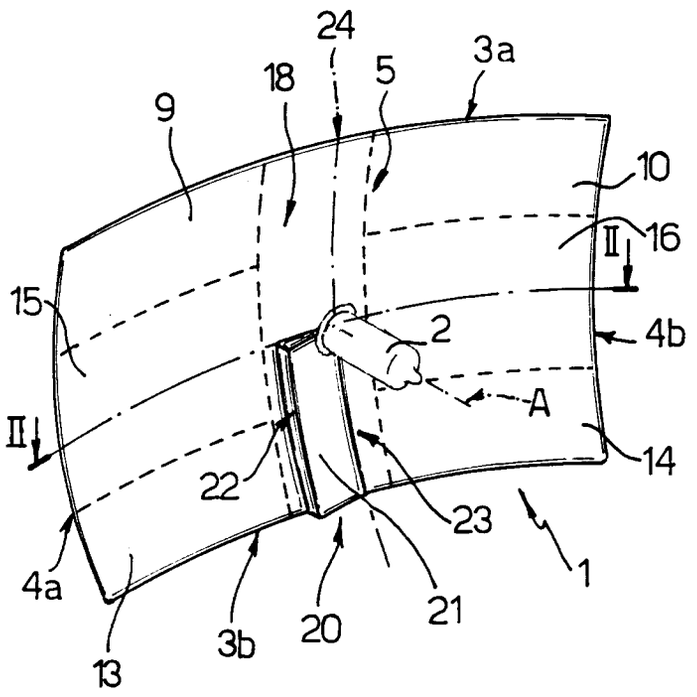

Fig.1

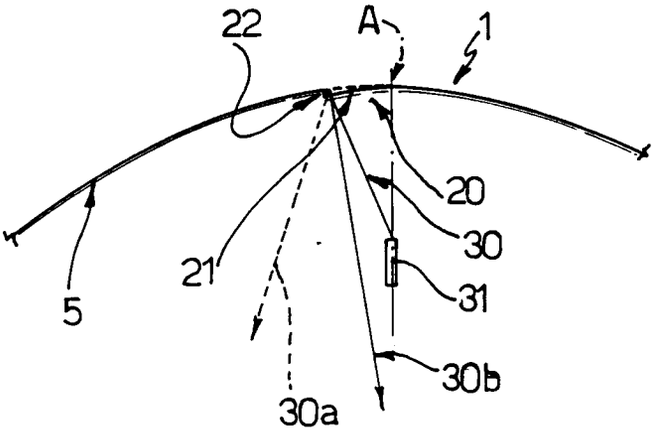

Fig.2

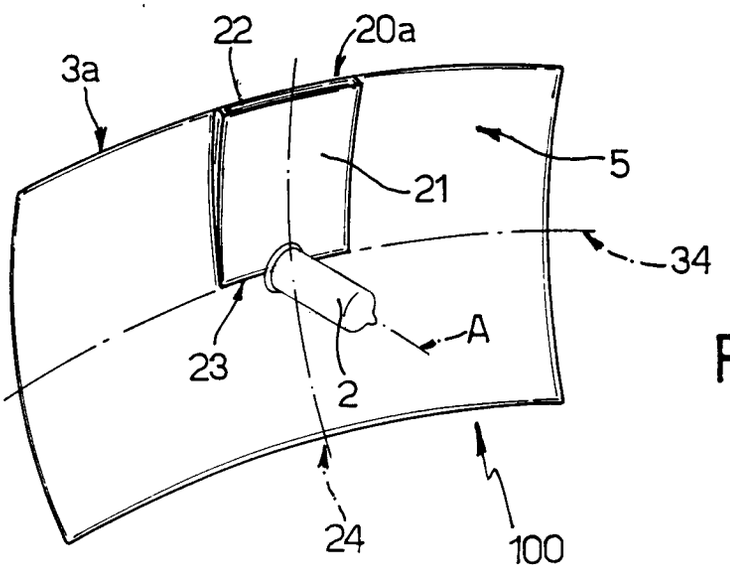

Fig.3

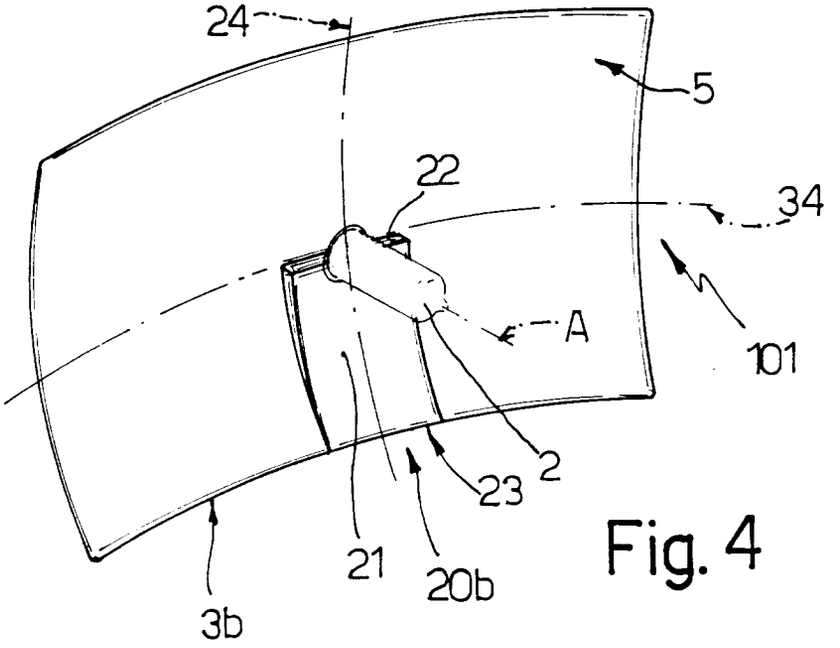

Fig. 4

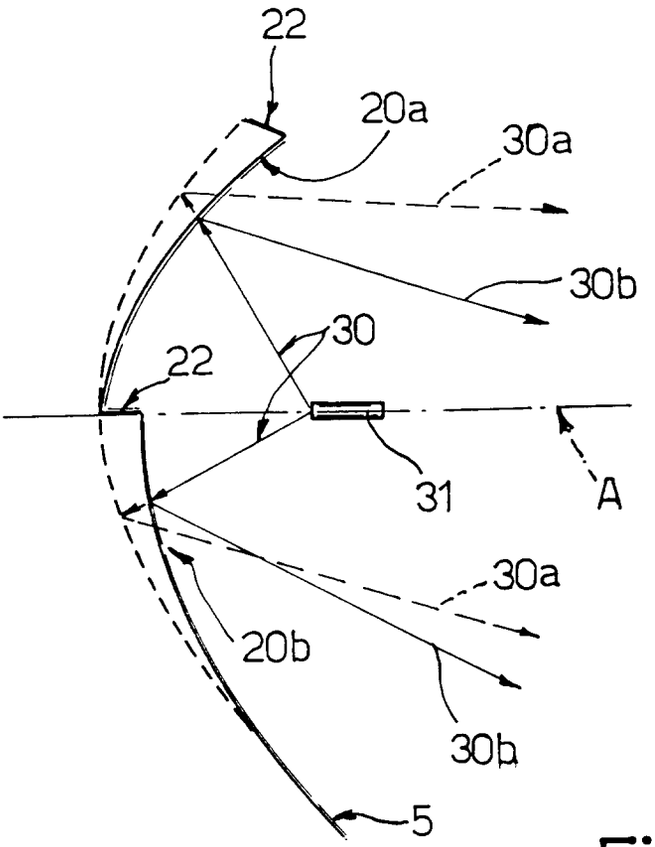

Fig.5

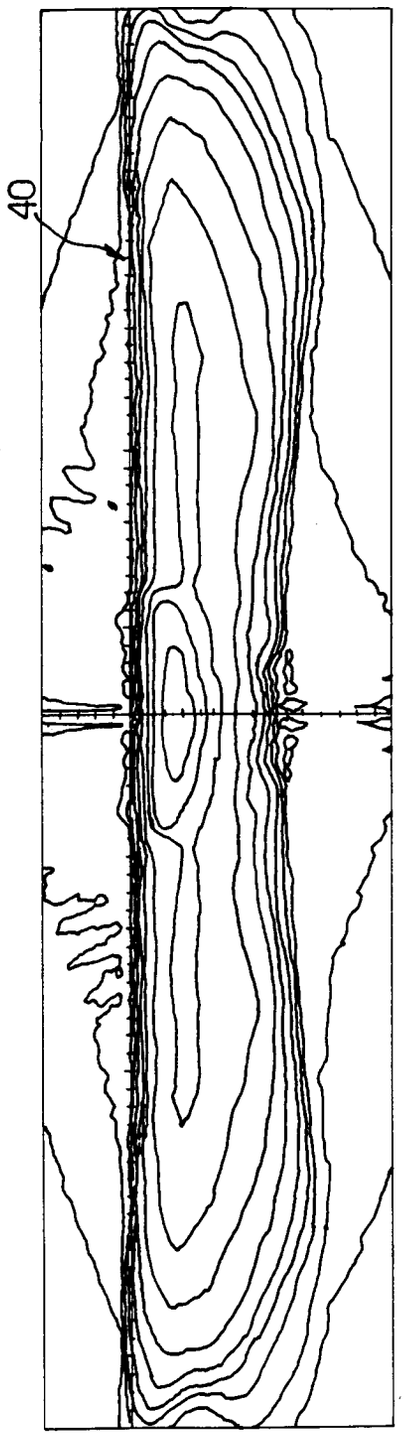

Fig.6

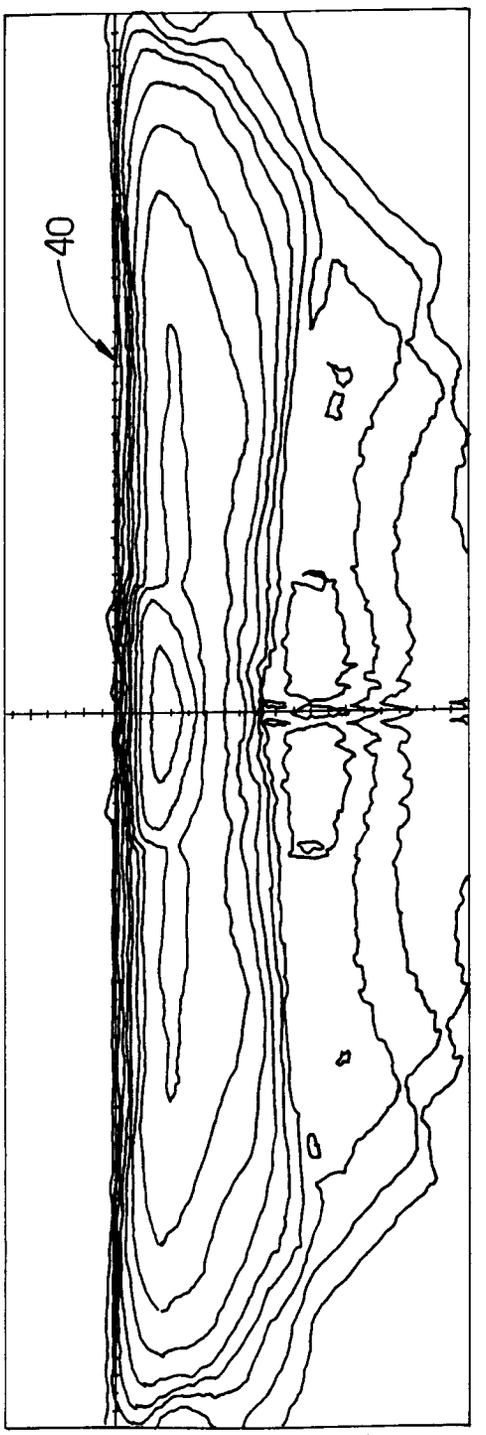

Fig.7

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EUROPEAN SEARCH REPORT

Application Number
EP 95 11 9884

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.6)
X	FR-A-2 525 733 (AUTEROCHE SA.) * page 2, line 17 - line 25 * * page 3, line 1 - line 17; figures 1-3 *	1,3,4,6, 7	F21M3/08
X	GB-A-2 069 123 (CIBIE PROJECTEURS) * page 2, line 9 - line 11 * * page 2, line 38 - line 62; figures 1,2 *	1-4,6	
X	US-A-1 681 298 (LOBERG) * page 1, line 70 - page 2, line 7; figures 1,3,4 *	1,3,6	
X	FR-A-2 528 537 (CIBIE PROJECTEURS) * page 4, line 33 - page 5, line 5 * * page 5, line 19 - page 6, line 2; figures 2,3A *	1,6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) F21M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	19 March 1996	Martin, C

CATEGORY OF CITED DOCUMENTS

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