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

(11) EP 0 741 262 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
06.11.1996 Bulletin 1996/45

(51) Int. Cl.[6]: **F21M 3/08**, F21V 7/04

(21) Application number: **96104681.0**

(22) Date of filing: **25.03.1996**

(84) Designated Contracting States:
DE ES FR IT

(30) Priority: **03.04.1995 IT RM950214**

(71) Applicant: **TRI.O.M. S.P.A.**
10020 Cambiano (Torino) (IT)

(72) Inventors:
- **Lioy, Vicenzo**
  10020 Cambiano (Torino) (IT)
- **Olivetti, Lucio**
  10137 Torino (IT)

(74) Representative: **Robba, Eugenio et al**
Studio "INTERPATENT"
via Caboto 35
10129 Torino (IT)

(54) A vehicle headlight comprising a worked reflecting surface for shaping the light beam through reflection

(57) A vehicle headlight of the clear transparent refractor type, comprising a worked reflecting surface for shaping, through reflection only, the light beam from a source lamp (9) wherein the profile of said reflector (19) comprises columnar reflecting surfaces (1) having a cross-section that is an arc of circle and having both curved edges lying on a reference surface of revolution.

Each of said arcs of circle (1) starts and terminates on the profile of the reference parabola (3) at intersection points (5, 7) that are selected so that a light ray from the filament (9) is reflected by said intersection points (3 or 5) into a plane 11 orthogonal to the optical axis 13 at an assigned distance from the center point (15) defined by the intersection of plane 11 with the optical axis 13.

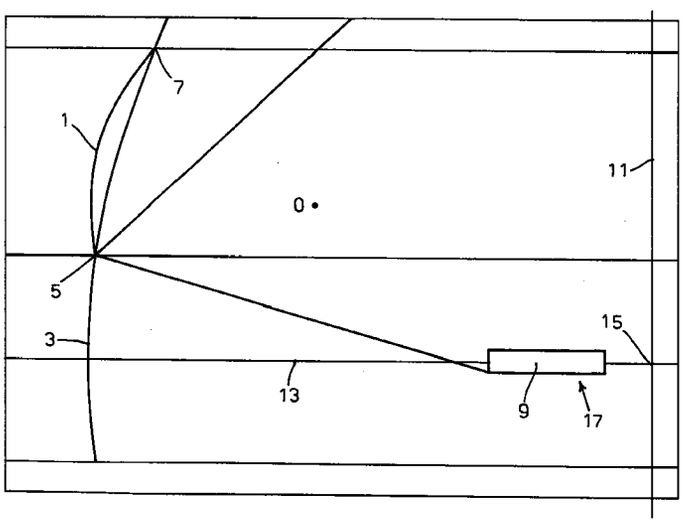

FIG. 1

EP 0 741 262 A2

Description

The present invention refers to headlights for motor vehicles comprising a reflector equipped with a worked or "carved" reflecting surface for shaping the light beam through reflection only.

It is known that headlights for vehicles designed for generating light beams for lower (traffic) beams and/or upper (driving) beams or to be mounted in fog lights, rear fog lights, backing lamps and the like are generally provided with a paraboidal or ellipsoidal reflector member with the filament of a lamp located near the focus thereof in a relationship depending on the function to be accomplished by the headlight.

The light which has been reflected by the reflector is then "shaped" by refraction through either a lens (for ellipsoidal reflectors) or one or more systems comprising lenses and prisms (for parabolic reflectors) in order to obtain the desired light distribution.

The transparent refractor needs to be located very precisely in respect of the reflector and its angle of inclination is limited to a maximum value of 30° (with respect to the horizontal plane) because of light penetration and dispersion phoenomena, and because of the manufacturing technique. Additionally, an uneven thickness of such transparent means causes an absorption of the light beam that can be between 25% and 30% of the overall light intensity.

It is known a composite reflecting mirror having a plurality of adjacent columnar reflecting surfaces (or lenses) with different values of thickess and area.

The object of the present invention is to overcome the above mentioned drawbacks, particularly the absorption inconvenience, by shaping the light beam distribution directly through the reflector, thus eliminating the need of a refracting device which is replaced by a simple clear transparent glass with the only function of protecting the reflector.

An essential feature of the headlight according to the present invention consists in that the reflector "shapes", i.e. modifies the light beam thanks to a composite reflecting surface formed by a plurality of adjacent columnar reflecting portions profiled - in a transverse cross section - as arcs of circles with the ends of such arcs located on a reference curve formed by one or more segments of conics. The reflector according to the invention allows for a quick design and check, and the resulting surface is uniform and aesthetically pleasant.

More particularly the beam shaping is accomplished through a modification of the surface of the reflector by replacing the profile of a "reference" paraboloid (or other surface of revolution) with a plurality of adjacent columnar reflecting surfaces (also called lenses) the cross sections of which are arcs of circles with both ends lying on two predetermined points of the reference parabola (or other conic curve) in the plane of the cross-section. The parameters of said arcs of circles, such as radius and length, are selected so that the reflection of a filament light in the intersection point reaches a plane (perpendicular to the optical axis) at an assigned distance from the center of such plane. The cross-section curve formed by the plurality of adjacent arcs of circles is then vertically shifted along a conic directrix that can be an arm of a parabola, of an ellipse, of a circle, or a curve made up by a combination of more conics.

It is not required that the reference parabola be formed by a segment of a single curve; it can be formed by properly selected segments of parabolas having different focuses or foci. More generally the reflector member can be formed by one or more portion of surfaces of revolution.

The reflecting lens pitch (length of the sector) can be either constant or variable, in accordance with the design needs.

It is evident that the reflector of the invention works with any filament of any lamp that has been approved for motor vehicles (with or without a shielding cup).

It is further evident that the shape of the headlight, when seen frontally, can have any suitable shape e.g. round, squared, rectangular or elliptical.

The invention will now be described in details with reference to the attached drawings, that are only exemplary and non limiting, and in which:

Fig. 1 is a schematic cross-section view showing a reference parabola with a single arc of circle for illustrating the principle of the invention;

Fig. 2 is a schematic cross-section view showing a portion of a reflecting surface (or reflecting lens) according to the invention with a plurality of arcs of circles resting on a reference parabola;

Fig. 3 is a perspective view showing a headlight reflector in accordance with the present invention;

Fig. 4 is a perspective view showing a headlight reflector according to the prior art; and

Fig. 5 is an explanatory perspective view of a reflectig surface according to the invention.

In the following and for simplicity sake, reference will be made to a cross-section of the reflector with a plane containing its optical axis. Thus in such cross section a reference paraboloid becomes a parabola and the columnar reflecting surfaces, that are shaped like cylindrical portions with a curved axis, become simple arcs of circles.

As illustrated in Fig. 1, according to the invention the cross-section profile of a parabolic reflector is modified by replacing an arc of the reference conic with an arc of circle 1 the ends 5, 7 of which rest on the conic 3, and more precisely are coincident with the ends of the arc to be replaced. This way a light ray from the filament 9 of a lamp 17 located near the focus of the reference parabola 3 is reflected by the curve 1, at point 5 or 7, onto a plane 11 at an assigned distance from the center point 15 defined by the intersection of plane 11 with the optical axis 13.

Fig. 2, in which the same references of Fig. 1 have been used for similar elements, shows a schematic cross-section of a portion of a reflecting surface according to the invention that is formed by a plurality of adjacent arcs of circles resting on a reference parabola. Since the profiles of the arcs of circles 1 are shifted or reproduced along a directrix of the parabola, the aspect of the reflector 19 is like the one shown in Fig. 5, comprising a plurality of reflecting surfaces 1 "carved" in the reflector body.

The above profile is easily designed and verified, and at the same time leads to a uniform surface that is aesthetically pleasant.

More particularly such modelling is carried out through arcs of circle 1 that rest (i.e. start and terminate) on the profile of the reference parabola 3, i.e. for the or each arc of circle both ends coincide with the ends of the arc of the reference parabola to be replaced. The arcs of circle are selected so that a light ray from the filament 9 is reflected by said intersection points 3 or 5 into a plane 11 (that is orthogonal to the optical axis 13) at an assigned distance from the center point 15 defined by the intersection of plane 11 with the optical axis 13.

The so obtained curve is then vertically shifted or reproduced along a directrix of the reference conic that can be a parabola, an ellipse, a circle or a combination of more conic sections.

In other words, in the reflector according to the invention, the curved edges of each of the adjacent columnar reflecting surfaces 1 lie on the surface of the reference paraboloid (or other selected surface of rotation).

The reference parabola 3 can be a portion of a single parabola or a curve formed by portions of properly selected different parabolas (having different focuses).

The pitch of the reflecting lens (that is the length of the sector) can be either constant or variable. In the embodiment of Fig. 2, the distance between the end points 5 and 7, as measured perpendicularly to the optical axis 13, is kept constant.

Of course any filament 9 of any lamp 17 that has been officially approved for motor vehicles can be used in the headlight of the invention (with or without a cup).

It is as well evident that the headlight frontally can have any shape, such as round, squared, rectangular (as shown in Fig. 5) or elliptical.

For comparison purpose, Fig. 3 shows a perspective view of a reflector 19 according to the invention and Fig. 4 illustrates a reflector 19' of the prior art.

From the comparison it is clear that the image 21 reflected onto the screen 23 by reflector 19 is quite wider than the image 21' reflected onto screen 23' by reflector 19'.

Claims

1. A vehicle headlight of the clear transparent refractor type, comprising a reflector member (19) provided with a reflecting surface having a reference surface formed by at least one portion of a surface of revolution, and a light source (9, 17) located near the focus of said surface of revolution, characterized in that said reflecting surface comprises a plurality of adjacent columnar reflecting surfaces (1), each of said columnar reflecting surfaces (1) having a cross-section that is an arc of circle and having both curved edges lying on said reference surface of revolution.

2. A vehicle headlight as claimed in claim 1, characterized in that each of said arcs of circle (1) has a start and terminal point (5, 7) lying on the profile of a reference parabola (3); said arcs of circles being selected so that the reflection of the filament (9) light in the intersection points (5 or 7) reaches a plane (11) that is perpendicular to the optical axis at an assigned distance from the center of such plane (11); with the so obtained curve being then shifted or reproduced along a directrix that can be an arm of a parabola, an ellipse, a circle or a curve made up by a combination of more conics.

3. A vehicle headlight as claimed in claims 1 and 2 characterized in that said reference parabola (3) comprises a portion formed by properly selected different parabolas having different focuses.

4. A vehicle headlight as claimed in the preceding claims, characterized in that the pitch of the reflecting surfaces, or length of the sector, can be either constant or variable.

5. A vehicle headlight as claimed in the preceding claims, characterized in that the radius of said arcs of circles varies from a sector to the other.

6. A vehicle headlight as claimed in the preceding claims, characterized in that the headlight can use any lamp (17) that has been officially approved for motor vehicles (with or without a cup).

7. A vehicle headlight as claimed in the preceding claims, characterized in that said headlight, when seen frontally can have any shape, such as round, squared, rectangular or elliptical.

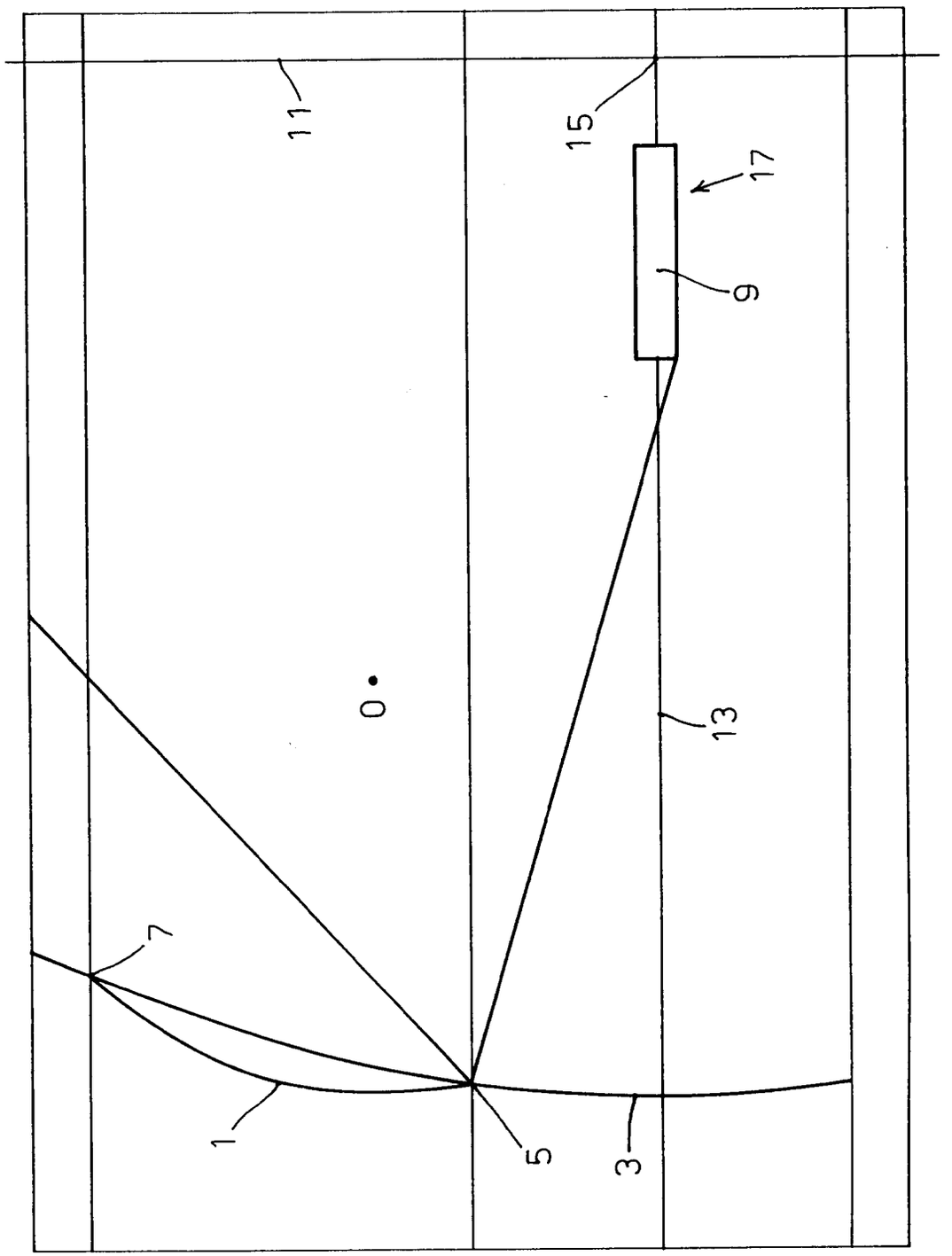

FIG. 1

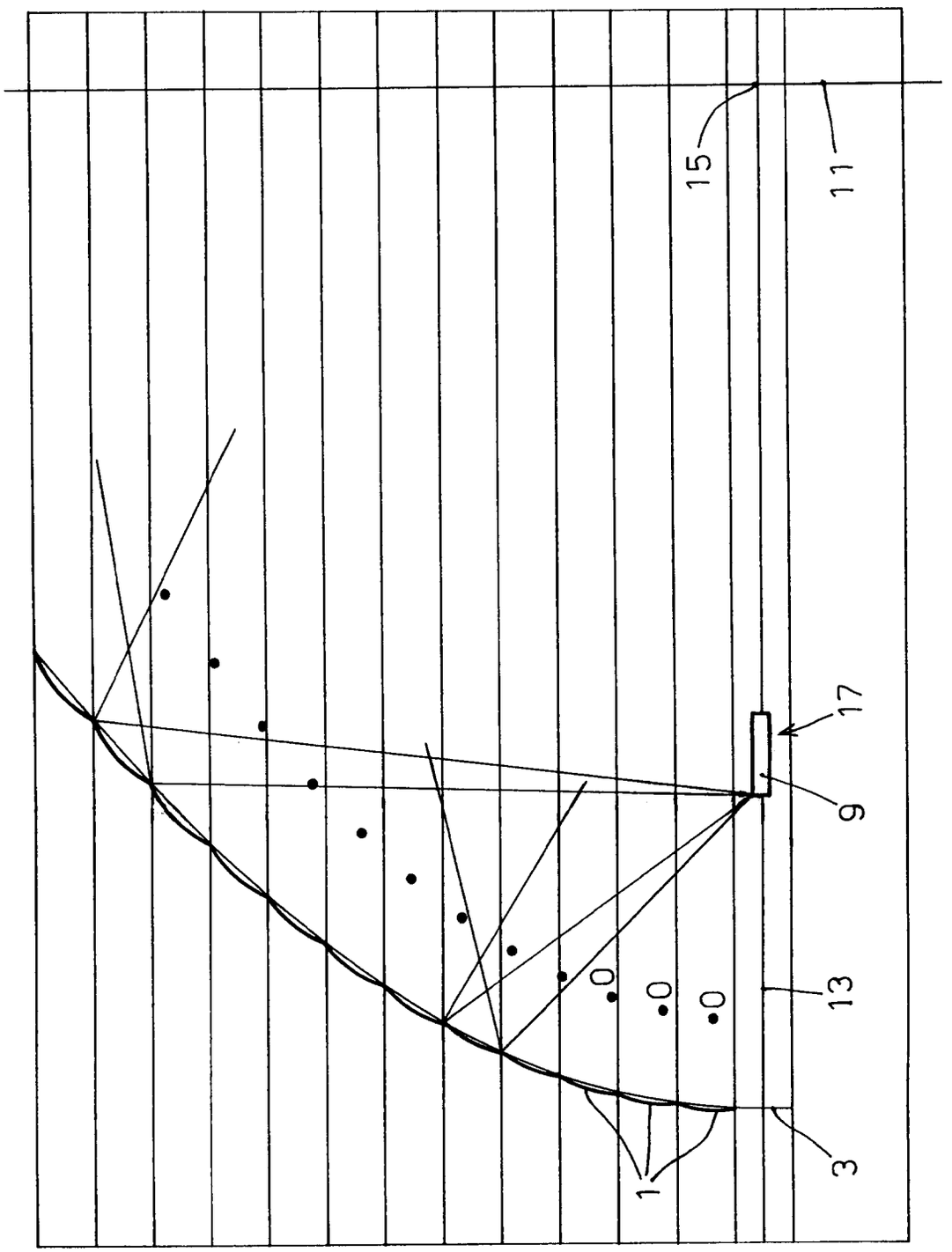

FIG. 2

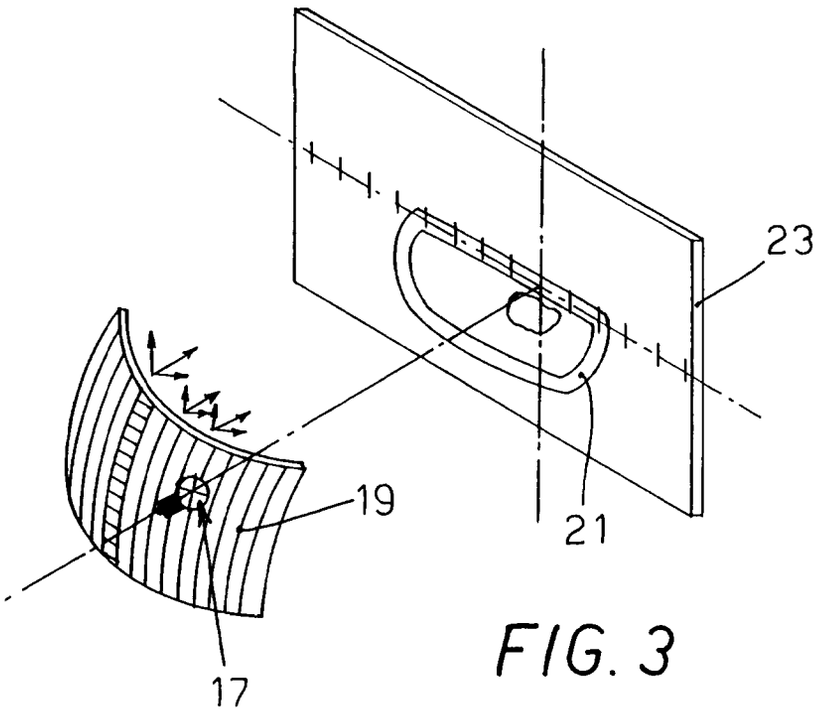

FIG. 3

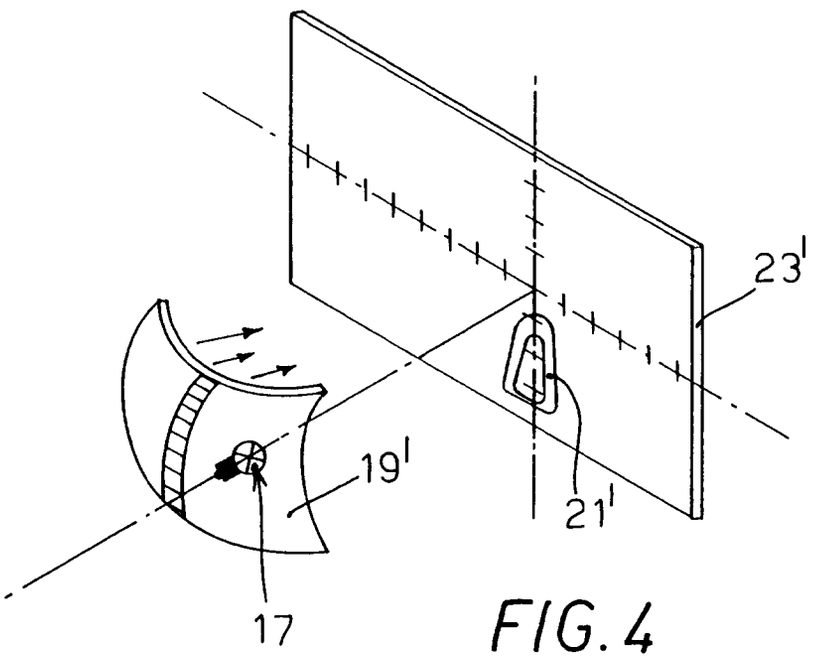

FIG. 4

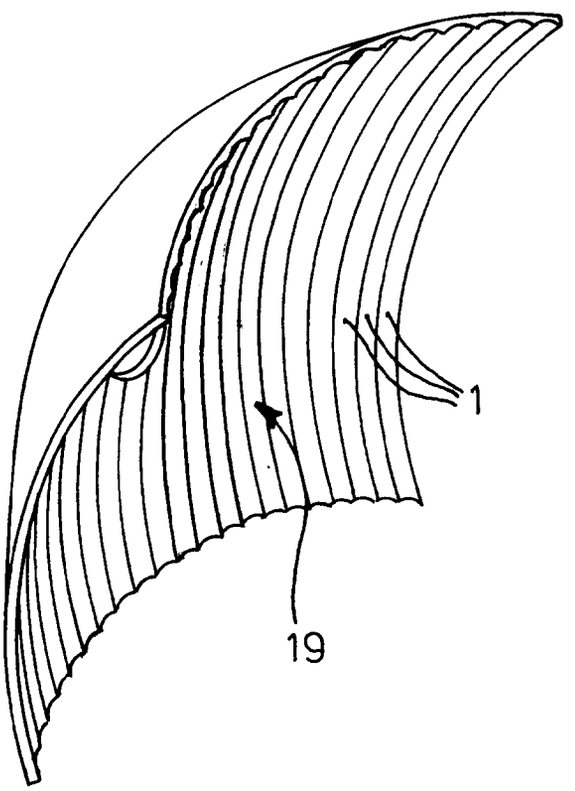

FIG. 5