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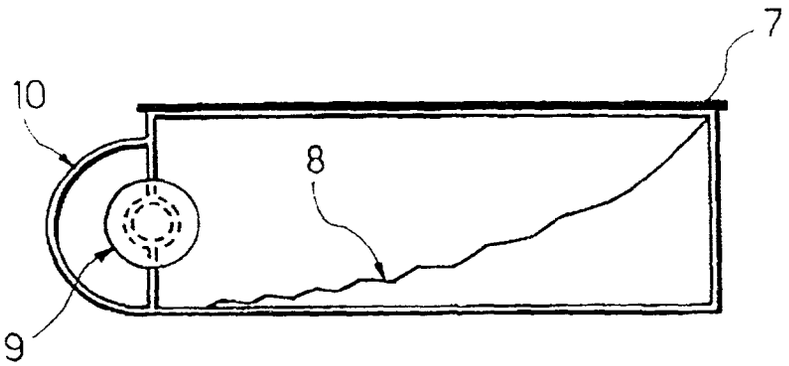
(54) Lamp for motor-vehicles

(57) A motor-vehicle lamp comprises a hollow body (2) having a front aperture closed by a transparent plate (7) and a main reflective wall (8) facing the transparent plate (7). The body of the lamp has a relatively reduced dimension in the direction orthogonal to the transparent plate (7) and includes a light source (9) located at one side of the hollow body, with which there is associated an auxiliary reflective element (10) to direct light rays emitted by the source (9) in a direction substantially parallel to the transparent plate (7), towards the main reflective wall (8), which is able to reflect these rays towards the transparent plate (7), so as to obtain a uniform light beam having the required characteristics coming out of said transparent plate.

FIG. 2



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Description

The present invention relates to the field of motor-vehicle lamps.

In recent years, the evolution in the design of motor-vehicle bodies has led to positioning the rear lights at areas of the motor-vehicle which are not ideal in order to achieving the required lighting characteristics. Thus a number of problems have raisen in the design of vehicle lights, which must be solved while simultaneously considering the need of obtaining a structure which is relatively simple to manufacture, with a reduced bulk and at low cost.

The object of the present invention is that of solving all the above mentioned problems efficiently by providing a lamp which has a minimum bulk along the direction orthogonal to the transparent element of the lamp, which is simple and inexpensive to manufacture and ensures that a uniform light beam is obtained at the output, having the required characteristics, even in case the lamp is positioned at an area of the motor-vehicle which is not ideal in order to achieving a good rearward lighting, such as at a side edge of the rear part of the motor-vehicle.

In order to achieving this object, the invention provides a lamp for motor-vehicles comprising:

- a hollow body having a front aperture closed by a transparent plate, and a main reflective wall facing the transparent plate, said hollow body having a relatively reduced dimension along the direction orthogonal to the transparent plate,
- a light source located at one side of the hollow body, with which there is associated an auxiliary reflective element for directing light rays emitted by the light source in a first direction substantially parallel to the transparent plate, towards the main reflective wall, said main reflective wall reflecting the rays towards the transparent plate, so as to obtain a uniform light beam having the required characteristics coming out of the transparent plate,
- wherein said main reflective wall has a central area defined by a stair-like arrangement of paraboloid segments located side by side along said first direction and each having a focus located at the light source, and two lateral areas.

These lateral areas may be also defined by a plurality of paraboloid segments located side by side along said first direction or alternatively may have a smooth surface.

The surface of the main reflective wall is optimized in order to lighten the transparent plate uniformly and the paraboloid segments are calculated in order to provide a light beam coming out of the lamp body in the required direction.

The light source with the auxiliary reflective element associated therewith is positioned on one side of the lamp body, either centrally with respect to this side, or at one end thereof, at one edge of the lamp body. This auxiliary reflective element has a cylindroid-like surface and forms, along with the light source associated therewith, a single unit provided with means for quick coupling to the lamp body.

The light source is preferably constituted by a lamp whose base is arranged transversely with respect to the optical axis of the auxiliary reflective elements and is received within a notch formed in the front edge of the auxiliary reflective element. Therefore, in order to replace the lamp, it is necessary to disengage the auxiliary element from the lamp body and then remove the electric lamp from the front notch of the auxiliary reflective element, proceeding thereafter in the opposite way in order to install the new electric lamp. This solution further reduces the bulk of the lamp according to the invention.

The main reflective wall is able to give raise to a uniform light beam, having the required characteristics, without the need of providing further prisms on the transparent plate, even if of course this possibility remains available to the designer.

The lamp according to the invention solves all the above mentioned problems brilliantly, while keeping the bulk along the direction orthogonal to the transparent plate extremely reduced, which renders possible to position the lamp even at areas of the motor-vehicle where the available space is very reduced.

Further features and advantages of the invention will become apparent from the description which follows with reference to the annexed drawings, given purely by way of non limiting example, in which:

figure 1 is a perspective view of a rear light unit for a motor-vehicle, including at least one lamp according to the present invention,
figure 2 is a diagrammatic cross-sectional view of the lamp of figure 1, in the plane orthogonal to the transparent plate and passing through the optical axis of the auxiliary reflective element,
figures 3, 4 show a view developed in a plane of two alternative embodiments of the main reflective wall of the lamp according to the invention,
figure 5 is a perspective view of the main reflective wall of one embodiment of the lamp according to the invention,
figure 6 is a diagram which shows the features of the light beam coming out of the lamp, in the horizontal and vertical planes,
figure 7 is a cross-sectional view of a rear light unit of a motor-vehicle, including two or more lamps according to the present invention, located side by side in a configuration adapted to minimize the bulk of the device, and
figure 8 shows a variant of the lamp according to the invention.

In figure 1, reference numeral 1 generally desig-

nates a rear light unit for a motor-vehicle, which is to be arranged along the righthand lateral edge of the rear portion of a motor-vehicle. The light unit 1 comprises a plurality of lamps 2, 3, 4, 5, 6 which are aligned vertically above each other, at least one of which is made according to the present invention. In the following, reference will be made, purely by way of example, to lamp 2.

With reference also to figures 2-4, the lamp comprises a box-like body opened at the front. The front aperture of the box-like body, which is preferably made of plastic material, is closed by a transparent plate 7 (see figure 2). The wall of the hollow body of the lamp which faces the transparent plate 7 constitutes a main reflective wall 8 having a central area 8a and two lateral areas 8b.

As clearly shown in the drawings, the dimension of the lamp along the direction orthogonal to the transparent plate 7 is greatly reduced with respect to the other dimensions of the lamp. In other words, the reflective wall 8 is relatively close to the transparent plate 7. This arrangement is possible since with the lamp 2 there is associated a light source 9 which is constituted by an electric lamp which is arranged at one side of the lamp body and surrounded by an auxiliary reflective element 10.

Figures 3, 5 show two possible alternatives in which the lamp 9 is arranged at one side of the lamp body, at the center of this side (figure 3) or at one end thereof (figure 4) at one edge of the lamp body (as shown also in figure 1).

The arrangement of figure 4 is preferred to that of figure 3 since it provides a greater value of the ratio between the surface of the central area 8a and the total surface of the reflective wall 8.

The central area 8a and the lateral areas 8b of the reflective wall 8 can be made as to form a continuous surface, as shown in figure 5.

Furthermore, as shown in figures 3, 4, the electric lamp 9 has a base 9a which is arranged transversely with respect to the optical axis of the auxiliary reflective element 10 and is received within a notch 10a formed in the front edge of the reflective element 10. The reflective element 10 and electric lamp 9 form a single unit provided with means of any known type (not shown) for quick coupling to the body of lamp 2.

The arrangement shown in figure 7 minimizes the bulk of the device in the case of two or more adjacent lamps, where the auxiliary reflective element 10 of each lamp is fitted under the reflective wall 8 of the adjacent lamp. By this arrangement, the transparent plate 7 can be arranged side by side with no remaining non-illuminated gaps between adjacent lamps.

As shown in figures 5 and 8 for two alternative embodiments, the central area 8a has a number of paraboloid segments arranged side by side along the direction of the optical axis of the auxiliary reflective element 10.

The lateral areas 8b can be defined similarly to the central area 8a or alternatively may have a smooth surface in order to simplify the moulding operation of the lamp body.

The transparent plate can be provided with prisms and preferably has a peripheral edge which is shaped so as to obtain particular aesthetical effects, or iridescence effects or in order to control the light beam.

In an alternative embodiment (not shown) the transparent plate 7 has a matrix of microlenses adapted to further modify the characteristics of the light beam coming out of the device.

Figure 6 shows a diagram which shows two graphs I, II relating to the light intensity characteristics in the horizontal and vertical planes respectively.

Although the lamp is arranged on the motor-vehicle at a position such that the geometrical axis of the lamp is inclined upwardly and outwardly with respect to the longitudinal direction of the motor-vehicle, the geometrical characteristics of the reflective wall 8 are such that the light beam coming out of the device has the required direction.

As indicated in the foregoing, the wall of the lamp body is made of plastic material and is coated with aluminium at the area where it is necessary to provide reflective characteristics. The transparent plate is also made of plastic material, according to the conventional requirements.

The auxiliary reflective element which is associated with the electric lamp can be made of aluminium pressed sheet. In a possible alternative solution, the whole unit of the auxiliary reflective element is made by electroforming, a method which provides a greater precision in the manufacture, a greater flexibility in the design of the shape and a greater dissipation ability with respect to the conventional materials.

Naturally, while the principle of the invention remains the same, the details of construction and the embodiments may widely vary with respect to what has been described and illustrated purely by way of example.

For example, the paraboloid segments could be replaced by ellipsoid segments or more generally by any other type of surface obtained by rotating a conic section.

Claims

1. Motor-vehicle lamp, comprising:

   - a hollow body (2) having a front aperture closed by a transparent plate (7), and a main reflective wall (8) facing the transparent plate (7), said hollow body (2) having a relatively reduced dimension along the direction orthogonal to the transparent plate (7),
   - a light source (9) located at one side of the hollow body (2), with which there is associated an auxiliary reflective element (10), for directing

light rays emitted by the source (9) in a first direction substantially parallel to the transparent plate (7), towards the main reflective wall (8), said main reflective wall (8) being adapted to reflect these rays in the direction of the transparent plate (7), so that a uniform light beam having the required characteristics is obtained coming out from said transparent plate (7),

- wherein said main reflective wall (8) has a central area (8a) defined by a stair-like arrangement of paraboloid segments located side by side along said first direction and each having a focus in the light source, and two lateral areas (8b)

2. Lamp according to claim 1, characterized in that the light source (9), along with the auxiliary reflective element (10) associated therewith, is positioned at the center at one side of the lamp body (2).

3. Lamp according to claim 1, characterized in that the light source (9) along with the auxiliary reflective element (10) associated therewith is positioned at one edge of one end of the lamp body (2).

4. Lamp according to claim 1, characterized in that the auxiliary reflective element (10) has a cylindroid-like surface.

5. Lamp according to claim 1, characterized in that the light source (9) along with the reflective element (10) associated therewith forms a single unit provided with means for quick coupling to the lamp body (2).

6. Lamp according to claim 5, characterized in that the light source (9) is constituted by an electric lamp whose base (9a) is arranged transversely to the optical axis of the auxiliary reflective element (10) and is received within a notch (10a) formed on the front edge of the auxiliary reflective element.

7. Lamp according to claim 1, characterized in that the transparent element (7) has no prisms.

8. Lamp according to claim 7, characterized in that the transparent element (7) has a peripheral edge shaped in such a way as to provide iridescence effects or effects affecting the light beam.

9. Lamp according to claim 1, characterized in that the transparent element (7) has a matrix of microlenses.

10. Lamp according to claim 1, characterized in that a coloured filter is associated with the light source.

11. Light unit for motor-vehicles, including two or more lamps according to claim 1, characterized in that the reflective element (10) of each lamp is fitted under the reflective wall (8) of the adjacent lamp.

12. Lamp according to claim 1, characterized in that said lateral areas (8b) have a smooth surface.

13. Lamp according to claim 1, characterized in that said lateral areas (8b) are each defined also by a stair-like arrangement of paraboloid segments.

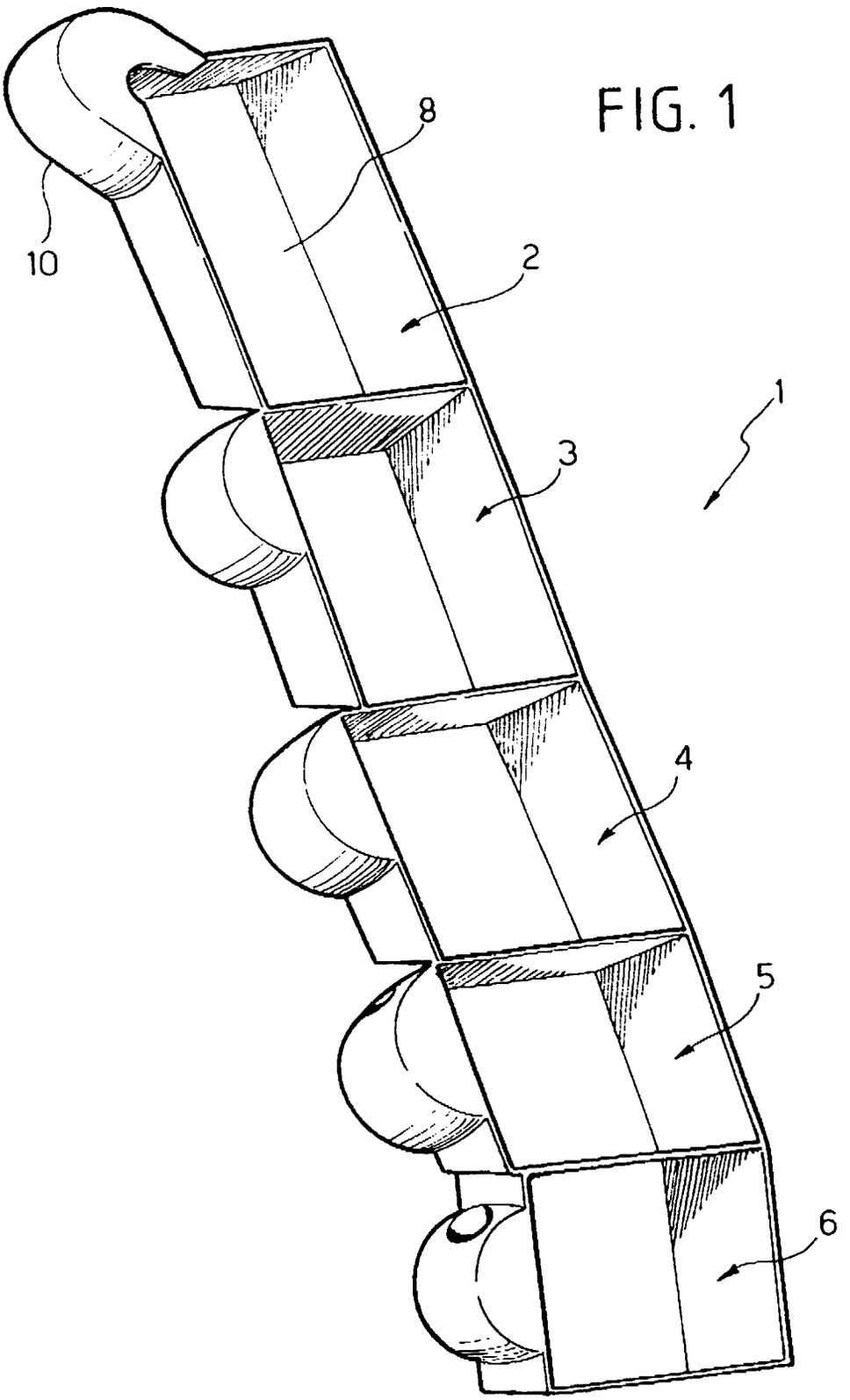


FIG. 1

FIG. 2

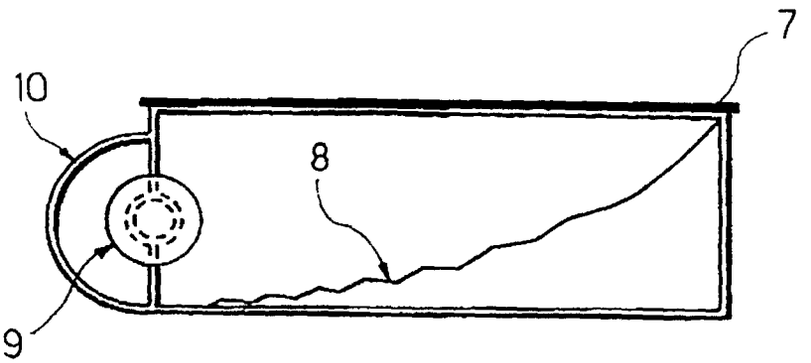


FIG. 3

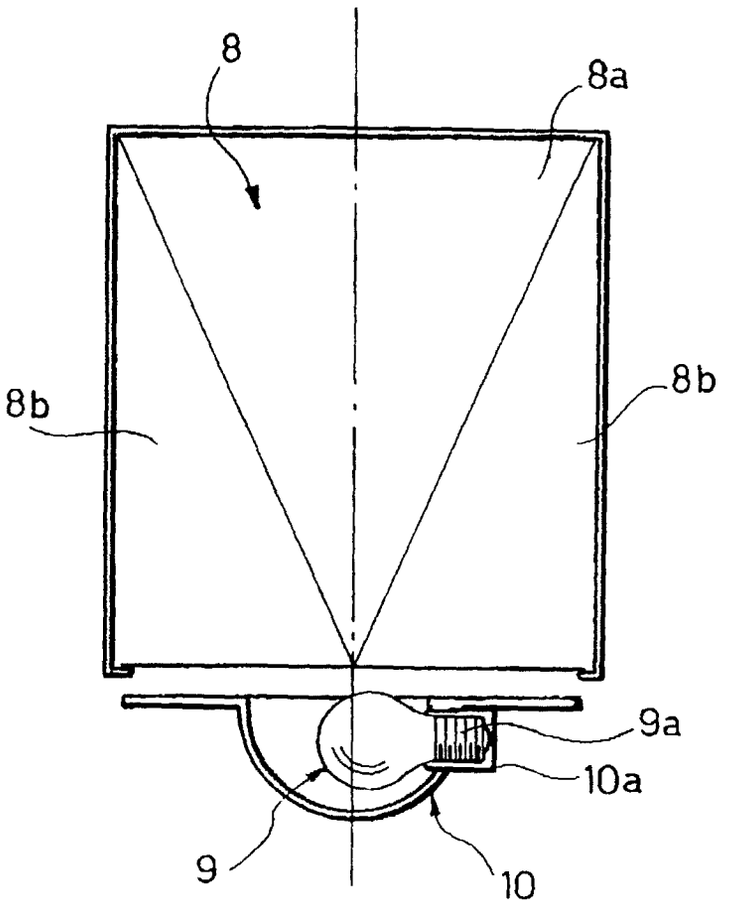


FIG. 4

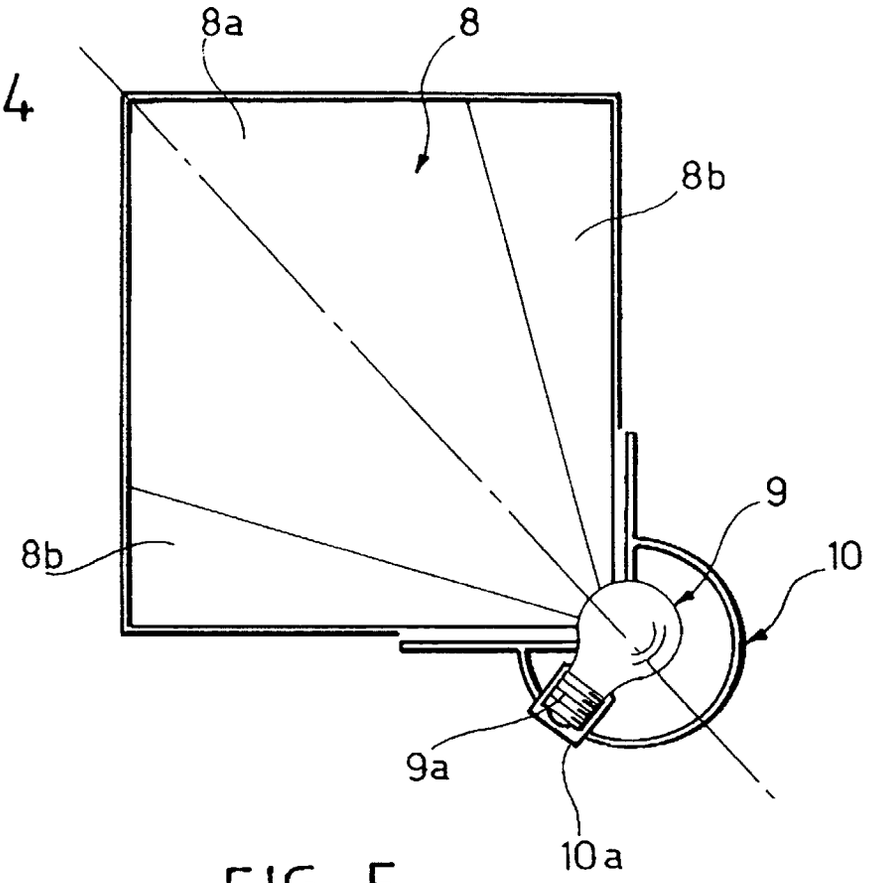
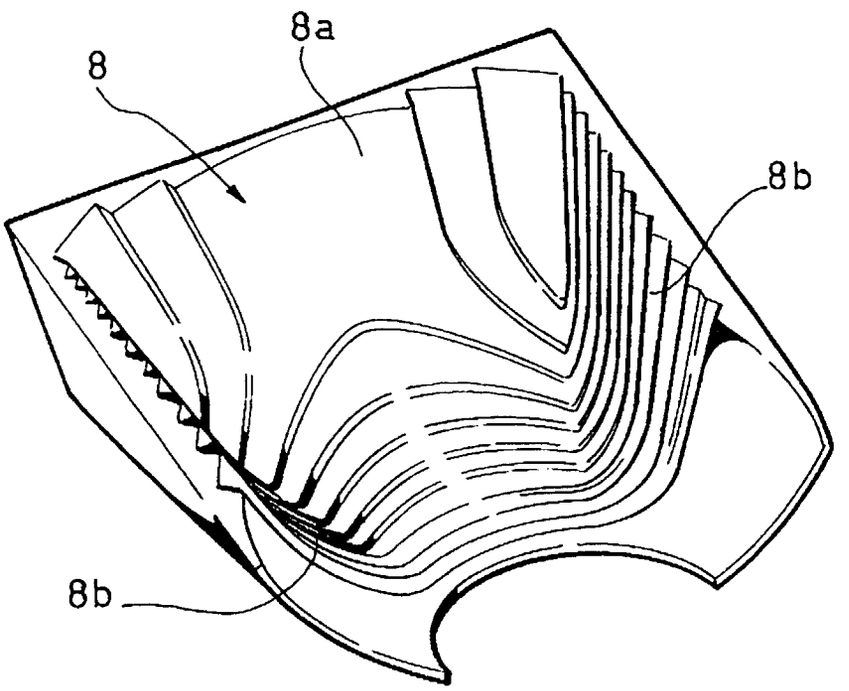


FIG. 5



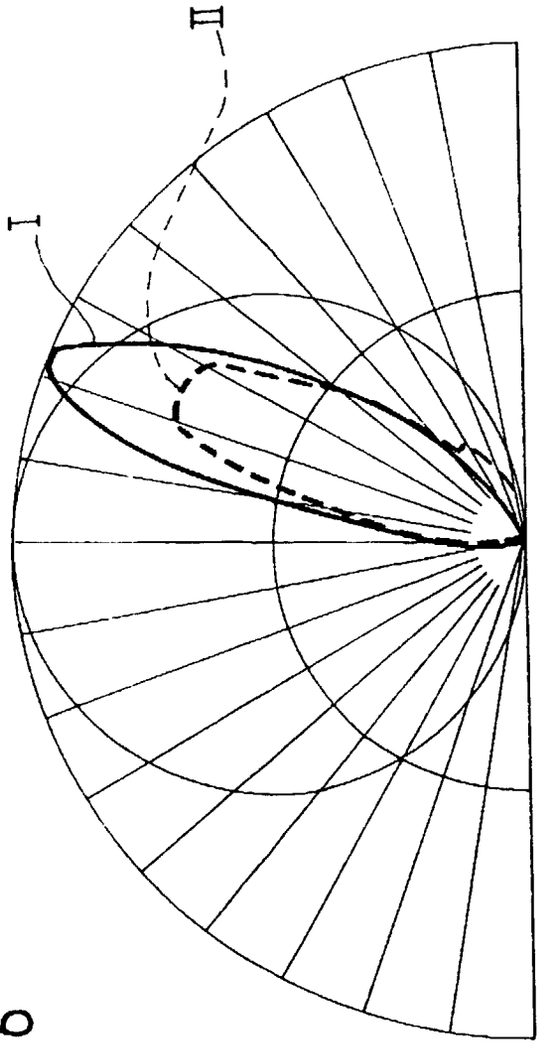


FIG. 6

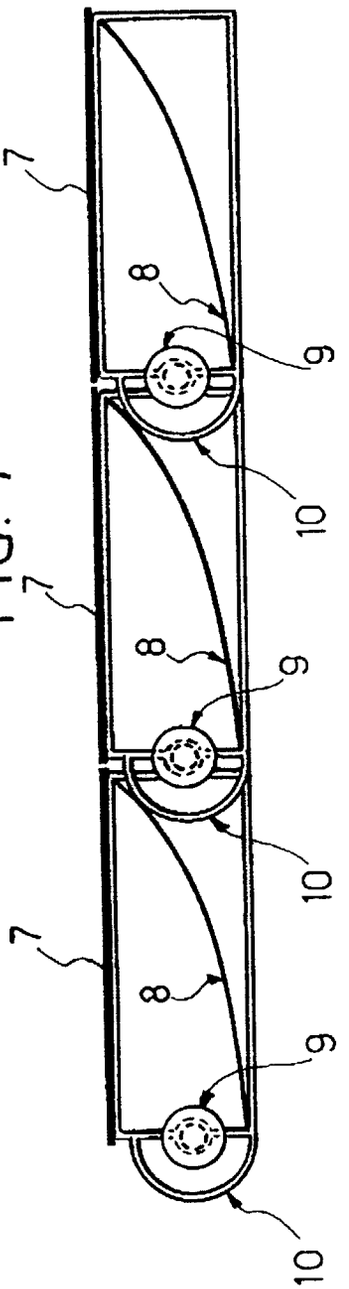


FIG. 7

FIG. 8