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(12) # EUROPEAN PATENT APPLICATION

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(54) **Improvements in or relating to luminaires.**

(57) The invention relates to luminaires for example for use in shops, offices and factories.

In the past the light intensity of certain types of luminaires have a varied in an axial direction to that light intensity in a transverse direction. It has been a problem to illuminate areas equally.

Sometimes, in a factory, lighting has been mounted on a cross beam several metres above a shop floor. Because of the distance from the shop floor to the light source the intensity of the light at the shop floor has been insufficient.

The invention provides a housing (11) comprising a metallised reflector (3) having specularly (7) and diffusely reflective (8) portions. The portions reflect the light from a light source (10) which lies substantially diagonally within a substantially square section of the lamp housing (1) such that light is evenly reflected onto a floor below.

A separate skirt may be attached for use in a high ceiling environment to focus the light.

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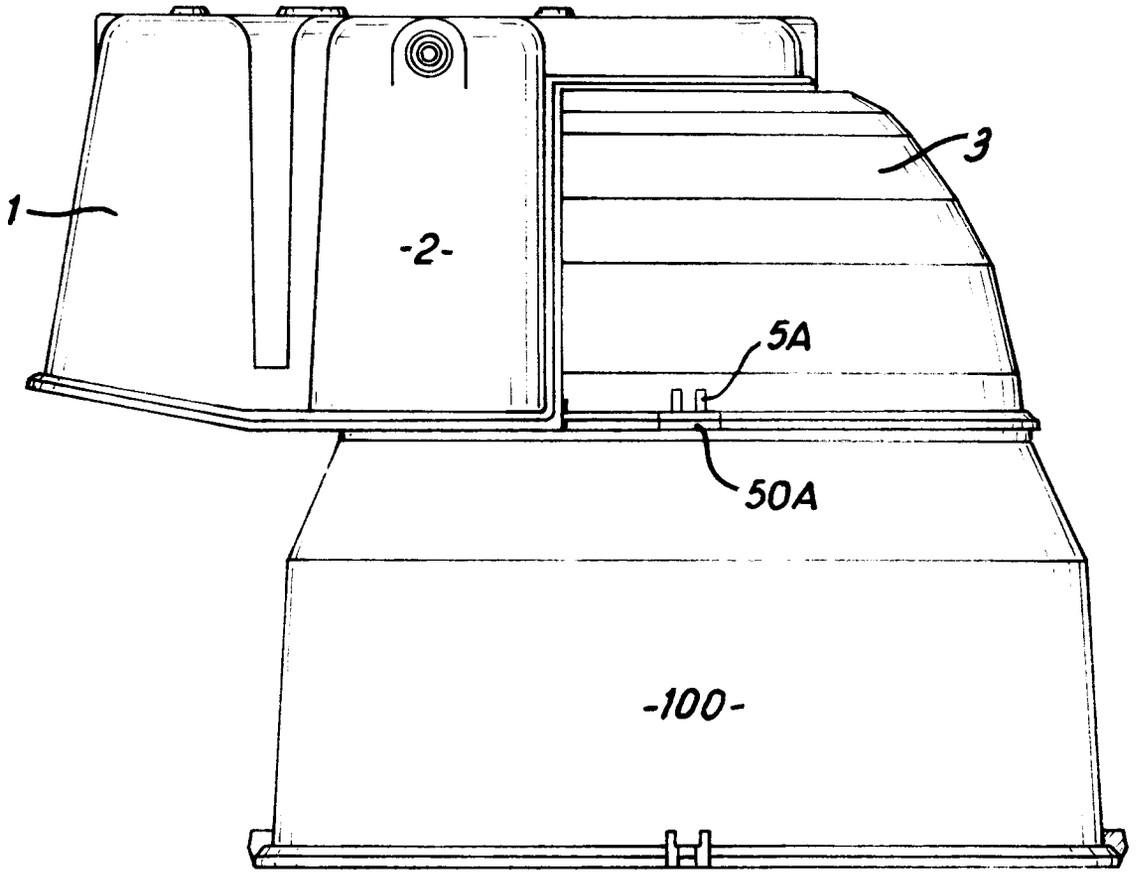


FIG. 8

This invention relates to luminaires in particular, but not exclusively, the invention relates to luminaires which are intended to be used in large numbers to illuminate extensive floor areas, such as in shops, offices, factories and the like.

Conventionally these type of luminaires suffer from the drawback that their light output varies spatially.

According to the present invention there is provided a luminaire having an axial to transverse spacing to height ratio substantially equal to one.

Preferably the luminaire comprises a lamp housing having a substantially rectangular opening, the housing being capable of supporting an elongate light source such that when supported the axis of the light source is substantially diagonal within the lamp housing.

Preferably a reflector is provided which has a metallised surface, portions of which are adapted to specularly reflect light and portions of which are adapted to diffusely reflect light. Such a reflector ensures that light is evenly transmitted both axially and transversely.

In some situations, such as within a factory or warehouse, the ceilings are higher than say in conventional offices. Sometimes the ceilings may be four or five metres higher, and in which case, because of the diffusing nature of light, the light intensity on a factory floor will be less than in an office if lamps of the same power are used. It has therefore been necessary in the past to provide a different type of luminaire for use in high ceiling environments. This has meant that lamp of higher power rating has had to be used, or a manufacturer has had to produce separate lamp housings, reflectors, louvres and the like, for lamps to be used in a low ceiling environment, so called low-bay luminaires; and a separate set of luminaires and related fittings, to be used in an environment with a high ceiling, so called high-bay luminaires.

According to a second aspect of the present invention there is provided a lamp housing and a reflector, the reflector having a surface, portions of which are adapted to diffusely reflect light and portions of which are adapted to specularly reflect light and a demountable attachment, the demountable attachment being such that when attached to the lamp housing the effective distance between the light source and a nominal plane passing through the rim of the demountable attachment is increased.

Preferably the light source is elongate and is provided within the lamp, the axis of the light source lying substantially diagonally within the lamp housing.

The lamp housing, which is adapted to selectively diffusely and specuarly reflect light, which is a demountable portion may be formed by a process known as vacuum metal vapour deposition on a plastics substrate. The plastics substrate is a high temperature resistant plastics material and may be produced by injection moulding. The interior of the reflector is contoured and textured prior to metal vapour deposition at the injection moulding stage.

Preferably the reflector housing has a substantially square section and an aperture in one corner, through which a support and electrical connection for a tubular light source may pass. The tubular light source is inserted into the tube support such that its axis is substantially parallel with a diagonal axis of the square reflector housing.

The lamp housing itself is preferably injection moulded from a similar plastics material on which the reflecting material is supported. It is important that this material is also resistant to high temperatures, which may exceed 200°C.

Embodiments of the present invention will now be described by way of example only, and with reference to the following figures in which:-

Figure 1a is a diagramatical representation of a tubular light source and its photometric properties;

Figure 1b is a polar plot of the photometric properties of the tube of Figure 1a;

Figure 2a shows diagramatically how eighteen lamps having a transverse to axial ratio of 1/2 are required to light an area;

Figure 2b shows diagramatically how only nine lamps having a transverse to axial ratio of 1 are required to light the same area of Figure 2a;

Figure 3 shows a side elevation of a low-bay luminaire;

Figure 4 shows an end elevation of the luminaire of Figure 3;

Figure 5 shows an end elevation of Figure 3, from the opposite end;

Figure 6 shows an underplan view of the luminaire of Figure 3;

Figure 7 shows an above plan view of the luminaire of Figure 3;

Figure 8 shows a side elevation of the luminaire of Figure 3 with a high-bay attachment;

Figure 9 shows an end elevation of the lamp with high-bay attachment;

Figure 10 shows an end elevation of Figure 8 from the opposite end;

Figure 11 shows an underplan view of Figure 8;

Figure 12 shows an above plan of Figure 8; and

Figure 13 shows a diagramatical representation of rays from the high-bay and low-bay lights.

Figure 1a, which is a diagramatical representation of a typical disymmetric luminaire and its resulting light rays, shows an illuminated floor area in the shape of a rectangle. Two lines, A-A and B-B, bisect the rectangle axially and transversely respectively. These lines are shown as reference lines in order to illustrate how the luminous intensity or photometric properties of the luminaire vary in the two perpendicular planes, namely axially and transversely. The inten-

sity of light produced from the luminaire is measured at a number of points through 180° in each plane. This is plotted on a polar chart as shown in figure 1b.

Figure 1b shows the polar chart as a graphical representation of the luminous intensity or photometric property of the invention. Ideally a uniform luminous intensity is desired both in the axial and transverse planes. This would appear on the polar chart as a completely symetrical shape throughout the vertical intersect. In the invention this is acheived by reflecting the light in a particular direction.

Because the photometric transverse to axial ratio is approximately one the number of luminaires required to light a large floor space is smaller than has been previously required. This last point is illustrated by the example shown in figures 2a and 2b.

Figure 2a shows an array of eighteen conventional luminaires used to light a floor space. The transverse to axial ratio of the luminaires is one half. Figure 2b shows diagramatically, how lamps constructed in accordance with the present invention, having the same light intensity, may be used to light the same floor space. However, only nine luminaires are required in order to create the same evenly lit environment, having no dark zones or harshly lit zones. This is very important because poor lighting in a large office or shop has often led to fatigue occuring in the employees, and a corresponding lowering in efficiency. By using luminaires in accordance with the invention, a bright and pleasant working environment is created, and fatigue is avoided.

Referring generally to Figures 3 to 7 a low-bay lamp housing 1 has a rigid plastics housing 2 to which is attached a reflecting and diffusing unit 3. The unit 3 is attached to the housing 2 to an overhanging limb 4 by way of a single screw 9. Clips 5 are mounted around a rim 6 of the reflector: The purpose of these clips is to enable a high-bay attachments to be mounted onto the luminaires as explained in detail below or by other means.

The housing 1 and unit 3 are formed from an injection moulding process using a high temperature resistant plastics material.

Figure 5 shows an underplan view of the lamp 1 and shows the generally square shaped reflecting and diffusing unit 3, with metallic reflective portions 7 and diffusing portions 8. The different textures, of the portions are applied to the inner surface of the unit 3 during the moulding of the lamp housing. The reflective metallic layer is applied to the textured surface by a metal vapour deposition process.

The lamp housing 1 supports the components such as balasts, ignitors, capacitators, starters, fuses, etc. for the normal running of the lamp on a metal geartray 20. The tray 20 is mounted onto the lamp by way of two screws 21 and 22. A lamp 10 which is shown in ghost lines, is inserted into a socket 11, which passes through an aperture in the reflector wall, at one corner of the reflector.

The axis of the lamp 10 is thus approximately at 45° to the square reflector. This arrangement provides a luminaire in which the photometric transverse to axial ratio is substantially equal to 1 and, which is also energy efficient.

Referring to Figures 8 to 12 a luminaire with a high-bay fitting 100 is shown. The views of the lamp and high-bay fitting correspond to the views of the luminaire in Figures 3 to 7. The same reference numerals have been used in both sets of Figures for clarity.

The high-bay fitting 100 is in the form of a square skirt and fits around the rim of the square aperture of the reflecting and diffusing unit 3. The fitting can be held in position by clips 50A and 50B which clip into clips 5A and 5B respectively or may be bonded or otherwise permanently attached.

The function of the fitting may be visualised with reference to Figure 13A. This is a diagramatical representation of rays of a lamp without the fitting - the so called low-bay lamp; and Figure 13B which is a representation of rays of a luminaire with the high-bay fitting.

The rays are focussed and Figure 13 shows how the high-bay attachment shapes the beam into a narrower column, thereby reducing spreading and enabling the low-bay luminaire to be used in a high ceiling environment with the fitting 100.

The advantages of this fitting and lamp combination are: that a manufacturer does not have to produce a range of different types of luminaires; fittings or associated hardware, but merely produces a low-bay lamp housing and fittings for perhaps one-or-two different ceiling heights.

It would be appreciated that the above description relates to only two embodiments of the invention and variation may be made without departing from the scope of the invention. For example a variation may be to include a Tungsten Halogen emergency lamp within the luminaire. These lamps are typically of 150 Watt power output and may be fitted to the gear tray by way of custom drilled holes. Other holes or similar supports may of course be provided for the requisite back-up equipment required by such lamps.

Claims

1. A luminaire having an axial to transverse spacing to height ratio substantially equal to one.

2. A luminaire according to claim 1 comprising a lamp housing, substantially rectangular opening.

3. A luminaire according to claim 2 wherein the housing is capable of supporting an elongate light source, such that when supported the axis of the

light source is substantially parallel to a diagonal of the lamp housing.

4. A luminaire according to any preceding claim having a reflector with at least a partially metallised surface, portions of which metallised surface are adapted to specularly reflect light and portions of which surface are adapted to diffusely reflect light.

5. A luminaire according to claim 4 wherein the reflector is demountable.

6. A lamp housing and a reflector, the reflector having a surface, portions of which are adapted to diffusely reflect light and portions of which are adapted to specularly reflect light and a demountable attachment, the demountable attachment being such that when attached to the lamp housing the effective distance between a light source supported by the lamp housing, and a nominal plane through a rim of the demountable attachment, is increased.

7. A lamp housing according to claim 6 wherein the light source is elongate,the axis of the light source lying substantially diagonally within the lamp housing.

8. A lamp housing having a reflector, the reflector having a surface, portions of which are adapted to diffusely reflect light and portions of which are adapted to specularly reflect light and a demountable attachment, the demountable attachment having portions which are adopted to specularly reflect light and portions of which are adapted to diffusely reflect light, the demountable attachment being such that when attached to the lamp housing the effective distance between the light source and a nominal plane passing through the rim of the demountable attachment is increased.

9. A lamp housing according to claim 6, 7 or 8 wherein the selectively diffusely and specularly reflective portions are formed on a plastics substrate by a vacuum metal vapour deposition process.

10. A lamp housing according to claim 9 wherein the interior of the reflector is contoured and textured prior to metal vapour deposition.

11. A lamp housing according to claim 10 wherein the contoured and texture interior of the housing is carried out at an injection moulding stage.

12. A lamp housing according to any of claims 6 to 11 having a substantially square cross section and an aperture in one corner, through which aperture a support and an electrical connection for a tubular light source may pass.

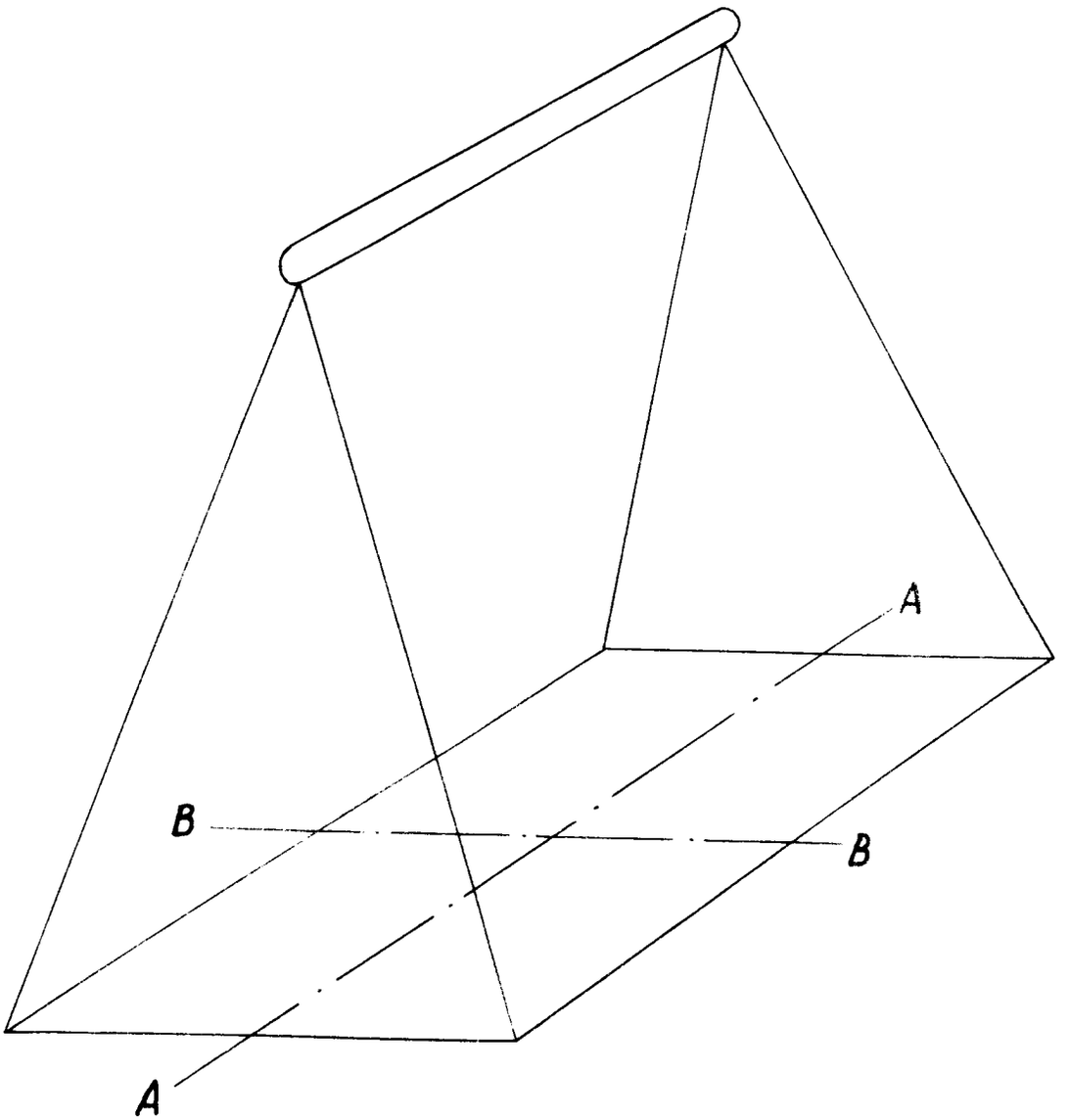


Fig. 1a

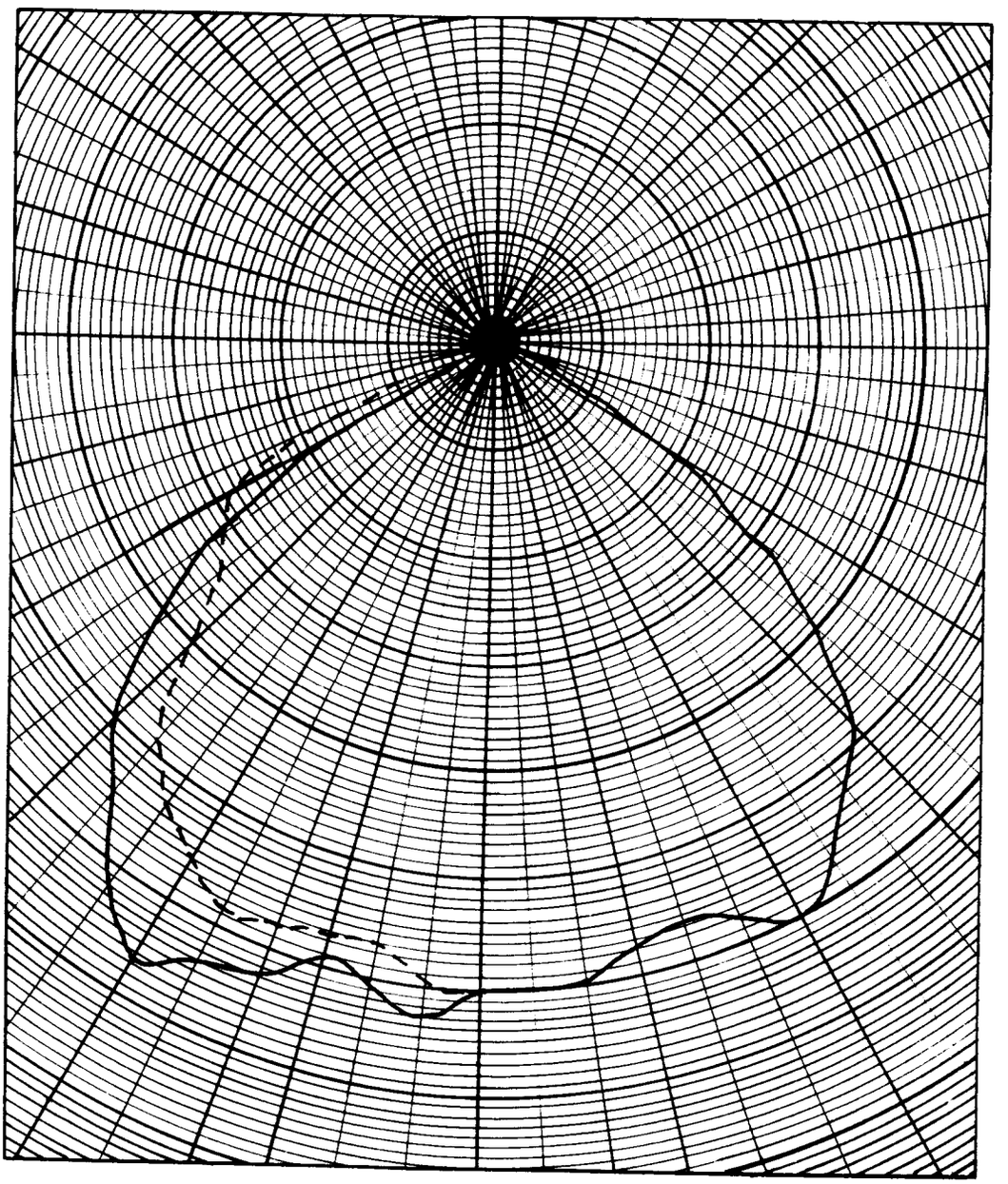


Fig. 1b

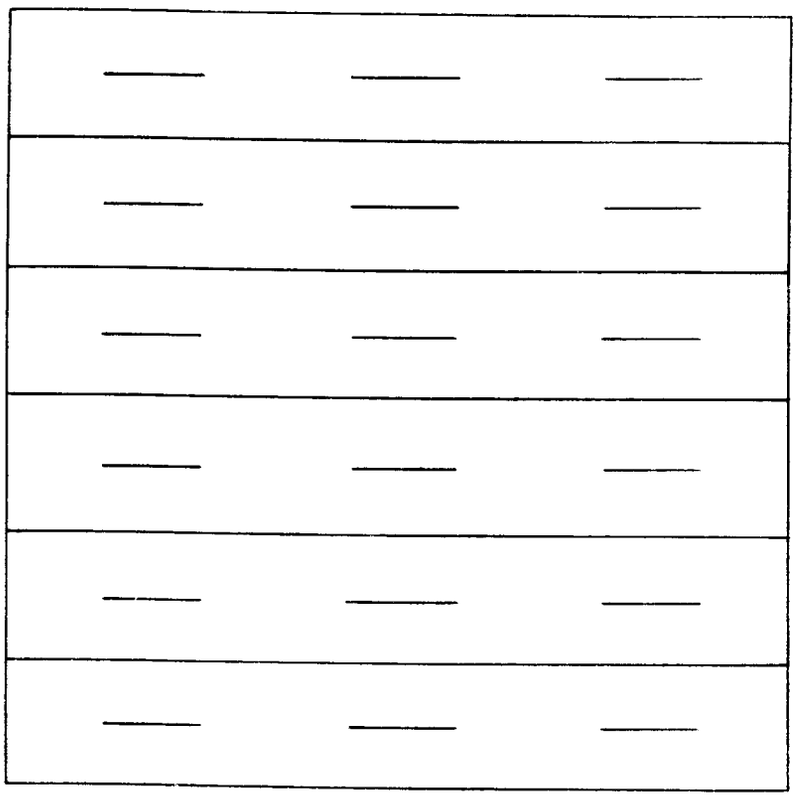


FIG. 2a

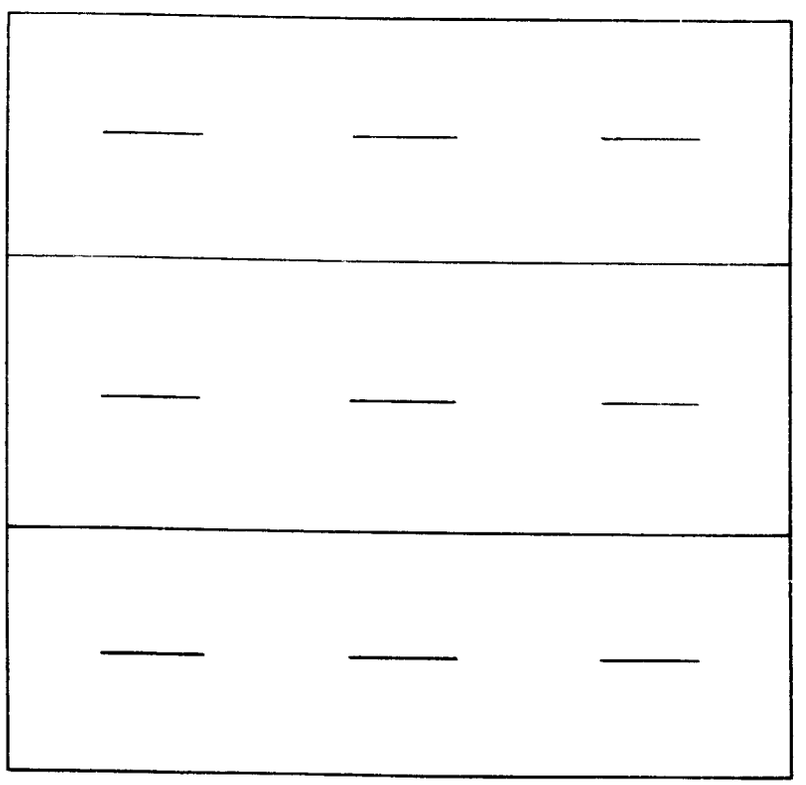


FIG. 2b

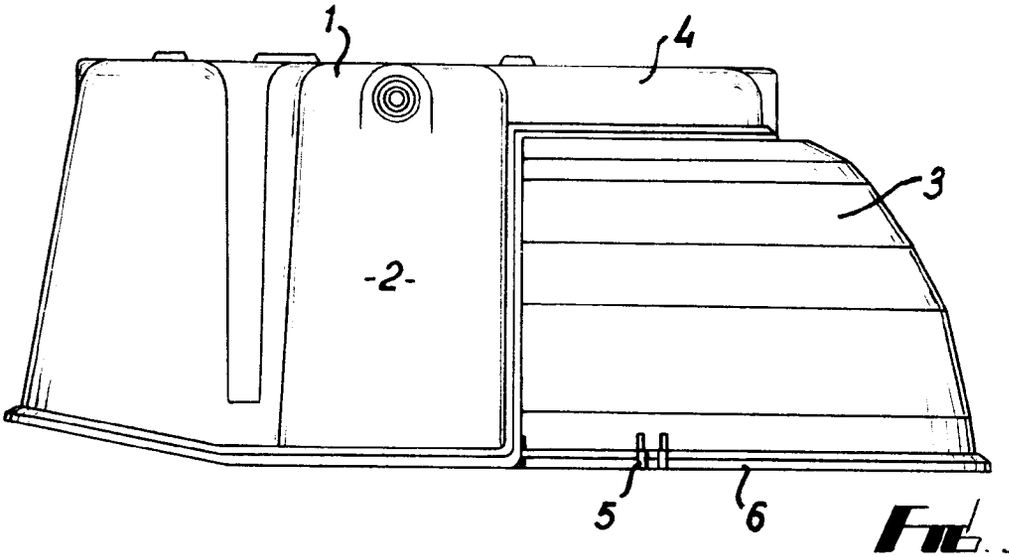


FIG. 3

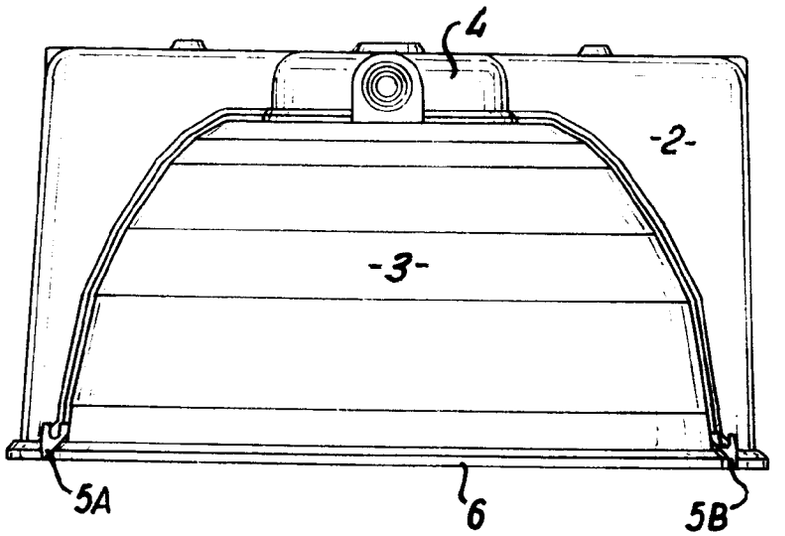


FIG. 4

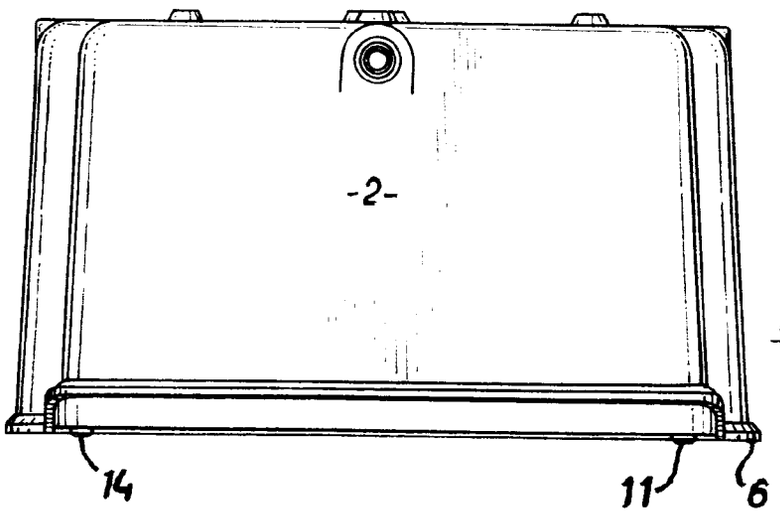


FIG. 5

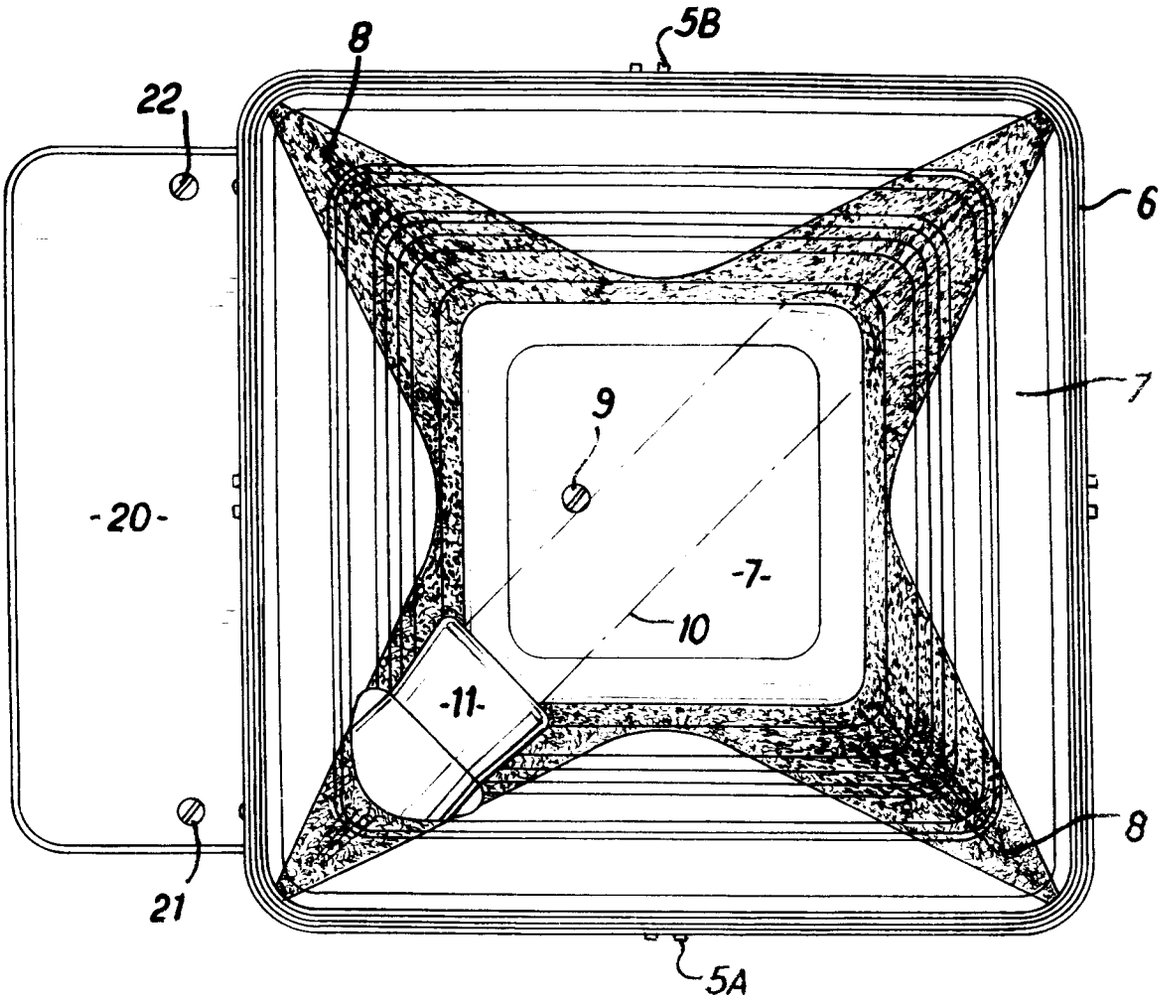
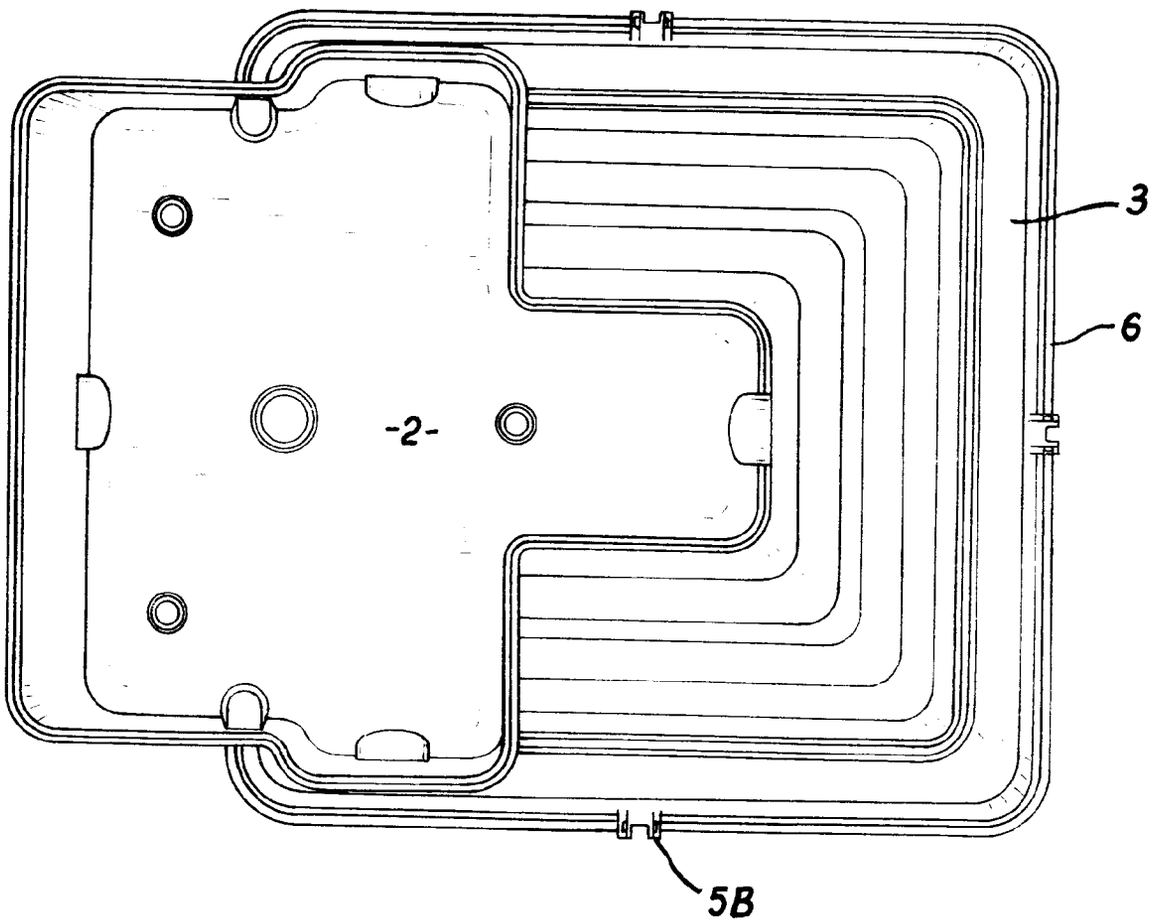


FIG. 6



Фиг. 1

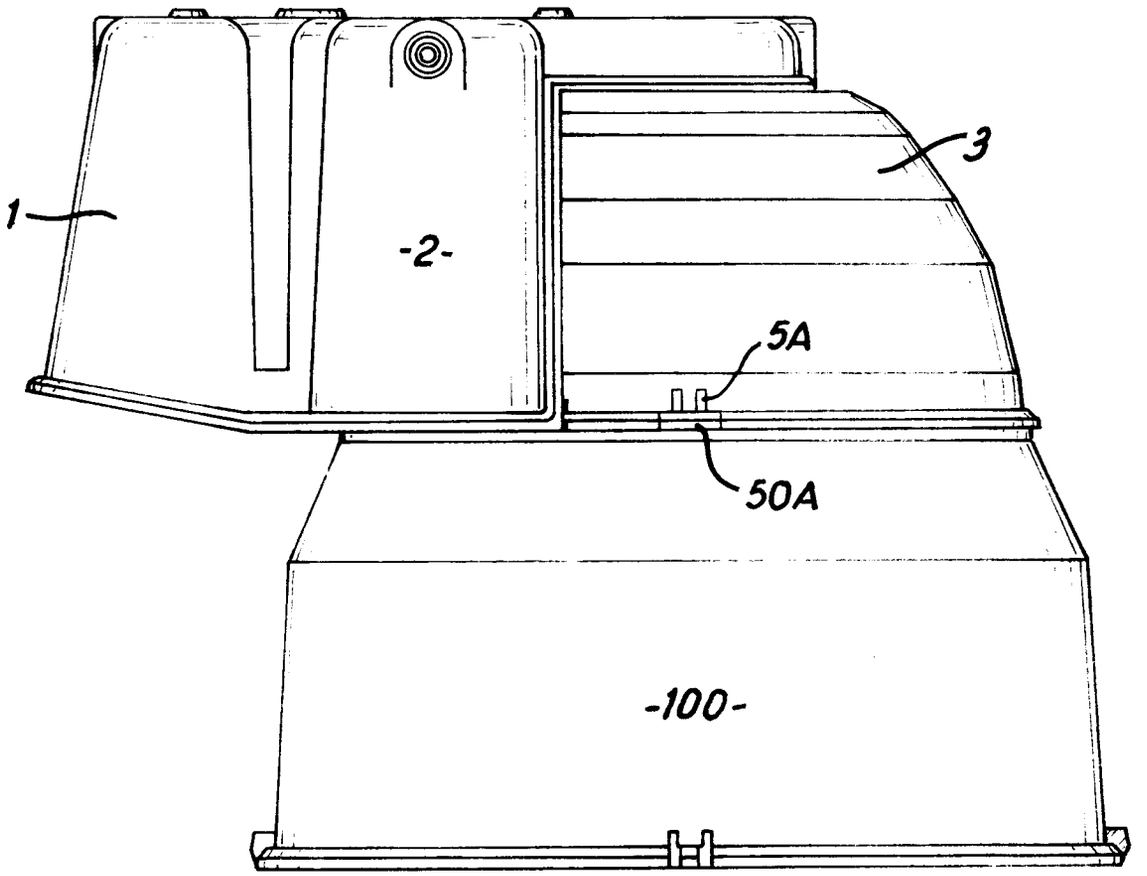


FIG.8

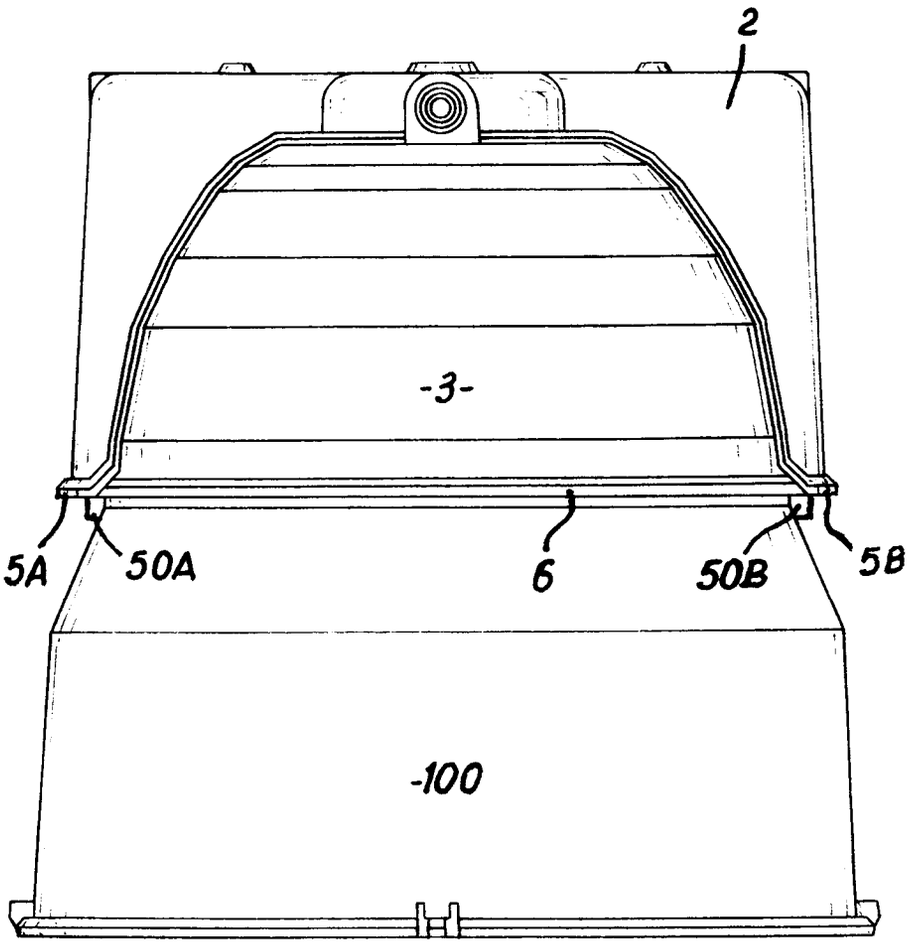


Fig. 9

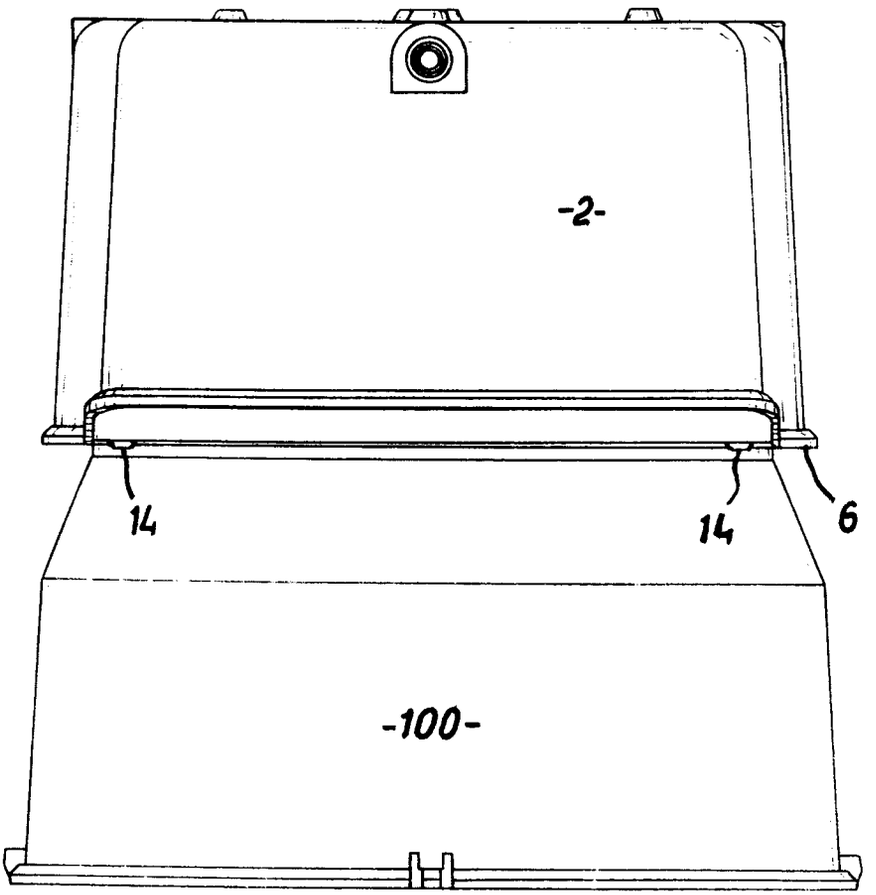


FIG. 10

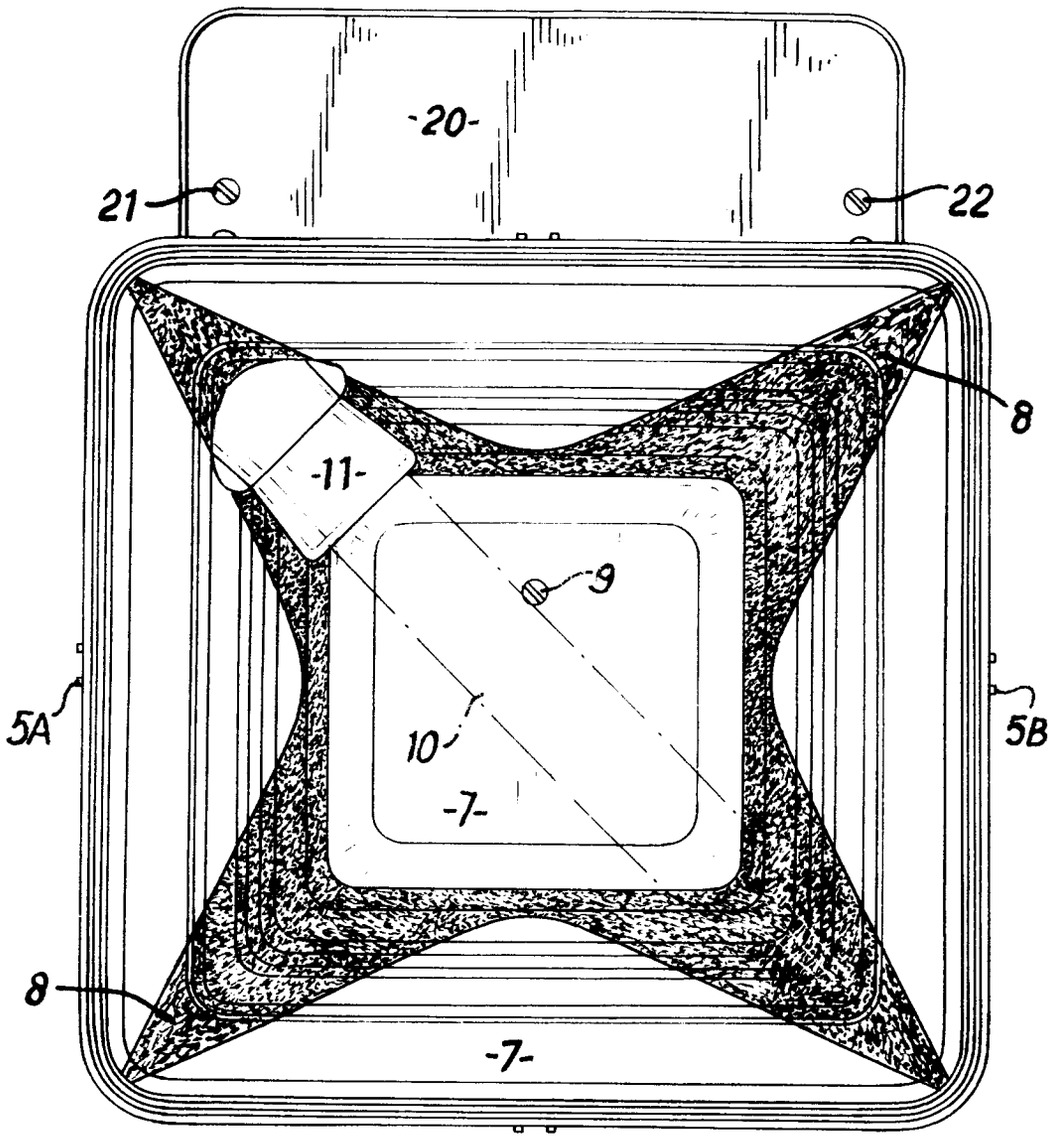


FIG. 11

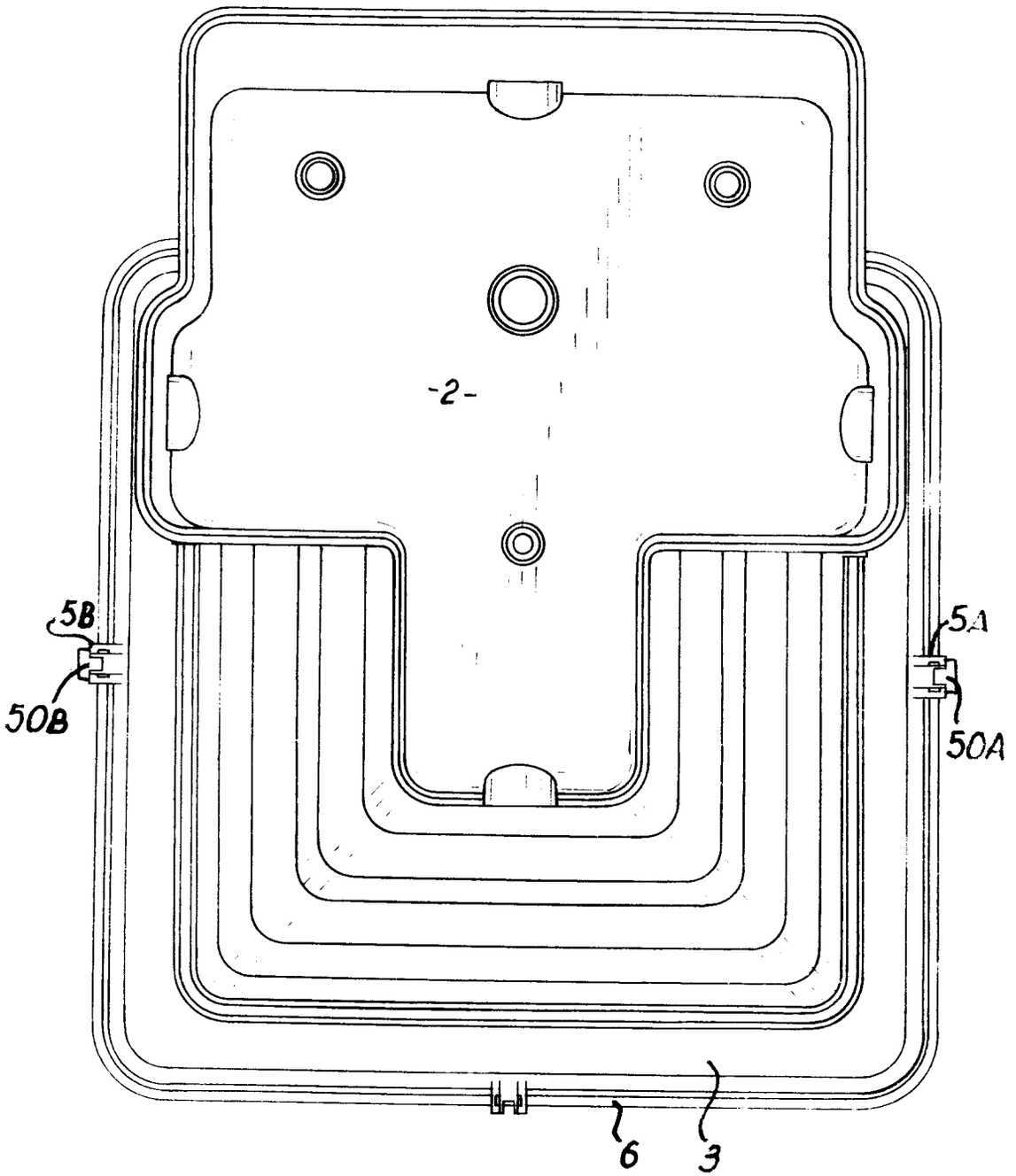


FIG. 12

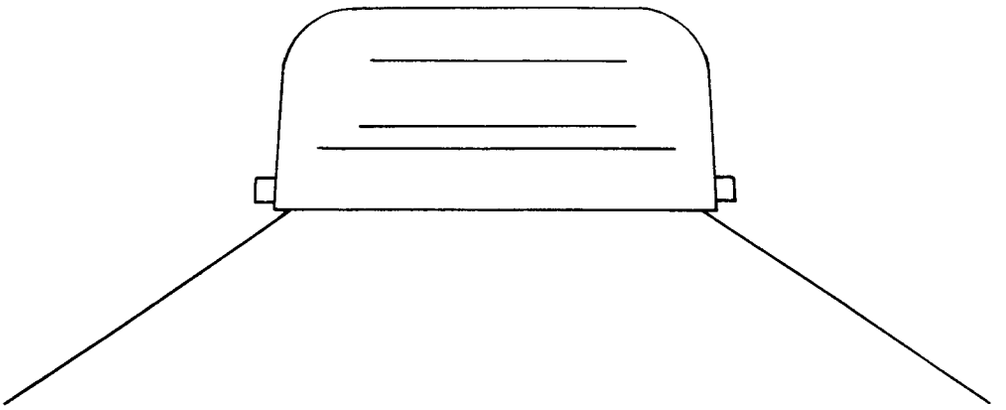


FIG. 13a

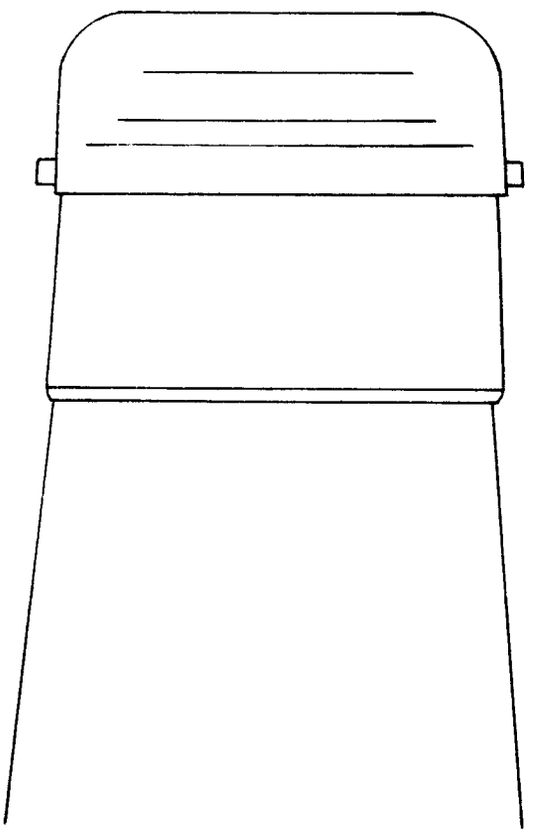


FIG. 13b