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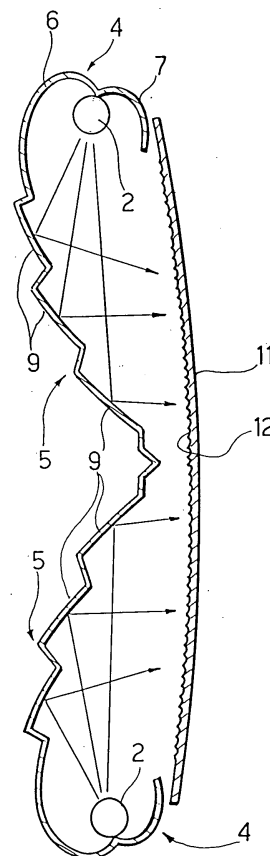
Remarks:

This application was filed on 29 - 08 - 2003 as a
divisional application to the application mentioned
under INID code 62.

(54) **Lighting device**

(57) Lighting device comprising a light source (2), a
primary reflector (4), presenting a double volute (6, 7)
cross-section profile and a secondary reflector (5),
which reflects the light rays directly from the source (2)
and from the primary reflector (4) to form a light beam
directed outwards.

FIG. 4



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Description

[0001] This invention relates to lighting devices for use in motor vehicles, for example for illuminating the passenger compartment, or in homes or offices and public working premises.

[0002] This invention particularly relates to a lighting device of the type indicated in the pre-characterizing portion of claim 1. A device of this type is known from DE 3 702 236. Other lighting devices are known from GB 1 021 109 and EP 0 766 037.

[0003] The purpose of this invention is to realise a lighting device presenting high efficiency and a simple, cost-effective, small sized structure.

[0004] In order to attain this purpose, this invention relates to a lighting device having all the features indicated in claim 1.

[0005] The device according to this invention can be equipped with a lens arranged in front of the primary reflector and the secondary reflector with an internal surface which may be partially or totally equipped with micro prisms.

[0006] This invention will be better explained by the following detailed descriptions with reference to the accompanying figure as non-limiting example, whereas:

- figure 1 is a prospective schematic view of an example of embodiment of the lighting device according to this invention,
- figure 2 is a cross-section view according to the line II-II in figure 1,
- figure 3 is a variation of figure 2 and
- figures from 4 to 6 illustrate two additional variations of figure 2.

[0007] With reference to figures 1, 2, and 5 numeral 1 generally indicates a lighting device comprising a pair of light sources 2 in the shape of fluorescent tubes, with an extended longitudinal direction. A reflecting structure, indicated generally with reference numeral 3, is associated to the two light sources. As clearly visible in figure 2, the reflecting structure presents a primary reflector 4 and a secondary reflector 5, associated to each light source 2. Each primary reflector 4 presents, on a plane which is perpendicular to the longitudinal direction of the light sources 2 (see figure 2) a profile consisting of two volute sections 6, 7, presenting concave surfaces facing the source 2 and joined together to form a cusp 8, located in immediately adjacent to the source 2. The axis 4a of the double cusp is slanted towards the secondary reflector 5. Each secondary reflector 5 presents a plurality of active reflecting sectors 9 corresponding, for example, to portions of a parabola or presenting a complex geometry of any type. Slots 13 are made between the active portions 9 of the secondary reflector and each active portion 9 is equipped with an additional tab 14 for reflecting the light rays hitting its rear surface (with reference to the main output direction of the light

beam) in the opposite direction to said main direction.

[0008] During operation, the secondary reflectors 5 reflect the light rays directly from the light source 2 either associated to it or reflected by the primary reflector 4 outwards (i.e. rightwards with reference to figure 2).

[0009] Thanks to the particular geometry described above, the light device presents high efficiency (in the order of 80%) of extraction of the light in the output direction of the light flow with respect to the total output energy. At the same time, the dimension of the device in the direction of output of the light beam is extremely reduced, which makes the device suitable, for example, also to illuminate rooms in homes or working premises fitted to the ceiling or the wall with the two secondary reflectors 5 both adjacent to the ceiling, because, in this position, the device will only slightly project from the surface on which it is fastened.

[0010] Figure 3 illustrates a variation with a single source 2, presenting a profile which essentially corresponds to one half of the profile in figure 2.

[0011] Figure 4 illustrates a variation which differs from the solution in figure 2 only for the fact that it is provided with a lens 11 which closes the front of the device and which has an internal surface partially or totally provided with micro prisms 12.

[0012] The solution in figure 5 can be used, for example, for illuminating the inside of vertical light panels visible on both sides, such as the case, for example, of light panels which indicate fire exits in public venues or working premises.

[0013] In the variant in figure 6, the central part of the device is more extended outwards, over the edge of the wall or ceiling. This solution is particularly suitable for ceiling applications in which the depth of the device must be reduced and good beam direction control is required at the same time.

[0014] Naturally, numerous changes can be implemented to the construction and forms of embodiment of the invention herein envisaged, all comprised within the context of the concept characterising this invention, as defined by the following claims.

Claims

1. Lighting device comprising a light source (2) which is extending longitudinally and reflecting devices (4, 5) for reflecting the light rays output by the source (2) in such a way for form an extending, wide beam output by the device, wherein said reflecting devices comprise:

- a primary reflector(4), arranged adjacently on one side of the light source (2), for reflecting the light rays output by the source (2) and
- a secondary reflector (5), for picking up both the light rays directly from the source (2) and the light rays reflected by the main reflector (4) and

conveying said light rays to form a light beam
of a predetermined shape outwards,

said primary reflector presents a section on a plane,
which is perpendicular to the longitudinal axis of the 5
source (2), comprising two volute sections (6, 7),
which concavities face the source (2), joined to form
a cusp (8) immediately adjacent to the source (2)
and
said secondary reflector (5) presents a section, on 10
a plane, which is perpendicular to the longitudinal
axis of the source (2), comprising a set of reflecting
sectors (9) arranged in steps,
characterised in that the reflecting sectors (9) of
the secondary reflector (5) are separated by slots 15
(13) and are equipped each with a reflecting tab (14)
for reflecting the light rays from the light source (2)
and from the primary reflector (4) in the opposite
direction with respect to the main output direction
of the light beam from the device, through said slots 20
(13).

2. Lighting device according to claim 1, **characterised**
in that the light source (2) is a fluorescent tube, for
example type T8 or T5. 25
3. Lighting device according to claim 1, **characterised**
in that the light source (2) is an incandescence, hal-
ogen or discharge bulb. 30
4. Lighting device according to any of the previous
claims, **characterised in that** it comprises a pair of
extended light sources, respectively parallel and
spaced, each equipped with a primary reflector and
a secondary reflector of the type specified above, 35
with the secondary reflectors (5) essentially recip-
rocal co-planar and the joined along the longitudinal
edge (15).
5. Lighting device according to any of the previous
claims, **characterised in that** it comprises a trans-
parent element (11) located in front of the reflecting
devices (4, 5). 40
6. Lighting device according to claim 5, **characterised**
in that the transparent element (11) presents an in-
ternal surface which is partially or totally equipped
with micro prisms (12). 45
7. Lighting device according to claim 1, **characterised**
in that the double volute section (6, 7) of the primary
reflector (4) presents an axis which is slanted to-
wards the secondary reflector (5). 50

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FIG. 1

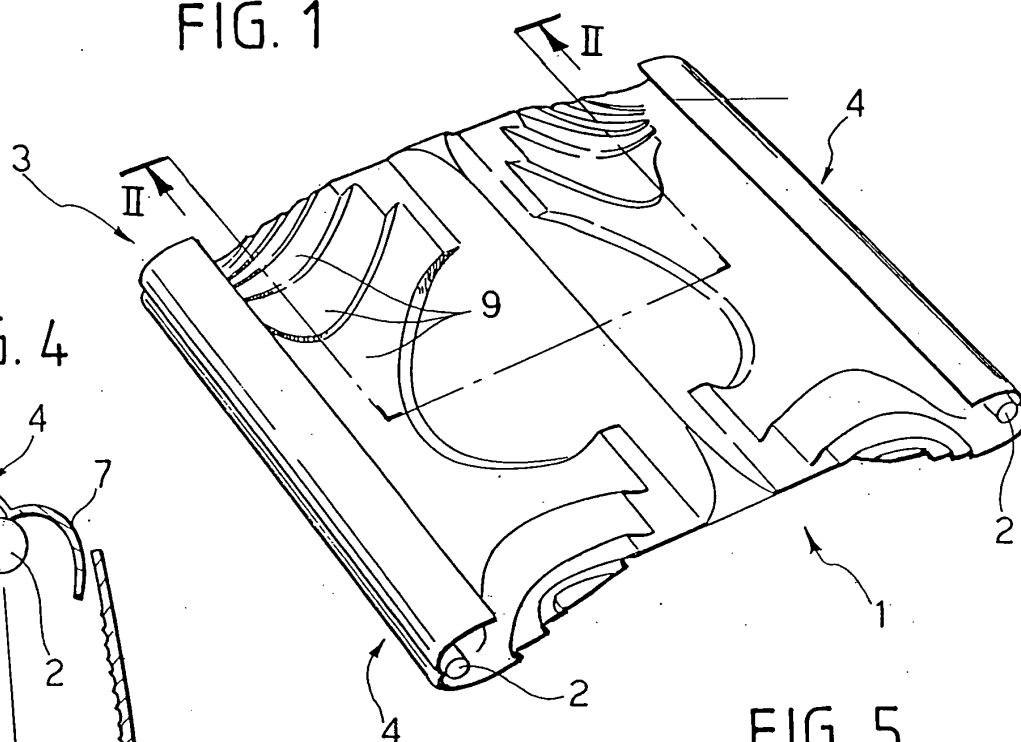


FIG. 4

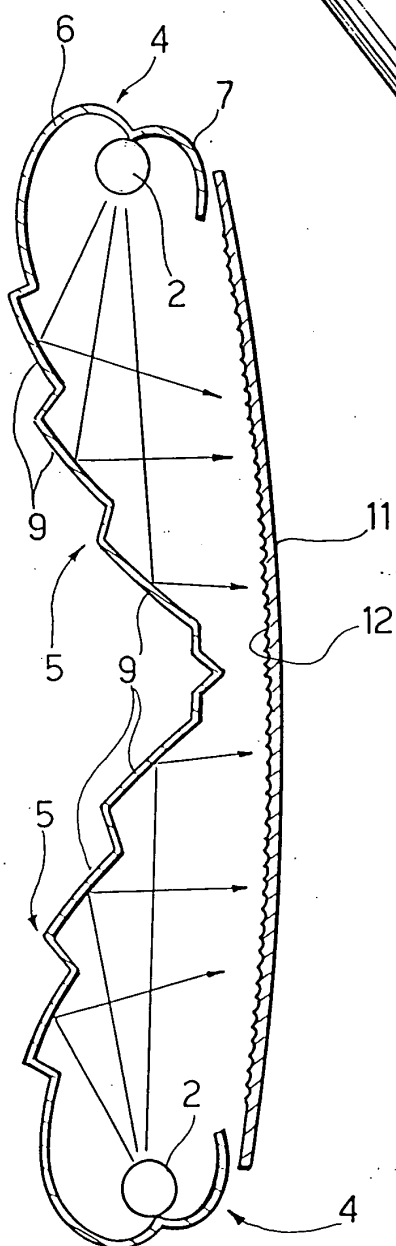


FIG. 5

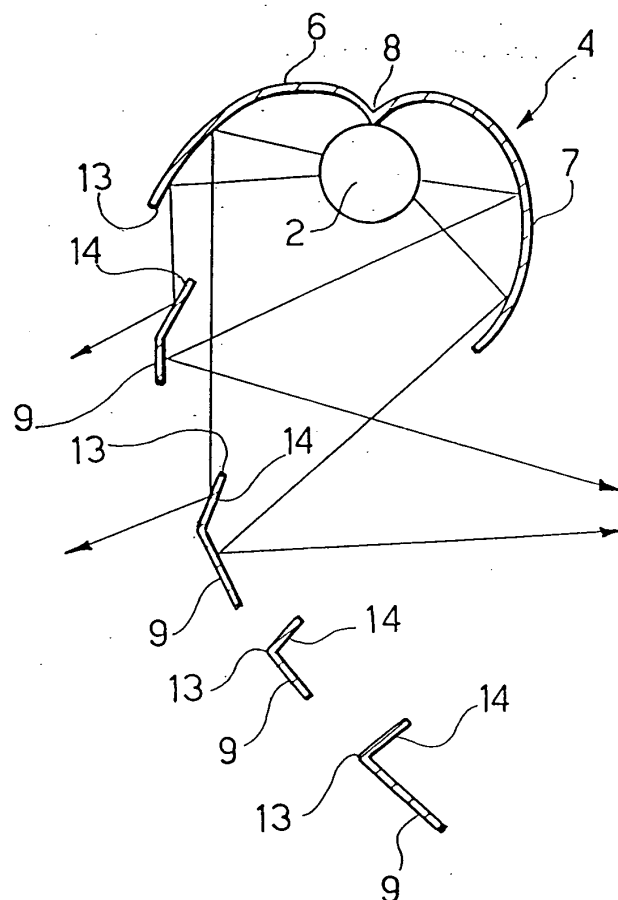


FIG. 2

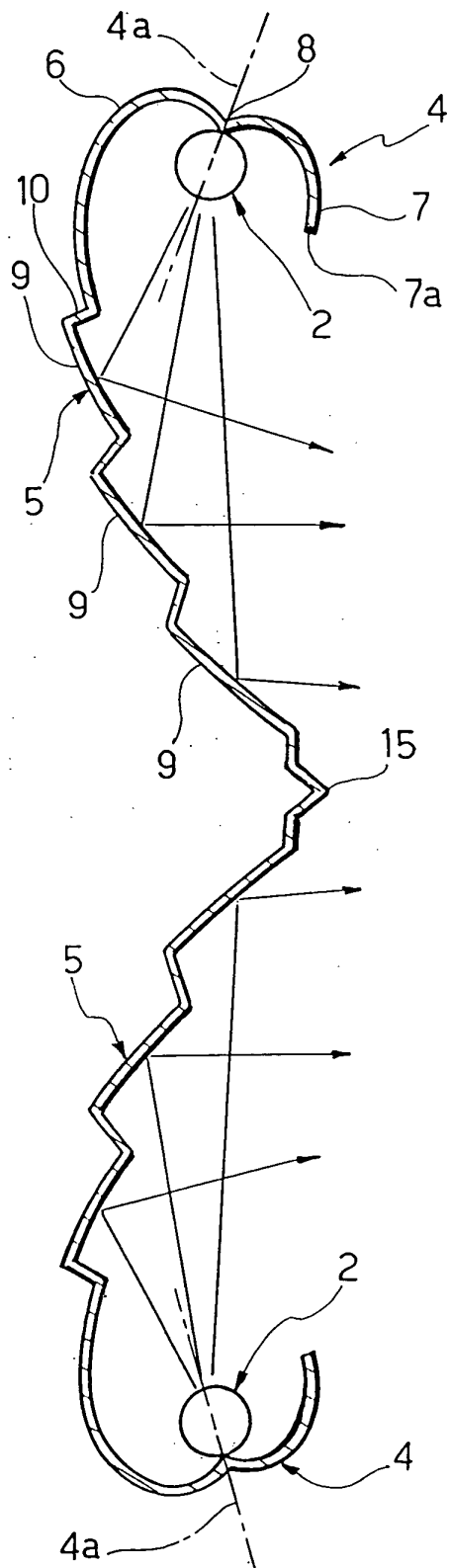
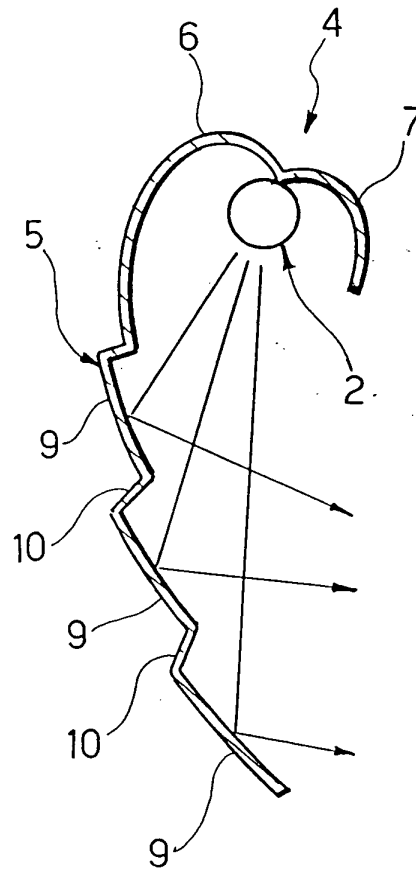


FIG. 3



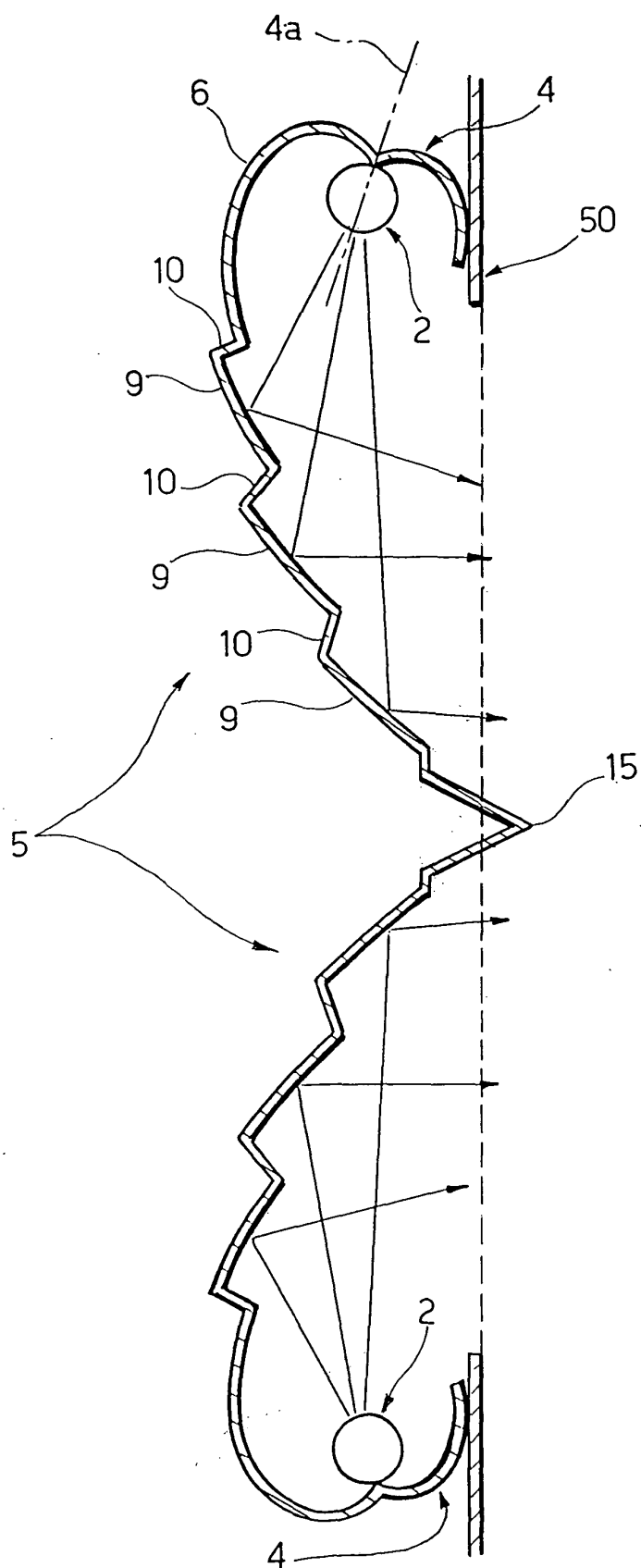


FIG. 6