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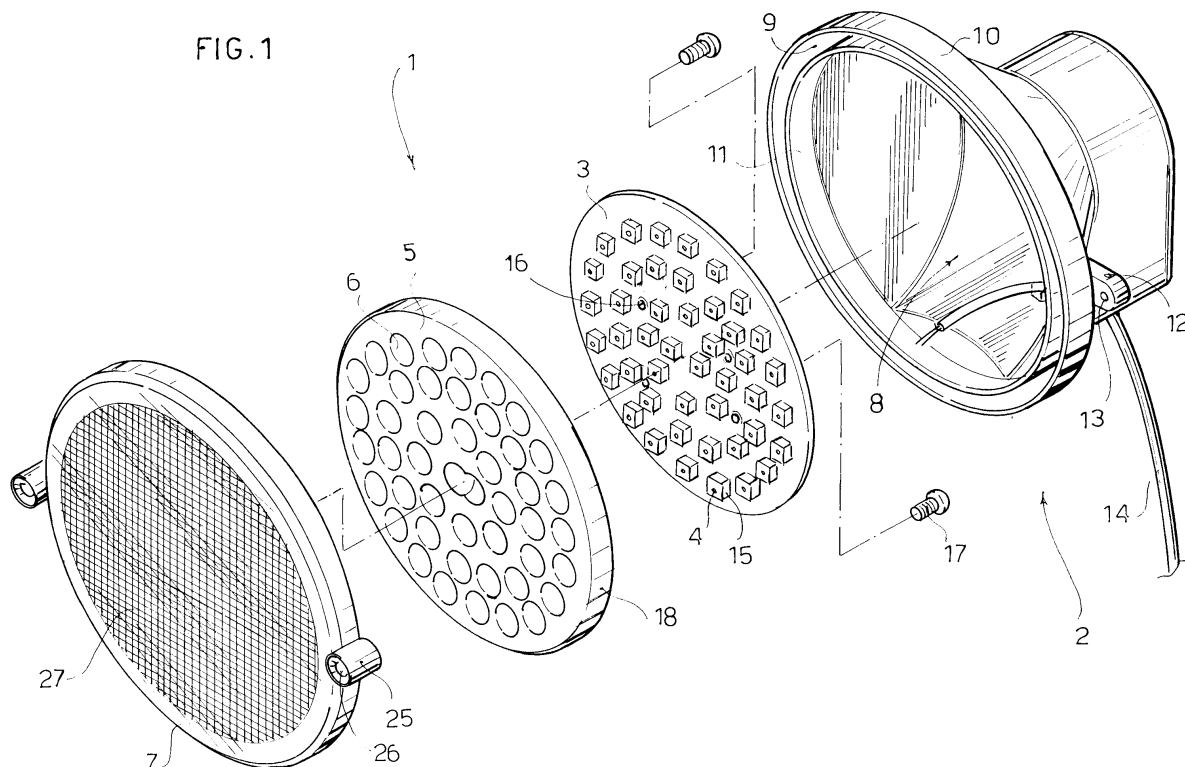
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(54) **Lighting device**

(57) A lighting device (1) comprises a shell (2) enclosing a reflecting body (5) comprising a plurality of hollow, paraboloid-shaped housings (6), each able to accommodate, in a position substantially close to the focus of the paraboloid, a light source (4) such as a LED, for example, supported on a plate (3), the shell (2) being covered by a light-transparent cover (7).

commodate, in a position substantially close to the focus of the paraboloid, a light source (4) such as a LED, for example, supported on a plate (3), the shell (2) being covered by a light-transparent cover (7).



Description

[0001] The present invention refers in general to a lighting device. Said device is particularly suitable for use in the field of safety, to provide signal lights on roads, motorways, railways, ports and airports.

[0002] The majority of lighting devices currently use halogen filament lamps. On roads, signal light devices are often used to indicate general danger or road works. Said known light devices generally comprise a hollow shell inside which a halogen lamp is positioned.

[0003] To ensure that an approaching vehicle driver clearly perceives the light signal emitted by the device, the luminous efficiency of the light source must be very high and must exceed threshold levels set by international standards. Consequently, halogen lamps are used as the light source but they dissipate too much electrical power, conflicting with energy saving requirements.

[0004] Another drawback is due to the fact that the average life of halogen lamps is very short; consequently they have to be replaced after a short time, with further maintenance and labour costs.

[0005] The object of the invention is to eliminate said drawbacks, providing a lighting device that is efficient, economical and long lasting.

[0006] This object is achieved, according to the invention, with the characteristics listed in appended independent claim 1.

[0007] Preferred embodiments of the invention are apparent from the dependent claims.

[0008] In the lighting device according to the invention a surface having a plurality of concave seats, substantially paraboloidal, ellipsoidal or of another similar shape, is provided. Said seats are coated with a reflecting material and a light source is inserted inside each of them, in a position substantially near the focus of the paraboloid.

[0009] Thanks to the optical requisites of the paraboloidal surfaces, dispersion of the light source can be reduced to a minimum. In this manner better focussing of the light is achieved and consequently a high efficiency of the lighting device.

[0010] The luminous efficiency achieved is so high that in place of halogen lamps LEDs (light emitting diodes) can advantageously be used as the light source.

[0011] LEDs have a considerably lower electrical power dissipation than halogen lamps. With a lighting device according to the invention, using LEDs, it is possible to obtain the same luminous efficiency as a device of the prior art with halogen lamps, with electrical power consumption reduced by about one-third.

[0012] Furthermore it must be considered that the average life of LEDs is considerably longer than that of halogen lamps. Consequently the lighting device according to the invention, using LEDs as the light source, requires a considerably smaller number of maintenance and LED replacement operations.

[0013] Further characteristics of the invention will be apparent from the detailed description that follows, referring to a purely exemplary and therefore non-limiting embodiment thereof, illustrated in the appended drawings, in which:

Figure 1 is an axonometric, exploded view of the lighting device according to the invention;

Figure 2 is a plan view of the device according to the invention, without the cover;

Figure 3 is a section view along the line III-III of Figure 2.

[0014] With reference to Figure 1, a lighting device is denoted as a whole by reference numeral 1. The device 1 comprises a shell 2 or outer casing, a plate 3 supporting light sources 4, a body 5 comprising a plurality of housings 6 for the light sources 4 and a light-transparent cover 7.

[0015] The shell 2, preferably made of plastic material, has a substantially frusto-conical shape with a large concave seat 8. An annular seat 9, defined by an outer annular rim 10 and an inner annular rim 11, is provided in the front part of the shell 2. Protruding from the outer edge 10 are fins 12 (one visible in Figure 1), having respective holes 13 able to receive screw means for securing the cover 7. A through hole for passage of an electrical supply cable 14 is provided in the shell 2. Securing means (not shown) can be provided to block the shell 2 on a support.

[0016] The plate 3 is substantially shaped like a circular disc with a slightly smaller diameter than the inner rim 11 of the shell 2, in order to be able to fit inside the cavity 8 of the shell. The plate 3 is preferably made by means of a silicon printed circuit board, so as to allow electrical connection tracks for the light sources 4 to be formed. An electrical connector element (not shown) able to house the electrical supply cable 14 is connected to the plate 3.

[0017] The light sources 4 are LEDs (light emitting diodes). The LEDs 4 comprise a rectangular LED supporting plate 15, supported by four pins fixed to the plate 3 and acting as electrical connections.

[0018] In a preferred embodiment of the invention, the LEDs 4 can be series connected in groups of three LEDs and then the groups of three LEDs are parallel connected to one another. In this manner the supply voltage, to allow lighting of the LEDs, is given by the bias voltage of a single LED multiplied by three.

[0019] The lighting device according to the invention, therefore, can be supplied with direct current, even by means of a vehicle battery, with a supply voltage of 12V - 24V DC. The device 1 can also be connected to the electrical network by providing an AC/DC transformer from alternating to direct current.

[0020] The plate 3 has four through holes 16, suitable

to receive the screws 17 that screw into the body 5 to secure the plate 3 to the body 5. The body 5, seen in a plan view (Figure 2), is substantially circular in shape, with a greater diameter than the diameter of the inner rim 11 and smaller than the diameter of the outer rim 10 of the shell 2. It has an annular shaped outer rim 18 that engages fixedly in the cavity 9 of the shell 2. In the rim 18 and/or in the cavity 9, sealing means are provided to ensure a better seal between the body 5 and the shell 2.

[0021] As shown in Figure 3, each housing 6 has a concave paraboloid shape, so as to form a cavity 21. Each housing 6 ends in a base 19 that forms a parallelepiped-shaped cavity on the inside, communicating with the cavity 21 by means of a circular hole 22.

[0022] In this manner when the plate 3 is secured to the body 5, the end of each base 19 abuts against the surface of the plate 3 and the plates 15 of the LED 4 house perfectly inside the cavity 20, so that the LED 4 protrudes from the hole 22 and is situated in a position substantially close to the focus of the surface of the paraboloidal housings 6.

[0023] Figure 2 shows, purely by way of example, a possible arrangement of the housings 6 of the body 5. The body 5 comprises two housings 6 arranged in a central position, around which is situated a first group of eight housings 6 equally spaced along a first circumference.

[0024] Around said first group of housings is situated a second group of fifteen housings evenly spaced along a second circumference with a larger diameter than that of the first.

[0025] Around said second group of housings is situated a third group of twenty housings evenly spaced along a third circumference with a greater diameter than that of the second circumference.

[0026] The body 5 can be manufactured, for example, by moulding of plastic material, such as an ABS (acrylonitrile butadiene styrene) polymer. A material having a high index of light reflection, such as aluminium for example, is made to deposit on the blank.

[0027] The cover 7 is substantially circular in shape with a diameter substantially equal to the diameter of the outer rim 10 of the shell 2, so that it abuts against said edge. The cover 7 has two protruding fins 25 with respective holes 26 intended to be aligned with holes 13 of fins 12 of shell 2 to accommodate securing means. The cover 7 is made of light-transparent material and can preferably be made of plastic material with a circular surface 27, ground to avoid the dazzling effect of the light emitted by the light sources 4.

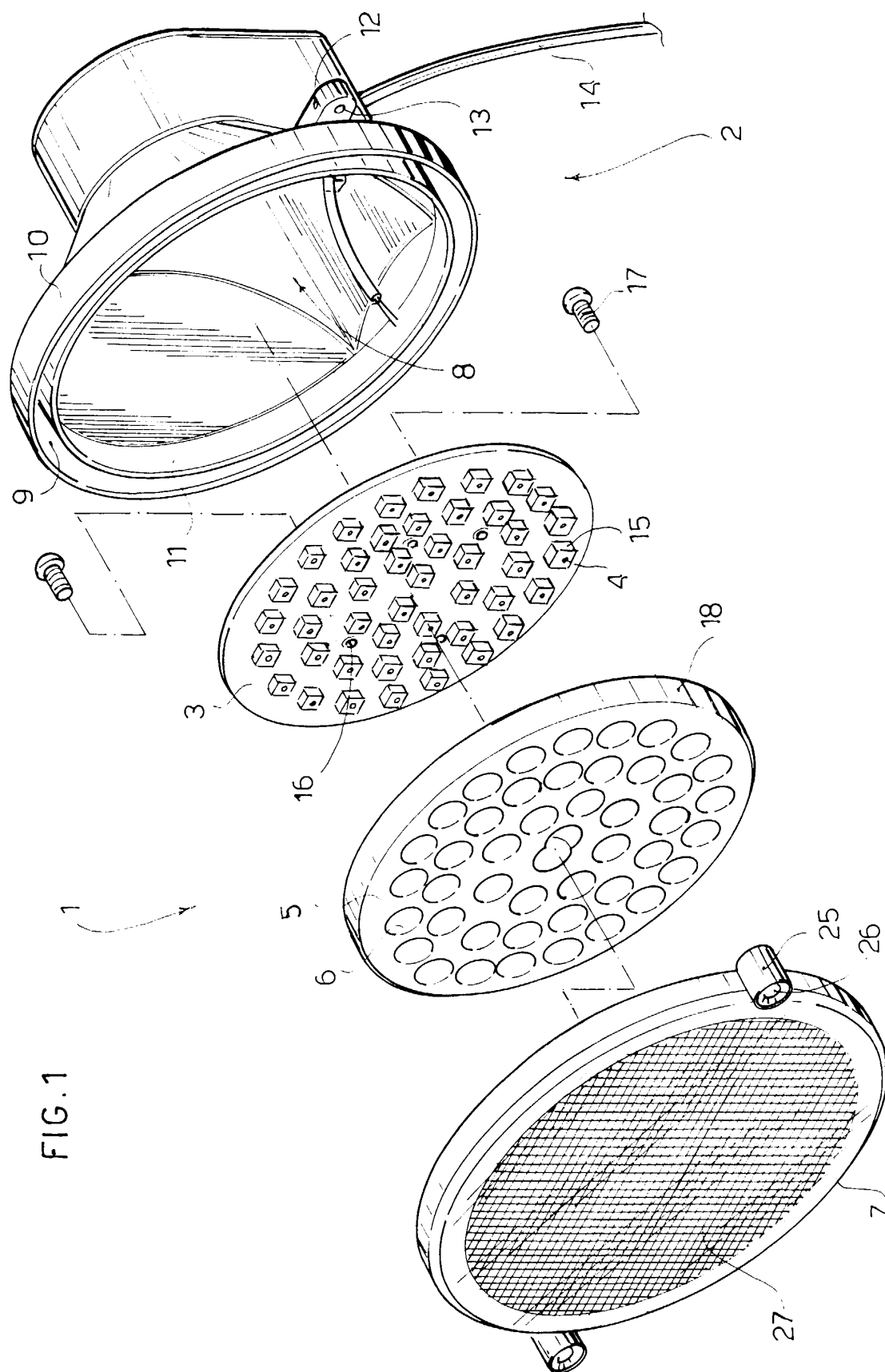
[0028] Obviously numerous modifications of detail within the reach of a person skilled in the art can be made to the lighting device as previously described and illustrated in the appended figures.

[0029] In particular neither the shape nor the dimensions of the device are binding, nor are the number and arrangement of the LEDs 4 or the materials employed.

Claims

1. A lighting device (1) comprising a shell (2) enclosing a reflecting body (5) with at least one light source (4) and a light-transparent cover (7), characterized in that said reflecting body (5) comprises a plurality of hollow housings (6) suitable to house respective light sources (4).
2. A device according to claim 1, characterized in that said hollow housings (6) have a concave surface with a paraboloidal, ellipsoidal or similar shape.
3. A device according to claim 1 or 2, characterized in that said light sources are LEDs (4) (light emitting diodes).
4. A device according to claim 3, characterized in that said LEDs (4) are situated in positions corresponding to or substantially close to the respective focuses of said housings (6) with a paraboloidal, ellipsoidal or similar shape.
5. A device according to claim 3 or 4, characterized in that said LEDs (4) are supported by a plate (3) that can be secured to the rear of said body (5).
6. A device according to claim 5, characterized in that said plate (3) is a printed circuit board wherein tracks are made for the connections and electrical power supply of the LEDs (4).
7. A device according to any one of claims 3 to 6, characterized in that each of said housings (6) ends in a base (19) forming a rectangular cavity (20) suitable for housing a supporting plate (15) of a LED (4).
8. A device according to any one of the preceding claims, characterized in that said body (5) has an outer rim (18) that engages fixedly inside a corresponding cavity (9) of the shell (2).
9. A device according to any one of the preceding claims, characterized in that said body (5) is made of plastic material.
10. A device according to any one of the preceding claims, characterized in that at least the housings (6) of said body (5) are coated in a material with a high light reflection index.
11. A device according to any one of the preceding claims, characterized in that the housings (6) of said body (5) are coated with a layer of aluminium.

FIG. 1



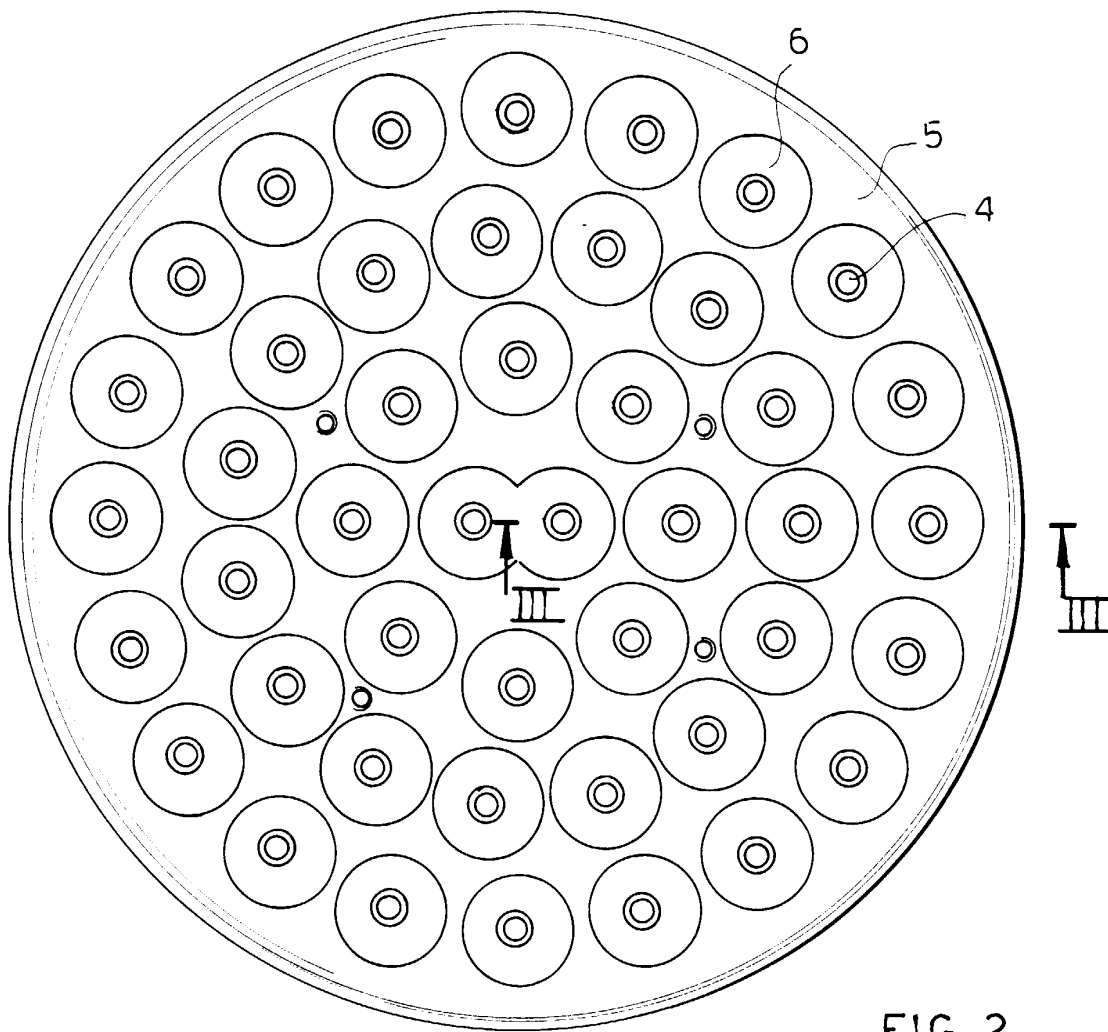


FIG. 2

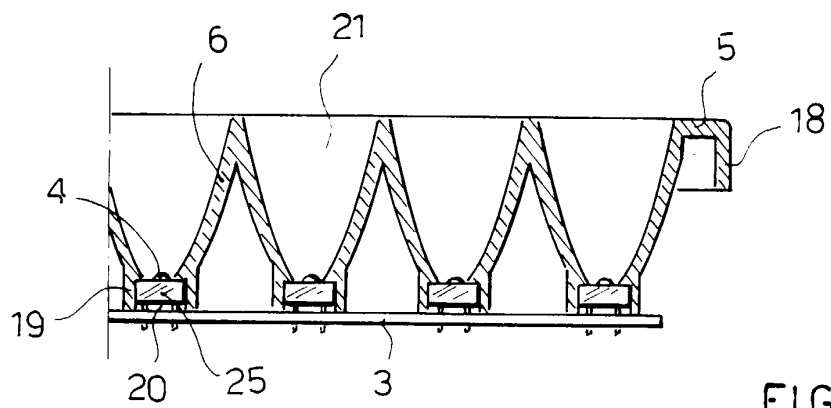


FIG. 3