

SIGNALING DEVICE WITH LIGHT EMITTING DIODE

This invention relates to a signaling device such as an indicating light or a light push button comprising a body with a longitudinal axis and terminated by a head that has a translucent device from which a useful light beam is output, and a printed circuit on which there is a light emitting diode that generates an emitting beam producing the useful beam.

It is known how to make indicating lights equipped with a light emitting diode mounted on a printed circuit that is also equipped with various components specific to a diode power supply circuit; the light emitting diode is usually placed at the end of the printed circuit on its edge, such that the diode emission beam is directed along an axis parallel to the plane of the printed circuit. However, this assembly mode is not suitable if a diode designed for surface mounting is used (SMC). It is also known how to install an SMC light emitting diode on a printed circuit with its emitting surface directed such that the emitted beam remains parallel to the plane of the circuit. It is normally considered a disadvantage to place the light emitting diode differently, since the energy of the resulting useful beam is then reduced.

Furthermore, it is difficult to use a common layout for indicating lights and for light push buttons. It is observed that since the light diffusion surface on the push buttons is essentially mobile, an annoying brightness variation occurs between adjacent signaling devices such as indicating lights and light push buttons and the appearance of these devices cannot be made similar.

The purpose of this invention is to structure a signaling device such as indicating light or a light

push button such that the useful light signal obtained with this device is extremely homogeneous and in particular several such devices can be placed close to each other without any difference in appearance.

5 The light emitting diode according to the invention is surface mounted on one side of the printed circuit such that its emission beam is directed along a direction approximately perpendicular to the longitudinal axis of the body and the general shape of
10 the body is tubular, and has an unpolished flared reflection surface inside facing the lateral diode.

The resulting light diffusion is very homogeneous and in particular is very similar on an indicating light or on a light push button equipped with the same
15 device, while avoiding the concentration of light flux at a point at the center of the translucent device that diffuses light.

Preferably, the light emitting diode is installed near the end of the printed circuit facing the
20 unpolished flared surface such that the part of the printed circuit between the end of the board and the diode does not affect the transmitted flux.

The following description of an embodiment of the invention is given as an example, with reference to the
25 attached drawings.

Figure 1 shows an elevation of a light emitting diode indicating light according to the invention.

Figure 2 shows an enlarged axial sectional view of the indicating light in figure 1.

30 The signaling device shown in the figures is an indicating light 10 that comprises a head 11 fitted with a translucent device 12 that diffuses light and a body 13 made of opaque plastic material with a generally tubular shape and a longitudinal axis X-X';
35 the translucent device 12 comprises a translucent wall 12a diffusing light and a colored cap 12b that covers

the wall 12a and is transparent or translucent. The shape of the body 13 is cylindrical but it may also have a parallelepiped shape.

5 The head 11 is designed to be visible above an indicating light assembly surface 14 whereas the body 13 is used firstly to attach the indicating light and secondly to contain diode connections and power supply means; the body 13 is inserted in an orifice in wall 14 and is fixed adjacent to it, for example by means of
10 a threaded part 13a onto which a nut 15 can be screwed. Connection and power supply means include external connection elements 16, for example screw or elastic pins or terminals and a power supply circuit, the components of which are supported on a printed circuit
15 20.

The light emitting diode 21 according to the invention is a surface mounted component (SMC) on the printed circuit 20 on the same side 20a of this circuit as the components 22 of its power supply. The light
20 emitting diode 21 is located in the immediate vicinity of the upper edge 20b of the printed circuit 20, at the same level as the flared surface 17 of the body, at a height h from the initial directrix 17a of this surface opposite to the translucent diffusing device 12.

25 The printed circuit 20 may be aligned with the longitudinal axis of symmetry $X-X'$ of the indicating light or may be slightly offset, and the lateral light emitting diode 21 emits a beam $F1$ along an average axis $Y-Y'$ approximately perpendicular to the $X-X'$ axis; the
30 height h of the diode and its average emission axis $Y-Y'$ with respect to the directrix 17a is determined to enable a good reflection of beam $F1$ towards the front of the indicating light by multiple reflections on surface 17.

35 Surface 17 of body 13, or of a reflecting part added onto body 13, facing diode 21 is not polished, or

is possibly dulled, in order to create a Lambertian surface condition, in other words favorable to reflections of beam F1.

5 As shown in figure 2, multiple reflections are applied to beam F1, initially on the flared surface 17 with a very low loss through the side wall of body 13, then secondly on part of the surface 18 that is connected to the flared surface 17 and which is more flared, to exit from the indicating light through
10 device 12, in other words with diffusion through the translucent diffusion surface 12a and then transmission through the rear surface of cap 12b in the form of a useful beam F2. The diffuser and/or the cap is colored appropriately to the wave length emitted by the diode.

15 The invention is also applicable to signaling devices in which the translucent device or the cap is mobile along the longitudinal X-X' direction of the body. It is found that with the signaling devices described, there is no light point at the center of the
20 cap and the lighting produced by indicating lights is very similar to the lighting produced by push buttons according to the invention when they are placed adjacent to each other or close to each other.

CLAIMS

1. Signaling device such as an indicating light or a light push button comprising a body (13) with a longitudinal axis (X-X') and terminated by a head (11) that comprises a translucent diffusion device (12) from
5 which a useful light beam (F2) is emitted, and a printed circuit (20) supporting a light emitting diode (21) that generates an emission beam (F1) producing the useful beam,

characterized in that:

10 - the light emitting diode (21) is surface mounted on one side (20a) of the printed circuit (20) such that the direction (Y-Y') of its emission beam (F1) is approximately perpendicular to the longitudinal axis (X-X') of the body (13),

15 - one part of the body (13) has a generally tubular shape with an unpolished flared inside surface (17), facing the lateral diode (21).

2. Signaling device according to claim 1, characterized in that the light emitting diode (21) is
20 mounted on the printed circuit (20) immediately adjacent to the end of the printed circuit located in the tubular part of the body at the same level as its unpolished flared surface (17).

3. Signaling device according to claim 1,
25 characterized in that the body (13) has an unpolished surface (18) connected to the unpolished flared surface (17), more flared than the latter surface and located between it and the translucent diffusing device (12a, 12b) generating the useful beam.

30 4. Signaling device according to claim 1, characterized in that the translucent diffusing device





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(12) can move along the longitudinal direction (X-X') of the body.

5. Set of signaling devices such as indicating lights or light push buttons according to one of claims 1 to 4.

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