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(54) Title: EMERGENCY LAMP

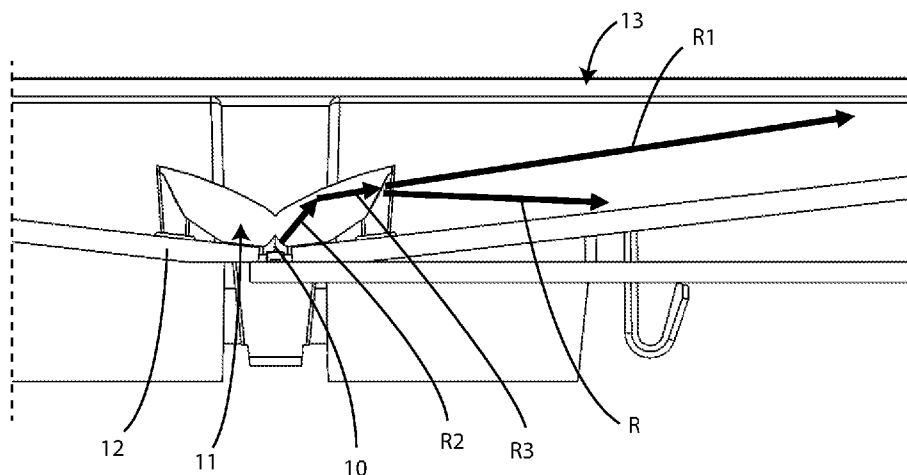


Fig. 3

(57) Abstract: Described is an emergency lamp, comprising a light source (10), consisting preferably of one or more LEDs, a lens (11), placed frontally to the light source (10), a reflector (12), located at the sides of the light source (10), and a transparent screen (13), arranged on the opposite side with respect to the light source (10) and placed to cover the emergency lamp; the lens (11) is designed in such a way as to direct towards the reflector (12) a first component (R) of the luminous flux emitted by the light source (10) and send towards at least one of the ends of the transparent screen (13) a second component (R1) of the luminous flux emitted by the light source (10).



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EMERGENCY LAMP

This invention relates to, in general, an emergency lamp, which uses in particular one or more LEDs as a light source.

5 More specifically, the invention relates to an LED emergency lamp, designed to satisfy the standards required by the sector, in particular, designed to fulfil the following main requirements:

- installation on the wall or ceiling in systems typical of emergency lighting;
- 10 - uniformity of a pictogram for the emergency signalling;
- hiding the light source with the lamp switched off.

A correct emergency lighting must guarantee, in the field of vision, sufficiently high and rationally distributed lighting in order to allow the perception of the important areas. More specifically, the emergency lamps
15 must guarantee a sufficient luminous flux to allow an easy and fast identification of the escape routes, especially in the case of danger.

Luminance is defined as the ratio between the intensity of a light source in a given direction and the relative apparent surface viewed from the same direction.

20 Its value depends on the lighting, the reflection characteristics of the surfaces and the directions of lighting and observation.

The illumination, relative to a point of a surface, is defined as the ratio between the luminous flux which strikes an element of the surface around the point, and the area of the element itself.

25 The illumination can be easily planned and measured by means of a lux meter or a light meter, so it can be conveniently and simply used to resolve technical problems, such as, for example, the design of a lighting system.

The performance of an emergency lamp is usually assessed by imposing a certain illumination on a work surface, consisting of, by convention, a
30 horizontal surface positioned at a certain distance from the floor.

When the light reaches this work surface directly from the light source, it is said that it has a direct illumination, whilst, when the light reaches the work surface after having been reflected, even several times, by the walls and/or

by the ceiling of the room, it is said that it has indirect lighting.

Naturally, the intermediate cases are very frequent, wherein the luminous flux arrives on the work surface in direct and indirect percentages which have intermediate values with respect to those mentioned above.

5 By using the emergency lamps of known type, it is not possible to obtain a combination between performance in the system, both for wall-mounted and ceiling-mounted lamps, uniformity of display of the pictograms adopted for the emergency signalling, and guaranteeing at the same time the requirement that the light sources are hidden when the lamp is switched off.

10 The aim of the invention is, therefore, to overcome the above-mentioned drawbacks, by making an emergency lamp which allows the standards required by the sector to be satisfied and, in particular, which allows the main requirements of being able to be wall-mounted or ceiling-mounted in the systems typical of emergency lighting to be fulfilled, so as to guarantee
15 a complete uniformity of the pictogram for emergency signalling and to be able to hide the light sources with the lamp switched off.

Another aim of the invention is to make an emergency lamp which complies with the current safety regulations.

A further aim of the invention is to make an emergency lamp with a
20 construction which is relatively simple, safe and reliable, using substantially known technologies and components which are relatively inexpensive.

These and other aims, according to the invention, are achieved by making an emergency lamp according to appended claim 1.

25 The features and the advantages of an emergency lamp according to the invention will more fully emerge from the description that follows, of a non-limiting example, referred to the accompanying schematic drawings in which:

- Figure 1 is a perspective view of a relative to a preferred but non-limiting embodiment of the emergency lamp according to the invention;
- 30 - Figure 2 is longitudinal cross section view of the emergency lamp of Figure 1 according to the invention;
- Figure 3 is a schematic and partial view of the optical diagram relative to the diffusion of the luminous rays from the source to the screen in the

emergency lamp according to the invention.

With reference to the above-mentioned drawings, the emergency lamp, according to the invention, comprises a light source 10 consisting preferably of one or more LEDs, a lens 11, placed frontally to the light source 10, a reflector 12, located at the sides of the light source 10 and being substantially V-shaped, with the light source 10 installed at the vertex of the V and the wings of the V considerably spread apart, in particular designed to form an obtuse angle between them, and a transparent screen 13, arranged on the opposite side with respect to the light source 10 and placed to cover the emergency lamp, together with a frame 14 of the map which encloses it.

In order to satisfy the standards required by the sector, the lens 11 is designed in such a way as to be able to redirect the luminous flux coming from the light source 10 to the outside of the lamp fulfilling the following main requirements:

- possibility of installing the lamp on the wall or ceiling in systems typical of emergency lighting;
- possibility of obtaining a significant uniformity of displaying a pictogram located on the transparent screen 13 for the emergency signalling;
- possibility of hiding the light source 10 with the lamp switched off.

In particular, advantageously, the lens 11, made preferably of PMMA (or similar materials with extremely high transmittance) and with dimensions preferably of approximately 19x6x70 mm (re-scalable to any dimension), allows a first component of the luminous flux emitted from the light source 10 to be sent towards the reflector 12 (in the direction of the ray R coming from the lens 11, shown in Figure 3), thanks to an optical design exploiting the known physical principle of total internal reflection (rays R2 and R3 of Figure 3), and to send towards at least one of the ends of the transparent screen 13 a further component of the luminous flux emitted by the light source 10 (in the direction of the ray R1 coming from the lens 11, shown in Figure 3).

In particular, the lens has a first curve or surface, preferably concave, which

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is used for suitably directing the component of the flux corresponding to the ray R2 on a second surface, preferably convex and designed to form as much as possible the total internal reflection and to generate a flux corresponding to the ray R3; the flux will then, lastly, be re-directed from a
5 third surface, which is responsible for forming the portions of flux corresponding to the rays R and R1.

This allows an adequate polar diagram to be obtained, with peaks of luminous intensity which allow the aims specified by the standards regarding emergency signalling to be achieved and to simultaneously have
10 the zone of the screen 13 far from the lens 11 very illuminated, so as to obtain a good identification of the emergency signalling both if the wall is wall-mounted and if the lamp is ceiling-mounted.

Moreover, the lens 11 is designed in such a way that a total reflection of the luminous beam entering and coming from the light source 10 occurs inside
15 it (rays indicated with R2 and R3 in Figure 3).

In practice, the luminous beam coming from the light source 10 and entering in the lens 11 does not escape from the above-mentioned lens 11, but is guided externally, by the known physical principle of total internal reflection, in such a way that the light source 10 is hidden by the lens 11 itself.

20 Again advantageously, the reflector 12 allows the part of the luminous flux, coming from the lens 11, which strikes it, to be recovered, thus improving the uniformity on the screen 13, compared with the prior art solutions.

More specifically, the inclination of the reflector 12, which gradually approaches the screen 13, moving away from the lens 11 and at both sides
25 of the lens 11, allows good contribution of illumination to be obtained at the ends of the screen 13.

Again advantageously, the transparent screen 13 also improves the uniformity of illumination especially in the zones far from the lens 11.

In particular, the luminous rays which are very inclined with respect to the
30 surface of the screen 13 and coming from the lens 11 are partly transmitted to the outside and partly reflected towards the reflector 12, which returns to the screen 13 part of the luminous flux.

This allows a better uniformity of lighting on the screen 13 to be achieved,

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since, by applying the identification pictograms typical of emergency lighting, a uniformity of lighting is obtained having values compliant with the standards.

5 It has been found in practice that the emergency lamp according to the invention is particularly innovative and advantageous and achieves the preset aims, by the use, in combination, of the lens 11, the reflector 12 and the screen 13.

The characteristics of the emergency lamp, according to the invention, clearly emerge from the description, as do the advantages thereof.

10 Lastly, it is clear that numerous other variants might be made to the emergency lamp in question, without thereby departing from the scope of this invention as expressed in the accompanying claims.

CLAIMS

1. Emergency lamp, comprising a light source (10), preferably consisting of one or more LEDs, a lens (11) placed frontally to said light source (10), a reflector (12) located at the sides of said source light (10) and a transparent screen (13) arranged on the opposite side with respect to said light source (10) and placed to cover the emergency lamp, characterized in that said lens (11) is configured to direct towards said reflector (12) a first component (R) of luminous flux coming from said light source (10) and to direct towards at least one of the ends of said transparent screen (13) a second component (R1) of said luminous flux emitted from the light source (10).
2. Emergency lamp according to claim 1, characterized in that said lens (11) is made of a highly transmissive material and is configured to send said first component (R) of luminous flux towards said reflector (12) thanks to a total reflection inside said lens (11) of the light rays corresponding to a third (R2) and to a fourth component (R3) of said luminous flux emitted from the light source (10).
3. Emergency lamp as claimed in at least one of the previous claims, characterized in that said lens (11) has a first concave surface, configured to direct a third component (R2) of said luminous flux onto a second convex surface of said lens (11), said second convex surface being configured to provide a total reflection inside said lens (11) of the luminous flux coming from said light source (10) and to generate a fourth component (R3) of the luminous flux, said fourth component (R3) of the luminous flux being also redirected by means of a third surface of said lens (11), said third surface of the lens (11) being configured to generate said first and second component (R, R1) of the luminous flux.
4. Emergency lamp according to at least one of the previous claims, characterized in that said reflector (12) has a substantially V-shaped structure, with said light source (10) installed at the vertex of the V and the wings of the V configured to form an obtuse angle between them.
5. Emergency lamp according to at least one of the previous claims, characterized in that said luminous flux coming from the light source (10) and entering said lens (11) is driven externally to the lens (11), so that said

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light source (10) is hidden by said lens (11).

6. Emergency lamp according to at least one of the previous claims, characterized in that said reflector (13) is gradually sloped with respect to the surface of said transparent screen (13) at both sides of said lens (11).

5 7. Emergency lamp according to at least one of the previous claims, characterized in that said transparent screen (13) is configured so that a first part of the luminous flux coming from said lens (11) is transmitted outside the lamp and a second part of the luminous flux coming from said lens (11) is reflected towards said reflector (12), said reflector (12) being
10 configured to send a further part of said second part of the luminous flux back onto said transparent screen (13).

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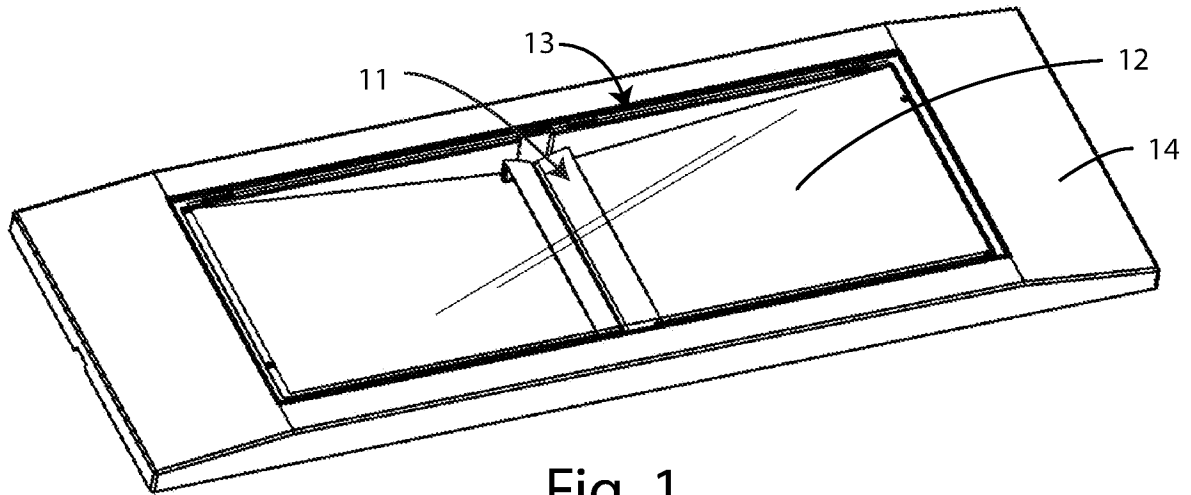


Fig. 1

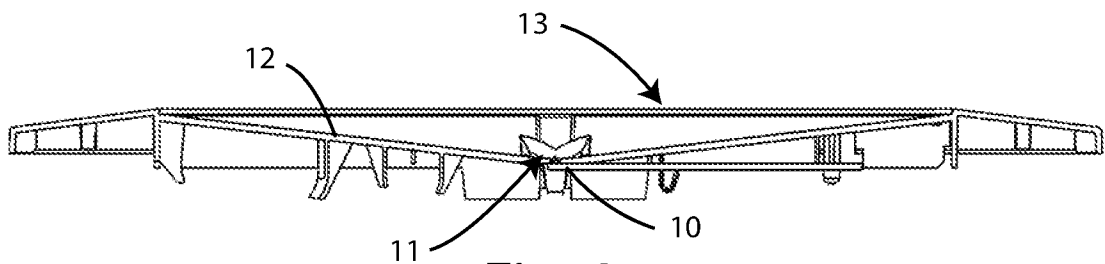


Fig. 2

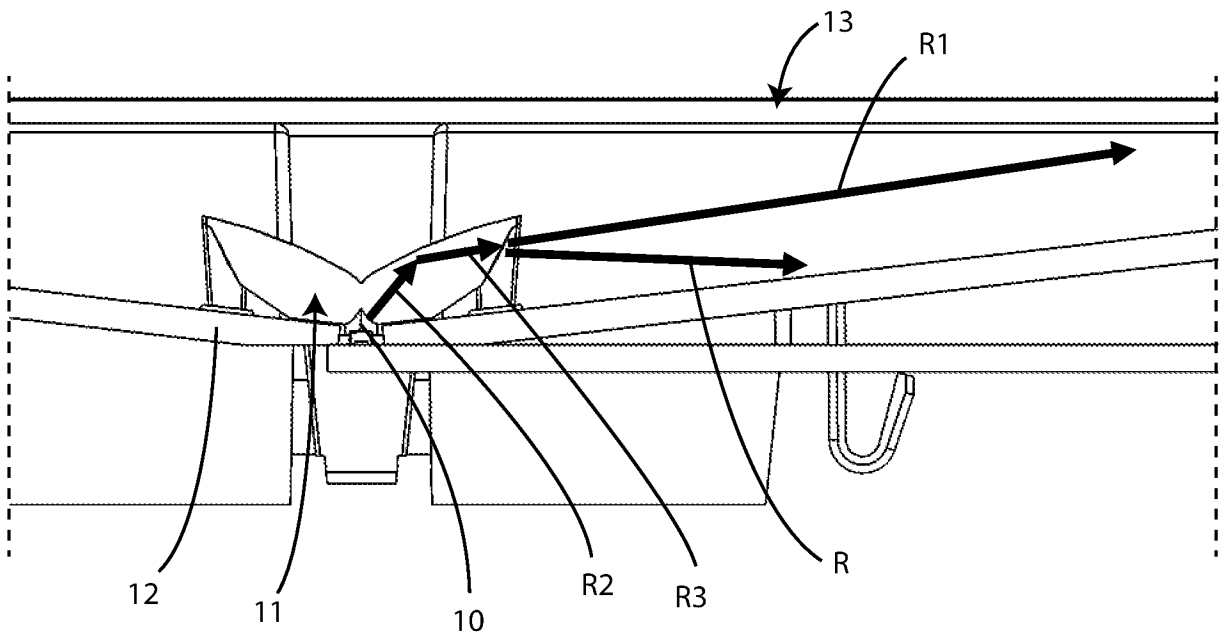


Fig. 3

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
 INV. G09F13/00
 ADD. G09F13/04 G09F13/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 G09F G02B F21S

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
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