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(54) **Illumination device comprising an led with its optical axis perpendicular to the optical axis of the said device**

(57) Illumination device comprising at least one light source of the LED type, at least one surface (130) reflecting the rays (RA,RB) emitted by the light source, said LED being arranged with its optical axis in a direction substantially perpendicular to the optical axis of the device.

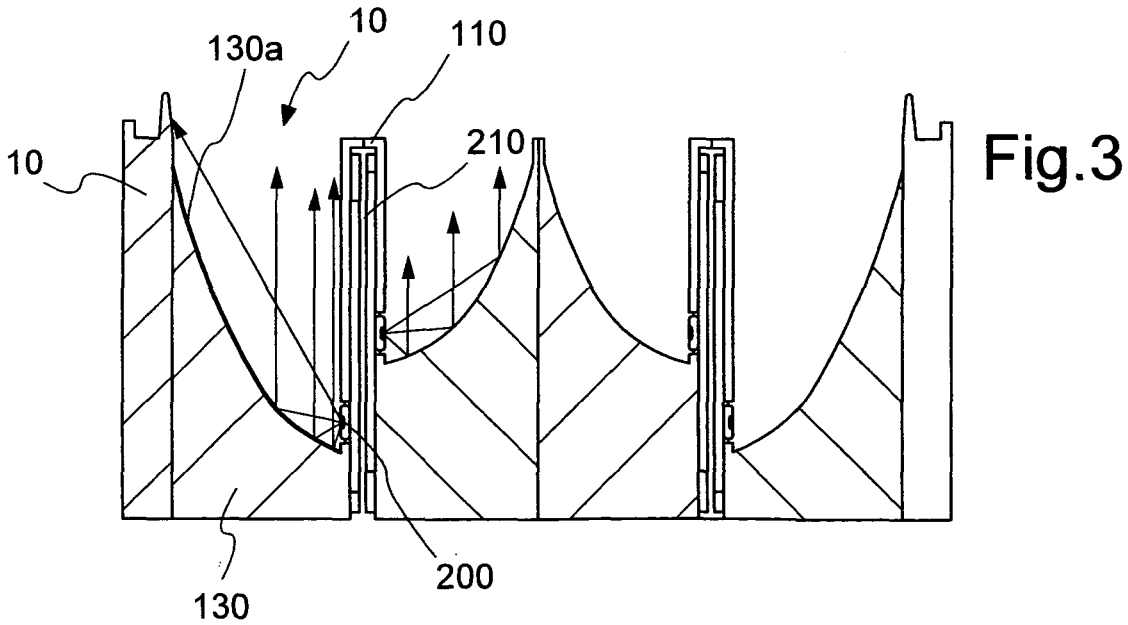

Fig.3

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Description

[0001] The present invention relates to an illumination device comprising at least one light source of the LED type arranged with its optical axis in a direction substantially perpendicular to the optical axis of the device.

[0002] It is known in the technical sector relating to motor vehicles that there exists a need to equip said vehicles with a front illuminating source able to provide different types of illumination corresponding to the different daytime/night-time requirements and/or to the different environmental conditions resulting from cloudiness, fog, entry into tunnels, and the like. For this purpose headlamps of various kinds are also known, said headlamps having a reflecting body with, arranged inside it, the light source(s) able to emit light of the dipped beam, full beam and/or parking type, the light rays of which strike the reflecting surface at any angle and are reflected in a calculated direction which may or may not be parallel to the optical axis of the headlamp.

[0003] The headlamps currently available in the art also include those where the light source consists of LEDs (Light Emitter Diodes) which allow light of sufficient power to be produced without the substantial need for maintenance since they are not subject to wear in the manner of filament lamps.

[0004] Although performing their function, these LED headlamps nevertheless have drawbacks arising from the fact that they are characterized by a luminous emission intensity which is maximum at small emission angles (symmetrical with respect to zero).

[0005] With these emission characteristics in fact the known headlamp structures are unable to ensure a high efficiency since, in the angular zone of maximum efficiency of the LED, the reflecting surfaces do not receive light rays owing to the emission angle which is too acute, while in the case of an angle wide enough to ensure that the rays strike the reflecting surface the luminous intensity emitted is poor.

[0006] The technical problem which is posed, therefore, is to provide an LED illumination device able to ensure a high efficiency in terms of a high ratio between reflected light and light emitted by the LED light source.

[0007] In the context of this problem it is also required that the device should have small dimensions, be easy and inexpensive to produce and assemble and be able to be easily installed on any user appliance by means of normal standardized connection means.

[0008] These results are achieved according to the present invention by an illumination device comprising at least one light source of the LED type, at least one surface reflecting the rays emitted by the light source, said LED being arranged with its optical axis in a direction substantially perpendicular to the optical axis of the device.

[0009] Further details may be obtained from the following description of a non-limiting example of embodiment of the subject of the present invention provided with reference to the accompanying drawings in which:

- Figure 1 shows a perspective view, from above, of a headlamp according to the present invention;
- Figure 2 shows a cross-section along the plane indicated by II-II in Fig. 1 with the LEDs switched off; and
- Figure 3 shows a cross-section similar to that of Fig. 2 with the LEDs switched on.

[0010] As shown in Fig. 1, assuming solely for the sake of convenience of the description a set of three axes, i.e. a longitudinal axis X-X, transverse axis Y-Y and vertical axis Z-Z, the headlamp according to the invention comprises essentially a containing body 10 having, arranged inside it, illuminating cells 100 substantially formed by transverse walls 110 for fastening to the container 10 and by partitions 120 delimiting the cell in the longitudinal direction.

[0011] Each cell has, arranged inside it, a reflecting element 130 in the form of a curved surface which extends in the transverse direction between the two partitions 120 and has, in the longitudinal direction, a curved profile 130a with an upper vertex in the vicinity of the front surface of the headlamp and lower vertex in the vicinity of the bottom of the headlamp.

[0012] According to preferred embodiments the reflecting surface 130 may be of the complex type.

[0013] At least one LED 200 mounted on a respective electromechanical support 210 - for example a rigid or flexible printed circuit - is arranged on the transverse wall zone 110 delimited by two partitions 110 or by a partition 110 and by the body 10 of the device so that the optical axis of the LED has a direction perpendicular to the optical axis of the reflector 130.

[0014] According to the invention it is envisaged moreover that said curved and/or complex surface is calculated so that all the light rays RA emitted by each LED with small emission angles relative to the optical axis of the said LED and therefore characterized by a high luminous intensity are correctly reflected and emitted by the headlamp, while the rays RB which are not reflected by the reflecting surface, and therefore substantially lost, consist solely of the rays with a large emission angle characterized by a low luminous intensity.

[0015] This means that the quantity of rays not reflected results in a loss of emitted light intensity which is substantially uninfluential for the purposes of the quantity of light which the headlamp must emit according to its specification.

[0016] It is envisaged, moreover, that the LEDs are associated with control means (not shown) able to cause selective switching on of the said LEDs so as to produce emission conditions for example of the dipped beam or full beam type if the device is configured for operation as a vehicle headlamp.

[0017] It can therefore be seen how with the device according to the invention it is possible to obtain all the

advantages resulting from the use of a light source of the LED type, solving the problems of poor efficiency of the devices known in the art.

Claims

1. Illumination device comprising at least one light source of the LED type, at least one surface (130) reflecting the rays (RA,RB) emitted by the light source, **characterized in that** said LED is arranged with its optical axis in a direction substantially perpendicular to the optical axis of the device.

2. Device according to Claim 1, **characterized in that** said reflector consists of a curved reflecting surface.

3. Device according to Claim 1, **characterized in that** said reflector consists of a complex reflecting surface.

4. Device according to Claim 1, **characterized in that** said curved surface is calculated.

5. Device according to Claim 1, **characterized in that** said device comprises a containing body (10) having, arranged inside it, illuminating cells (100) substantially formed by transverse walls (110) for fastening to the container (10) and by partitions (120) delimiting the cell in the longitudinal direction.

6. Device according to Claim 5, **characterized in that** said reflecting element (130) extends in a transverse direction between the two partitions (120) and has a profile (130a) with an upper vertex in the vicinity of the front surface of the device and lower vertex in the vicinity of the bottom of the device.

7. Device according to Claim 1, **characterized in that** it is a headlamp for vehicles.

8. Device according to Claim 1, **characterized in that** it is a headlamp for motor vehicles.

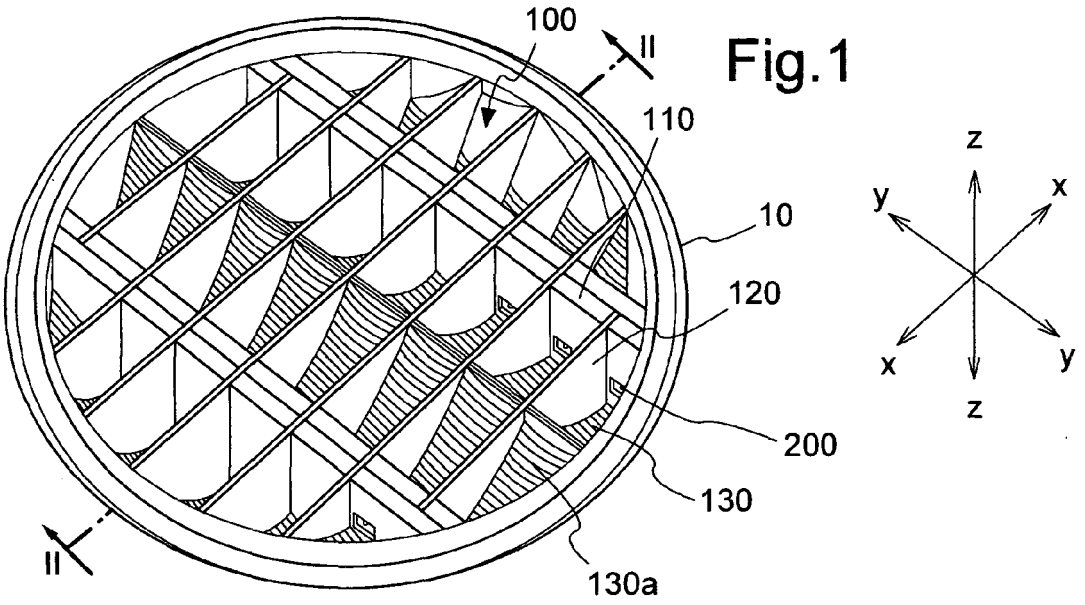
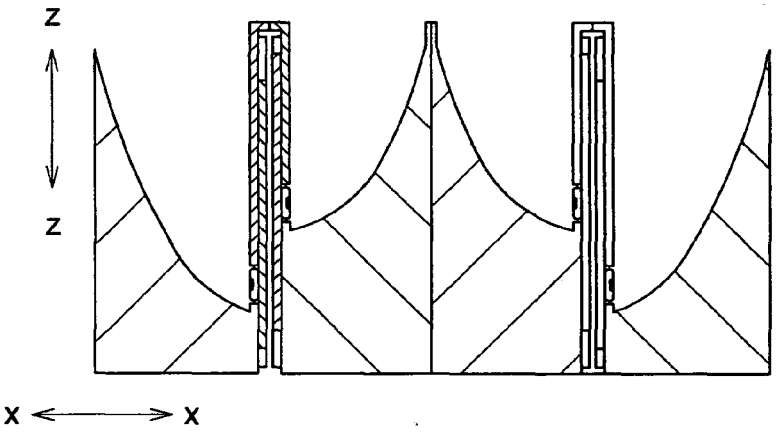


Fig.1

Fig.2



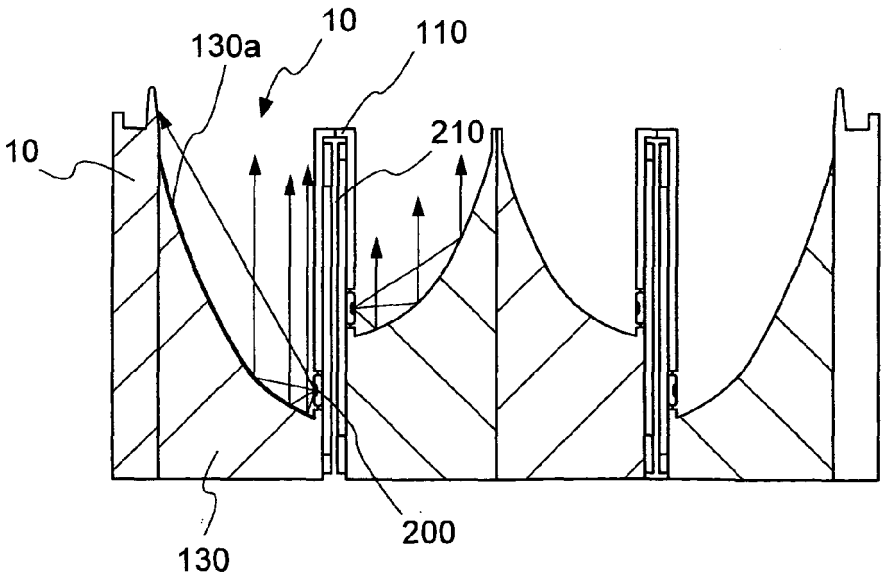


Fig.3