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(71) Applicant: **SILT S.R.L.**
Corso Ferrucci, 46
I-10138 Torino(IT)

Applicant: **SIMPLER INTERNATIONAL S.P.A.**
Largo Moncalvo, 18
I-10131 Torino(IT)

(72) Inventor: **Parisi, Nicola**
Via Madama Christina, 45
I - 10100 Torino(IT)
Inventor: **Guasconi, Giancarlo**
Strada Antica della Posta, 140
I - 10046 Poirino(IT)

(74) Representative: **Jorio, Paolo et al**
STUDIO TORTA Società Semplice Via Viotti 9
I-10121 Torino(IT)

(54) An illumination device provided with a heat radiating lamp carrier.

(57) An illumination device is described consisting of a headlamp or headlight composed of a body or concave casing housing within it a parabolic reflector, a transparent protection element closing the front of the casing and having a front screen preferably defined by a lens, a light source defined by a lamp and a lamp carrier element supporting the light source in correspondence with the focus of the reflector and supported projecting from the rear of the casing and closing a rear cavity thereof; the lamp carrier element is made of heat conductive material and is provided externally with radiating means adapted to dissipate into the environment the heat conducted by it, as well as by a possible screen element interposed between the light source and the front screen.

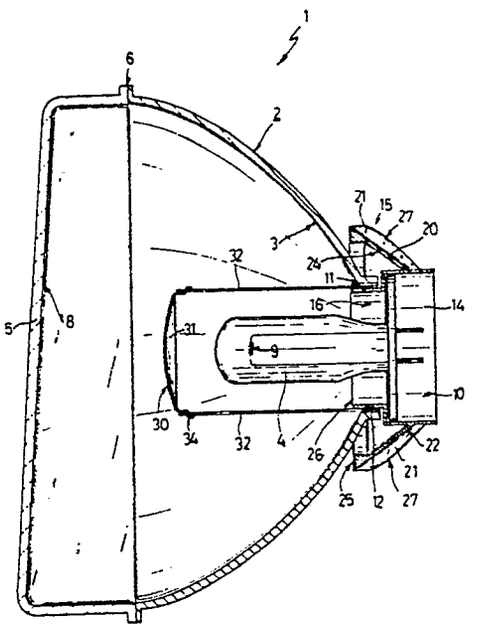

Fig.1

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AN ILLUMINATION DEVICE PROVIDED WITH A HEAT RADIATING LAMP CARRIER

The present invention relates to an illumination device such as a headlamp or spotlamp for a vehicle or for the illumination of public places such as squares, streets, offices, shops, shop windows or houses, which is provided with component elements made of synthetic plastics material and uses a light source developing heat energy, such as for example an incandescent lamp.

It is known that devices of the type defined above usually comprise a body or casing defining (or housing within its interior) a parabolic reflector, the said light source which is supported by a lamp carrier element fixable, in turn, to the rear of the body or casing, a transparent protection element located at the front to close the body or casing, and a lens, usually formed integrally with the transparent protection element, for spreading the light beam produced by the source and concentrated by the reflector, usually parabolic, at the focus of which the light source itself is positioned. Thanks to modern moulding technology many of the first defined elements can conveniently be made, instead of in glass and metal, by utilising synthetic plastics material having a low weight and improved workability; in particular it would be advantageous to use such materials to make the body or casing, the reflector and, where possible, the lens or the optically inactive part of the protection element if the lens is incorporated in this latter.

Unfortunately the light sources in most common use in such devices are incandescent lamps which, as well as developing light energy, also develop a considerable quantity of heat energy, causing in use a significant heating of the illumination device; thus, since the majority of the plastics materials usable for this purpose are thermoplastic, or at least such as to be damaged by intense heat, this currently restricts their utilisation in the field of illumination devices.

The object of the invention is that of providing an illumination device of the type described, utilising a light source also developing heat energy, the structure of which, in particular that of its lamp carrier element, permits a rapid dissipation of the heat produced and, therefore, prevents the illumination device as a whole from suffering a high rise in temperature in use. A further object of the invention is that of providing an illumination device for the construction of which a wide range of synthetic plastics materials can be used.

The said objects are achieved by the invention, which relates to an illumination device, in particular a headlamp for a vehicle, comprising a light source developing heat energy, a body housing the said light source and provided with a reflector, a lamp carrier element supported to the rear of the said body and supporting the said light source substantially at a focus of the said reflector, and a lens disposed in such a way as to be able to spread a light beam produced by the light source and concentrated by the reflector, characterised by the fact that the said lamp carrier element is made of a head conductive material and includes radiating means supported so as to project externally from the said body, in correspondence with a housing cavity for the said lamp carrier element formed through the body itself, the said radiating means being able to dissipate into the environment the heat energy produced by the light source and conducted by the lamp carrier element.

For a better understanding of the invention a non-limitative description of an embodiment is now given with reference to the attached drawings, in which:

Figure 1 illustrates a schematic sectional side view of an illumination device formed according to the invention; and

Figures 2 and 3 respectively illustrate a rear face view and a sectioned view taken on the line III-III of a detail of the device of Figure 1.

With reference to Figures from 1 to 3, an illumination device constituted by a headlamp or, in a current but imprecise terminology, a headlight for a motor vehicle (not illustrated for simplicity) is generally indicated with the reference numeral 1; the illumination device or headlamp 1 comprises a body or hollow casing 2 of paraboloid form preferably made of moulded synthetic plastics material, in this example defining within its interior an integrally formed parabolic reflector 3 of known type, and housed within its interior, substantially in correspondence with a focus of the reflector 3, a light source constituted by an electric incandescent lamp or bulb 4, and a transparent front protection element 5 of substantially cup-shape, which is disposed with its concavity facing the light source 4 opposite this latter and closing the front of the body or casing 2 around a perimetral frontal edge 6 to which the element 5 is mechanically fixable in a known manner to form a fluid-tight seal. The element 5, which can be made entirely of glass, or else of a mixed glass/polycarbonate structure, is provided with a front screen 8 in this case defined by a lens adapted so as suitably to spread the light beam produced by the lap 4 and concentrated by the reflector 3; this lens 8, in a possible (but not illustrated) variant can also be made as an element separate from the element 5 and housed within the interior of the body 2, in which case it is preferably

made of plastics material, for example polycarbonate. According to the invention the lamp 4 is supported by a lamp carrier element 10 made of a metal material having a good thermal conductivity, for example a light alloy or die-cast aluminium, which is in turn supported by the body 2 rearwardly thereof, in correspondence with a seat or housing cavity 11 formed in the rear of the body 3 and through which a bulb 9 of the lamp 4 is mounted within this latter at the focus of the reflector 3.

The lamp carrier element 10, from hereon indicated, for simplicity, also as the lamp carrier 10, comprises a first concave portion 12 adapted to engage on the outside with the housing cavity 11 to ensure fixing of the lamp carrier element 10 to the body 3, and a second portion 14, which is provided, according to the invention, with radiating means generally indicated 15, which in use (Figure 1) are supported so as to project out from the body 2 and which are adpated to dissipate into the environment surrounding the projector 1 the heat energy produced by the lamp 4 and which is transmitted from this by conduction, as will be explained, to the lamp carrier 10; the portions 12 and 14 are both shaped as cylindrical sleeves and the portion 14 has a greater diameter and is carried by and projects rearwardly of the portion 12; this latter releasably carries the lamp 4 in a known way within an interior cavity 16 thereof, and is shaped in such a way as to be interposed, when the element 10 is mounted in the cavity 11, between the lamp 4 itself and the body 2 to screen this latter. Fixing of the lamp carrier 10 to the body 2 can be effected in any known way, for example by adhesive or force fitting of the portion 12 into the seat 11, or by fixing means, not illustrated for simplicity, carried externally of the portion 12, such as threaded connectors, bayonets, snap-engagement hooks and the like. For the purpose of the mounting of the lamp carrier 10 the portion 14 of greater diameter is able to abut against the outer edge of the seat 11 to determine the axial position of the lamp carrier 10 itself. Internally this latter is further provided with coupling and fixing means for the lamp 4, of known type generally indicated 18, in the illustrated example adapted to allow a bayonet fixing of the lamp 4 when this is introduced from the rear through the portion 14. The radiating means 15 comprise a radial flange 20 carried by and projecting out from the portion 14 of the lamp carrier element 10, and a plurality of radial fins 21 closely spaced around a ring on the flange 20, in particular on a rearwardly facing surface 22 thereof, facing away from the body 2. The flange 20 is shaped as a frustoconical cap tapering towards the portion 14 and projecting axially from this towards the portion 12, coaxially thereto, and is delimited by a concave front surface 24 facing the body 2 and terminating with its perimetral edge 25 substantially flush with a corresponding perimetral edge 26 of the portion 12, as well as by a convex rear face defined by the surface 22, which carries the fins 21 disposed in respective meridian planes thereof; these latter are in turn delimited by respective curved longitudinal edges 27 having convex outlines.

The lamp carrier element 10 is integrally formed with the radiating means 15, which are therefore also made of a material which is a good conductor of heat, such as a light alloy or aluminium, and is further shaped in such a way that it can be made by moulding in one piece together with the radiating means 15. In a preferred embodiment of the invention the headlamp 1 further includes a known screen element 30 interposed between the lamp 4 and the lens 8 to intercept light radiated directly from the source or lamp 4 towards the lens 8, or rather the light beams which, not being directed towards the reflector 3, cannot be concentrated thereby and which, therefore, would be able to lower the optical efficiency of the lamp; this screen element 30 is constituted by a metal cap 31, for example spherical and made in the same heat conductive material as the lamp carrier 10, which is disposed close to the lamp 4 and is mechanically and thermally connected with the lamp carrier 10 by means of respective longitudinal conductive support elements 32 intimately connected both with the cap 31 and with the lamp carrier 10, and made of a heat conductive material, for example copper, aluminium or a light alloy, adapted to define respective head bridges between the screen element 30 and the lamp carrier element 10. By "intimately connected" is intended a form of connection which ensures substantial thermal and mechanical continuity, such as welding, brazing or a mechanical connection by tightly clenched plastic deformations. These longitudinal support elements 32 are defined, in this example, by respective metal rods connected peripherally and externally in the said manner both to the lamp carrier element 10, in particular to the portion 12 of this latter, and to the screen element 30, in particular to a suitably shaped peripheral rim 34 of the cap 31.

In use the heat energy produced by the lamp 4 is in part transmitted by conduction to the lamp carrier 10, which transmits it by conduction to the heat radiating means 15 which are able, because of their shape and position, to disperse this heat energy rapidly into the environment partly by radiation and partly by convection, preventing transmission by conduction of the heat from the lamp carrier 10 to the body 2 as takes place in known illumination devices; the remaining part of the heat energy produced by the lamp 4 is for the most part

radiated and, therefore, collected by the metal cap 31 which is found in close proximity to the filament 9, or rather to the focus of the reflector 3 inasmuch as the lamp carrier 10 is not located there; the remaining part of the heat energy produced by the lamp 4 escapes therefrom by convective movement of the air enclosed within the interior of the body 2. The heat collected by the cap 31, thanks to the presence of the rods 32 and, above all, to their intimate connection therewith and with the portion 12, is also transmitted, in part by conduction and in part by convection, towards the lamp carrier 10; in fact, this experiences a lower temperature than that of the cap 31 being more distant from the filaments 9 and being closer to the radiating means 15, and facing them, and therefore the rods 32 not only thermally short circuit the screen element 30 permitting the transmission of heat energy by conduction, but they also create within the interior of the body 2 and in the immediate surroundings of the lamp 4, a convective movement which goes from the cap 31 to the concavity 16 of the portion 14 of the lamp carrier 10; this convective motion on the one hand permits the dissipation of heat collection by the screen 30 and, on the other, partially screens the transmission of heat by convection and radiation from the lamp 4 to the body 2. In conclusion, this latter receives very little heat from the lamp 4 in that the major part of the heat energy produced thereby is intercepted by the cap 31 and the lamp carrier 10, and receives very little heat even from the lamp carrier 10 in that the means 15 disperse the heat energy which is collected by the lamp carrier 10 before this can be transmitted to the body 2; therefore, this latter, in the illumination device according to the invention, no longer runs the risk of overheating and, consequently, can be made without difficulty in synthetic plastics material of low cost; the same argument holds true mostly for the same reasons also for the transparent element 5 and for possible lenses 8 within the body 2; consequently even these elements can be made of plastics material thus producing headlamps of high efficiency, low cost and low weight which are excellent for use on vehicles.

Claims

1. An illumination device, in particular a headlamp for a vehicle, comprising a light source developing heat energy, a body housing the said light source and provided with a reflector, a lamp carrier element supported to the rear of the said body and supporting the said light source substantially at a focus of the said reflector, and a lens disposed in such a way as to be able to spread a light beam produced by the light source and concentrated by the reflector, characterised by the fact that the said lamp carrier element is made of a heat conductive material and comprises radiating means supported externally of and projecting from said body in correspondence with a housing cavity for the said lamp carrier element formed through the body itself, the said radiating means being adapted to dissipate into the environment the heat energy produced by said light source and conducted by the lamp carrier element.

2. An illumination device according to Claim 1, characterised by the fact that the said lamp carrier element comprises a first concave portion which can be coupled in the said housing cavity to ensure fixation of the lamp carrier element to the said body, and a second portion fixedly provided with the said radiating means, carried rearwardly of and projecting from the first portion; this latter supporting the said light source removably within the interior thereof and being shaped in such a way as to be interposed between the light source itself and the said body to screen this latter.

3. An illumination device according to Claim 2, characterised by the fact that the said radiating means comprise a radial flange carried externally of and projecting from the said second portion of the lamp carrier element and a plurality of radial fins formed in a ring on the said flange, on a rear face thereof facing away from the said body.

4. An illumination device according to Claim 3, characterised by the fact that the said flange is cap-shaped and is delimited by a concave front surface facing towards the said body and terminating at its perimetral edge substantially flush with a corresponding perimetral edge of the said first portion of the lamp carrier element, and by a convex rear surface provided with the said fins in respective meridian planes; these latter being delimited by respective curved longitudinal edges having convex outlines.

5. An illumination device according to any of the preceding Claims, characterised by the fact that the said lamp carrier element is formed integrally in one piece with the said radiating means in a light alloy, the lamp carrier element being further shaped in such a way that it can be made by moulding in one piece together with the said radiating means.

6. An illumination device according to any preceding Claim, characterised by the fact that the said reflector and the said lens are made of synthetic plastics materials.

7. An illumination device according to any preceding Claim, characterised by the fact that it further includes a screen element interposed between the said light source and the said lens to intercept light directly radiated by the said source towards

the said lens, the said screen element being constituted by a metal cap disposed close to the said light source and mechanically and thermally connected with the said lamp carrier element by means of respective longitudinal support elements intimately connected both to the said cap and to the said lamp carrier element and made of a heat conductive material adapted to define respective thermal bridges between the screen element and the lamp carrier element.

8. An illumination device according to Claim 7, characterised by the fact that the said longitudinal support elements are defined by respective metal rods connected peripherally and externally both to the said lamp carrier element and to the said screen element.

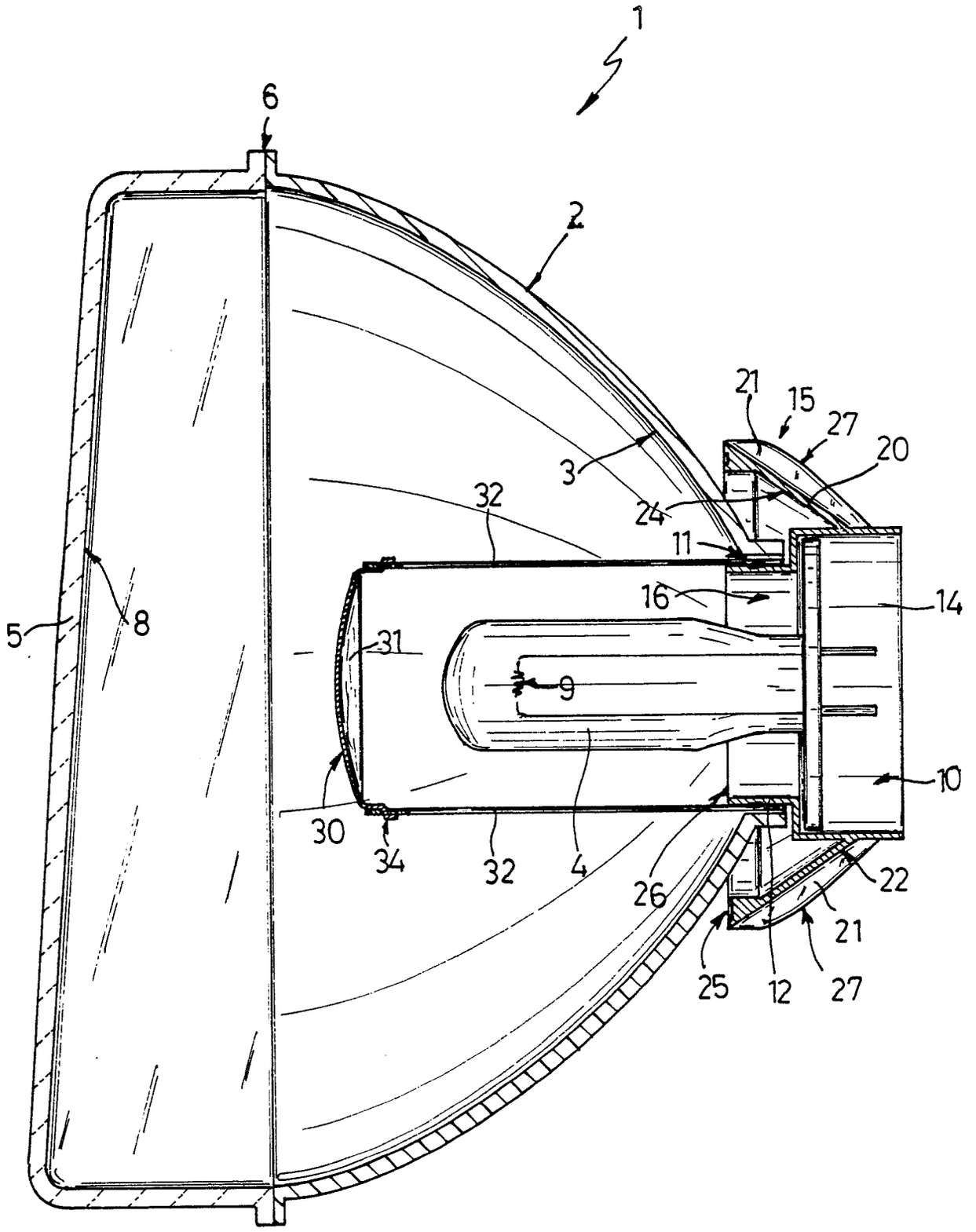

Fig.1

(Dr. Ing. Paolo JORIO)

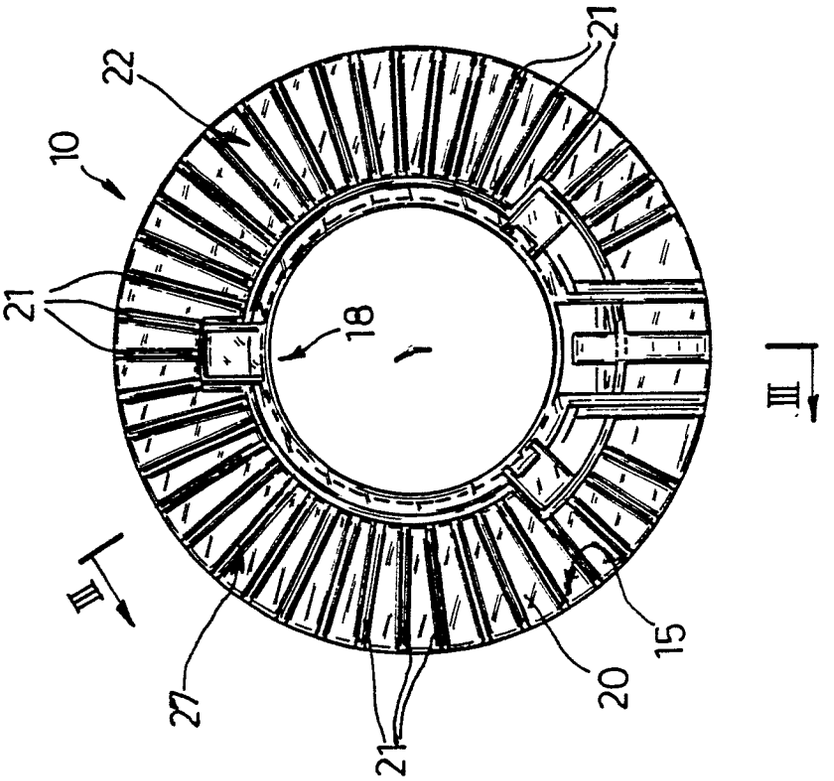

Fig.2

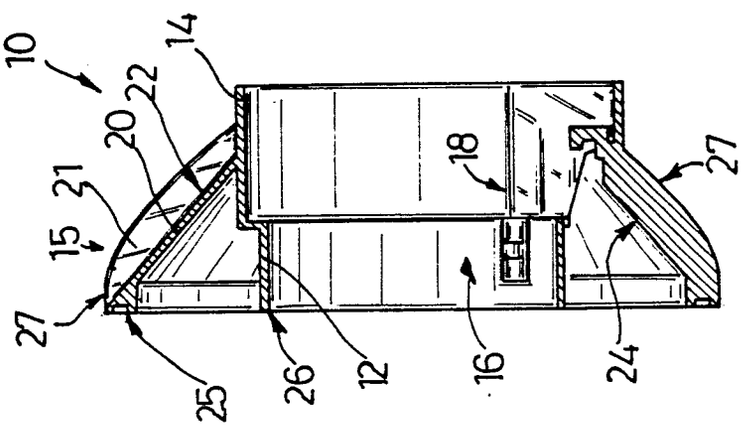

Fig.3

(Dr. Ing. Paolo JORIO)