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(54) **Heat dissipation device for LEDs and related production method**

(57) Lighting device - and related production method - comprising a mounting board for electronic components (10) suitable to mount, on the one side, said electronic components including at least one light emitting diode or LED (11) and relative optics (12), and, on the other side, at least one heatsink element (13) associated with said at least one LED (11) and suitable to be fastened through one of the base sides thereof to said mounting board (10) so as to extend in length in a direction essentially perpendicular thereto, characterized in that said mounting board (10) is suitable to house LEDs (11) of different size and rated power and said at least one heatsink element (13) is obtained from a bar of heat conductive material having a cross section of fixed and constant dimensions and length determined by the size of said at least one LED (11).

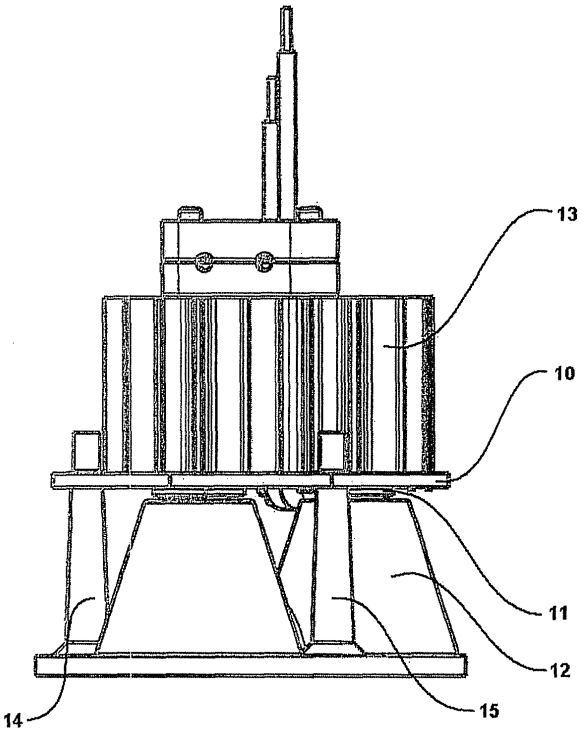

Fig. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of lighting devices, in particular it relates to the field of LED (Light Emitting Diode) devices and to techniques to eliminate heat generated during their operation.

STATE OF THE ART

[0002] Modern lighting devices and apparatus make increasingly frequent use of light emitting diodes or LEDs due to their ease of use and superior characteristics, compared to conventional light sources composed of incandescent and fluorescent lamps, in terms of average useful life, flexibility of use and the possibility of integration into small spaces.

[0003] Notwithstanding the fact that technology regarding LED light sources promises imminent developments that will further improve the characteristics and determine that LEDs finally surpass all other light sources, one of the aspects that to date has been considered most problematic concerns the power dissipation of these devices and the need for efficient systems for eliminating and dissipating the resulting heat.

[0004] In fact, present LEDs only emit 20-30% of the absorbed power in the form of visible light radiation and dissipate the remaining 70-80% by conduction and convection. This naturally makes it necessary to provide LED devices employed for lighting with adequate dissipation means which guarantee elimination of the heat generated so as to ensure correct operation of this LED device and of the surrounding circuit.

[0005] In the majority of cases the most widely used method for this purpose provides for the use of metal heatsinks, with ad hoc dimensions, to be placed in contact with the LED device so as to eliminate the power dissipated by conduction and maintain the operating temperature within such limits as not to compromise correct operation and reduce the average useful life of the device. However, this solution naturally requires the design and use of a new heatsink each time the LED device utilized in a specific lighting appliance is replaced with one of different size. This has obvious consequences on the layout of the circuit as a whole, which could require modifications to obtain the space required for the new heatsink.

[0006] It is therefore desirable to introduce a lighting device based on LEDs and comprising suitable heat dissipation means, associated with said LEDs, suitable to be managed in a flexible manner for use with LEDs of different sizes and rated powers without this requiring a new design of the circuit layout.

SUMMARY OF THE INVENTION

[0007] The present invention relates to a lighting device based on LEDs (Light Emitting Diode) and comprising suitable heat dissipation means, associated with said LEDs, suitable to be managed in a flexible manner for use with LEDs of different sizes and rated powers without this requiring new design of the circuit layout.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 is a perspective view of a preferred embodiment of the present invention.

Fig. 2 is a plan view of the component side of the mounting board included in a preferred embodiment of the present invention.

Fig. 3 is a plan view of the heatsink side of the mounting board included in a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0009] The appended Fig. 1 shows a perspective view of a preferred embodiment of the present invention. The lighting device based on LEDs shown in the aforesaid figure comprises a mounting board for electronic components 10, suitable to mount, on the one side, said electronic components including at least one light emitting diode or LED 11 and relative optics 12, and, on the other side, at least one heatsink element 13 associated with said at least one LED.

[0010] Said mounting board 10 is suitable to house LEDs 11 of different sizes while said at least one heatsink element 13 is composed of a bar of heat conductive material, preferably produced by extrusion, having a cross section of fixed and constant dimensions and suitable to be fastened by one of the base sides thereof to said mounting board 10 so as to extend in length in a direction essentially perpendicular thereto.

[0011] In this manner said at least one heatsink element 13 makes it possible to ensure a fixed and constant dimension on the mounting board 10 while the thermal resistance can be modulated as desired - to meet changing dissipation requirements of the electronic circuit - simply by modifying the length. This allows the designer to dimension the layout of the mounting board 10 so that it can house LED devices of various sizes and rated powers using only one type of heatsink element, the thermal resistance of which is adapted time by time to the dissipation requirements of the circuit simply by changing the length of said heatsink element 13.

[0012] Said at least one heatsink element 13 is provided with appropriate means for fastening to said mounting board 10 suitable to provide the necessary mechanical stability, maintaining it in an appropriate position to eliminate the power dissipated by the LED device with which it is associated.

[0013] In a preferred embodiment of the device according to the present invention, the LED devices present on

said mounting board 10 are three in number 20, 21, 22, evenly spaced apart by approximately 120° and provided with relative optics 23, 24, 25, as shown in the appended Fig. 2, which shows a plan view of the component side of said mounting board 10. On the opposite side of said mounting board 10, shown in a plan view in the appended Fig. 3, an extruded heatsink 30 shaped appropriately so as to be associated with each of said three LED devices 20, 21, 22 and provided with means for fastening to said board 10 composed of a central pin 31 suitable to engage, at one end, with a specific hole on said mounting board 10, and, at the other end, with a cross member 32 suitable to exert the necessary pressure on said extruded heatsink shaped so as to minimize the thermal resistance of contact with said mounting board 10. Said cross member 32 can also be suitable to operate as locking element for any power cables associated with said board 10.

[0014] In a preferred embodiment of the present invention, said optics 23, 24, 25, can be produced through a single element comprising 3 conical lenses each associated with a LED device 20, 21, 22 mounted on said board 10 and connected by a surface 26 suitably machined so as to provide the total cone of light desired and provided with appropriate means for fastening to said board 10 which can be produced, for example, by appropriate pins 14, 15, suitable to engage with specific holes 27, 28, 29 made in said mounting board 10.

Claims

1. Lighting device comprising a mounting board for electronic components (10) suitable to mount, on the one side, said electronic components including at least one light emitting diode or LED (11) and relative optics (12), and, on the other side, at least one heatsink element (13) associated with said at least one LED (11) and suitable to be fastened through one of the base sides thereof to said mounting board (10) so as to extend in length in a direction essentially perpendicular thereto, **characterized in that** said mounting board (10) is suitable to house LEDs (11) of different size and rated power and said at least one heatsink element (13) is obtained from a bar of heat conductive material having a cross section of fixed and constant dimensions and length determined by the size of said at least one LED (11).

2. Device as claimed in claim 1, **characterized in that** said at least one heatsink element (13) is produced by extrusion.

3. Device as claimed in claims 1 - 2, **characterized in that** said at least one heatsink element (13) is provided with appropriate means for fastening to said mounting board (10) suitable to provide the necessary mechanical stability, maintaining it in an appropriate position to eliminate the power dissipated by the LED device with which it is associated.

4. Device as claimed in claims 1 - 3, **characterized in that** said mounting board (10) is associated with three LED devices (20, 21, 22), evenly spaced apart by approximately 120° and provided with relative optics (23, 24, 25).

5. Device as claimed in claims 3 - 5, **characterized in that** said appropriate means for fastening to said mounting board (10) with which said at least one heatsink element (13) is provided, are composed of a central pin (31) suitable to engage, at one end, with a specific hole on said mounting board (10), and, at the other end, with a cross member (32) suitable to exert the necessary pressure on said heatsink (13).

6. Device as claimed in claim 5, **characterized in that** said cross member (32) is also suitable to operate as locking element for any power cables associated with said board (10).

7. Device as claimed in claims 4 - 6, **characterized in that** said optics (23, 24, 25) are produced through a single element comprising three conical lenses each associated with each one of said LED devices (20, 21, 22) mounted on said board (10) and connected by a surface (26) suitably machined so as to provide the total cone of light desired and provided with appropriate means for fastening to said board (10).

8. Device as claimed in claim 5, **characterized in that** said appropriate means for fastening to said board (10) are produced by appropriate pins (14, 15) suitable to engage with specific holes (27, 28, 29) made in said mounting board (10).

9. Method for producing lighting devices comprising the following steps:

   a) use of a mounting base for electronic components suitable to house, on the one side, LED devices (11) of different size and rated power and relative optics (12), and, on the other side, at least one heatsink element (13) associated with said at least one LED;
   b) use of a heatsink element (13) composed of a bar of heat conductive material, having a cross section of fixed and constant dimensions and suitable to be fastened by one of the base sides thereof to said mounting board (10) so as to extend in length in a direction essentially perpendicular thereto;
   c) adaptation of the thermal resistance of said heatsink element (13) by changing the length thereof.

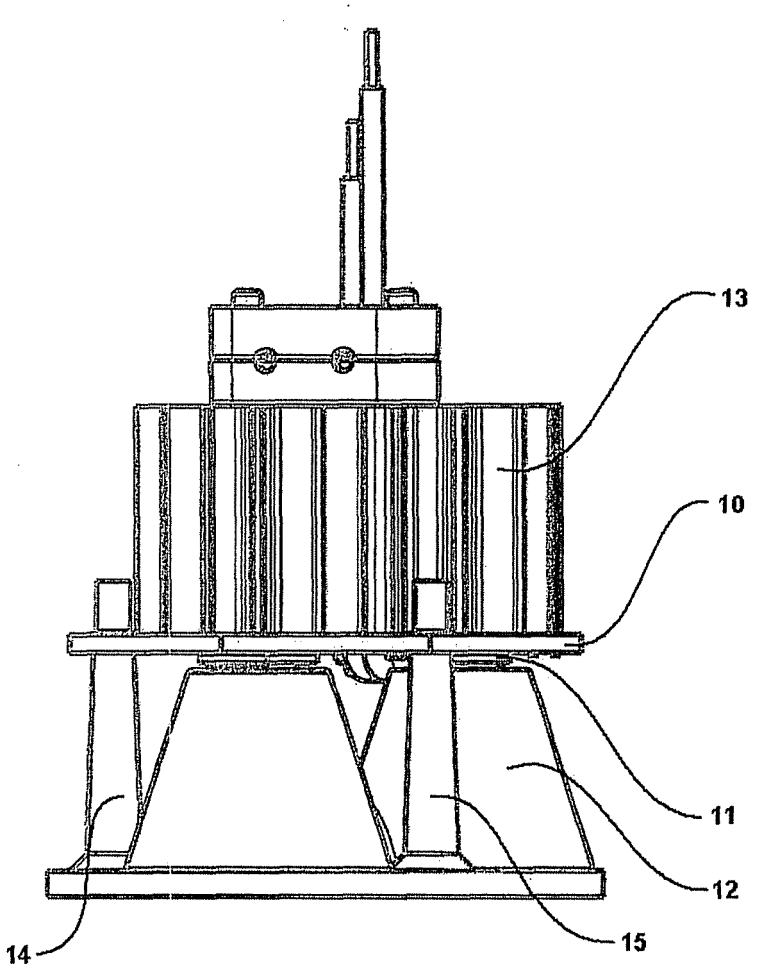

Fig. 1

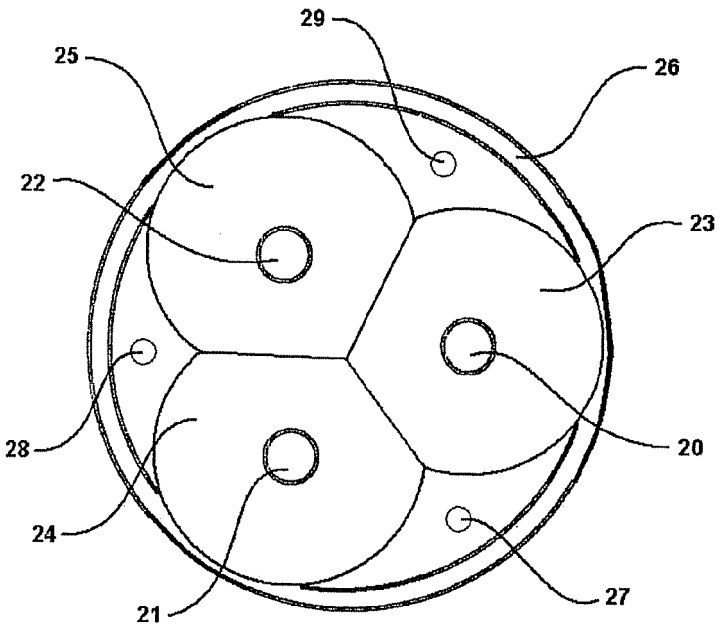

Fig. 2

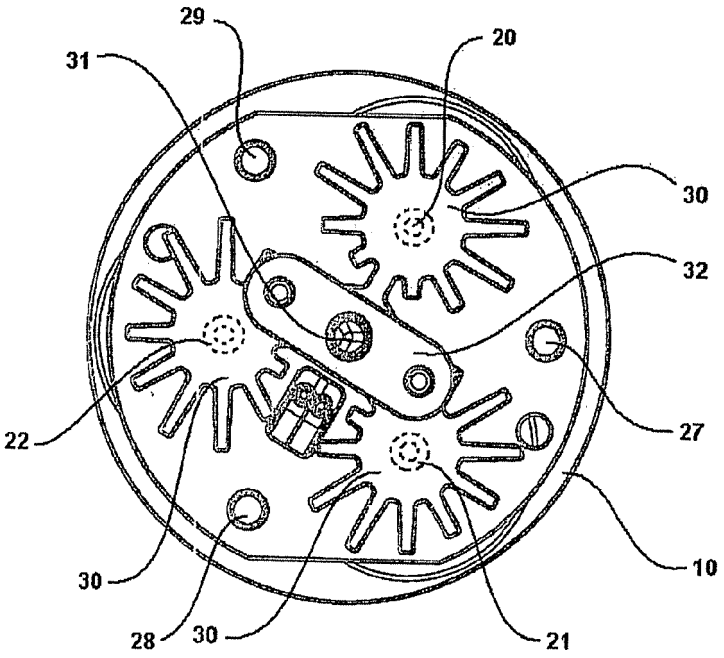

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 08 16 7394

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 February 2009	Meacher, David

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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E : earlier patent document, but published on, or after the filing date
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 16 7394

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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