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(54) LIGHTING DEVICE

(57) Lighting device comprising a connecting element (1) coupled to the socket, a protection housing (2) having at least one controller (4) and the power supply (6), a printed circuit board (11) intended to support and connect the electronic elements, connection cables (3), and a diffuser element, wherein between the protection housing (2) and the printed circuit board (11) a heat sinking element (13) is placed, being the electronic elements arranged on the printed circuit board (11) a plurality of LEDs. In addition, a heat insulation chamber is created through two protective plates (5, 7) of the power supply (6), wherein the only existing temperature is that provided by the controller (4) and the power supply, and the whole device being also sealed.

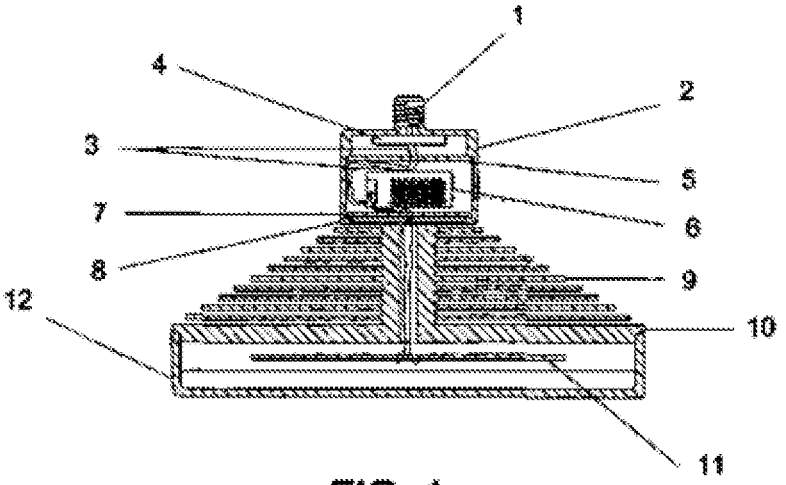


FIG. 1

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Description

Object of the invention

[0001] The invention being proposed consists of a lighting device based on LED diodes, with temperature deterrent elements, which allows obtaining the maximum performance, efficiency and durability of LEDs. The device can be configured for different consumptions depending on where is to be applied, with less heat emission and greater energy savings.

Background of the invention

[0002] When the needs are to economize the electricity consumption, the consumption tends to be reduced by lowering the power of the lamps and tubes. This impairs vision and can cause headaches, fatigue in the vision and even accidents due to poor lighting. Power-LED manufacturing industries are always developing new devices through which not only extending the life of the lamp is achieved, but also achieves energy savings.

[0003] The white-light LEDs are blue diodes that emit light at a wavelength of about 460 nm, coated with a layer of phosphorus derivatives. The phosphorus absorbs the blue light and sends it to different wavelengths in the visible spectrum, generating white light. These are based on Indium Gallium Nitride sem iconductors.

[0004] The cathode of the diode is directly attached to a small parabolic reflector which in turn serves as output terminal. The positive pole of the diode is soldered to the output terminal, the anode, through a thin metallic conductor, usually made of gold. The diode is coated with a film of phosphorus derivative, which gives it a yellowish hue. The assembly is encapsulated in an epoxy resin of optical quality (high transparency) which serves as support, protection and focusing optics.

[0005] A major benefit of LED lighting is its low power consumption, about 10 times less than a halogen bulb. In addition, the life span of the LEDs is also higher than the bulb; during the same period with the light on, you have to replace about 16 times the aforementioned halogen bulb.

[0006] Currently, the high-pressure sodium vapor, commonly used in street lighting in much of Europe, provides an efficiency of 85 lumens per watt; LED technology is poised to exceed 150 lumens per watt, increasing this number as progressing in the development of semiconductors.

[0007] The mercury used in older lighting systems involves major environmental hazards. Unlike sodium lamps, LED lamps do not require a boot time to reach optimal levels of brightness. At the same time it decreases the power consumption and overall operating costs. Lighting by LED diodes on the streets has the potential, according to the researchers, of reducing light pollution.

[0008] Powerful LEDs that are currently in the market are fully able to being used in street lights as they comply with standard regulations for luminance levels and uniformity, compared with other technologies. That is, what is required is the uniformity of the street lighting, able to eliminate problems of glare, excessive concentration of the light beam and visibility, thus enhancing the safety.

[0009] Due to their greater longevity, streetlight and traffic signal LEDs do not need to be replaced as often, reducing the bills for public lighting, traffic jams, even easing their replacement.

[0010] The LED-based street lighting offers the benefit of showing more natural colors that may help to improve security. The diodes allow adjusting the color temperature to a specific lighting application, which with conventional lighting technologies are not available for this alternative.

Description of the invention

[0011] The proposed invention is a lighting device based on LED diodes that can be configured for different consumptions depending on where is to be applied. Its effectiveness is greater than the mercury vapor, sodium vapor and even the new generation of halides, producing less heat emission and contributing in a greater extent to energy savings. A key feature of its design is that a completely waterproof lamp is achieved, so that it can be used as a direct spot of light, and allowing eliminating the large protecting structures for current spot heads.

[0012] The light distribution achieved is more homogeneous than any of the alternatives currently available in the market. The shelf life is also improved with respect to any of the alternatives and their capacity to minimize wasted light make the energy demands falling further by reducing the lighting needs for a given area of the street. As the light distribution can be controlled for each of the LEDs, the target area can be effectively lighted without the pollution created by solutions of a single light beam.

[0013] One of the objectives of the proposed device is being able to manufacture lamps based on LED technology with different powers, according to the market needs. It also allows the replacement of all types of lamps that are currently in use, by simply changing the pace and size of the cap or connecting element.

[0014] The proposed lighting device will present a universal input voltage. Each module has a very stable light control because the electronic design is responsible for maintaining a constant power of each LED independently from the junction temperature or drafts. Its design is easy to install lights for both indoor and outdoor use, being adapted to the customer needs and the amount of light needed, so that more or fewer LEDs will be placed.

[0015] The working temperature is an important factor to consider in the use of LED. Therefore, the present invention has designed a series of temperature deterrent elements for maximum performance, efficiency and durability allowed by the LEDs. This design is universal, since it allows, without changing base structures, manufacturing light emitters from an LED to the amount that

allows the site location of the finished product, meeting the requirements demanded by the manufacturer of the LED.

[0016] Thus, the proposed lighting device comprises a printed circuit board, protected by a diffuser element, and supported by the opposite side on a supporting base of the main part of the device, the heat sinking means. These heat sinking means consist of sinking discs of different sizes, so that increase in size from the bottom to the top of the supporting base. The number of sinking discs depends on the light output required, so that the more the power required, the greater number of discs, and therefore only the size of the supporting base would have to be modified. Below the bottom of the supporting base a protective chamber for the isolation of the power supply comprising the LEDs has been created, through two protective lids.

[0017] The lighting control device is performed through at least one controller to be modified depending on the power needs for controlling the LEDs. The controllers can, for example, control about 6 LED, so that if one part melts, the device can continue operating without causing a total blackout of the product.

[0018] The set of protective lids, LED power supply and the controller, is located within a housing that protects all of these elements, and which is connected through a connection means, which may be a tapping element to a socket, connection through contact, connection blocks, or any other similar through which the supply enters.

Description of the drawings

[0019] To complete the description being made and in order to help to a better understanding of the characteristics of the invention, according to a preferred example of practical embodiment thereof, a set of drawings is attached as an integral part of said description, wherein in an illustrative and not limitative manner, the following has been represented:

Figure 1.- shows a cross sectional view of the device of the invention, wherein there are all elements of the device and the arrangement thereof.

Figure 2.- shows the same cross sectional view of Figure 1, but seeing the elements exploded.

Figure 3.- shows a side view of the outer part of the device of the invention, wherein the rings disposed in the sinking element are all equal.

Figure 4.- shows on its left part (A), a side view of the outer part, of another preferred embodiment of the invention, wherein the rings disposed in the sinking element increase their length from the housing to the area of the printed circuit board with the LEDs; while the right part (B) shows a front view of the printed circuit board with LEDs arranged on the base (10), so that in this representation the diffuser element (12) has been removed.

Figure 5.- shows an enlarged cross sectional view of the heat sinking element.

Preferred embodiment of the invention

[0020] The present invention relates to a lighting device comprising a connection means (1) that is coupled to the socket, through which the supply enters. Such connection means (1) may be a threading cap, as illustrated in the figures, or the connection by contact, terminal blocks or the like susceptible of application can also be performed. It fits existing lamps, whereby the replacement of old lighting fixtures is easy and fast, without the need of changing base structures. The whole device is sealed, so that it not only adapts to existing structures, but the device complexity and protective elements is eliminated, because such sealing allows a direct lighting without the need of a shelter from the outside. A housing (2) next to the connection means (1) protects the electronic elements, such as the controller (4) and the power supply (6).

[0021] Since this is a device that adapts to the needs, it may include a controller (4) or more, depending on the number of electronic elements and their control. Thus, each controller manages the operation of a number of electronic elements independently, so that in case of power failure of any of the groups of elements managed by the controller (4), the device would still work with the rest of them, without ever causing a complete blackout.

[0022] The device also has a printed circuit board (11) intended to support and connect the electronic elements. These electronic elements are embodied in a plurality of LEDs, which number will vary depending on the light intensity required. Some connection cables run inside the device, from the connection means (1) for the connection to the power supply, passing through the controller (4), the power supply (6) and the printed circuit board (11). As an end lid of the device, exterior view, there is a diffuser element (12) design of which is based on the emission and projection angle, as well as the dispersion or concentration required according to the needs.

[0023] Between the protection housing (2) and the printed circuit board (11) a heat sinking element (13) is placed. This is the core of the device, as it makes the heat to circulate more quickly gaining greater cooling. The sinking element (13) consists of a base structure (10), with a central tube (14), through which the connecting cable (3) pass, with a clamping base element (8) that is coupled to the housing (2). Between the base (10), the tube (14) and the clamping base element (8) the sinking discs (9), which can take all the same shape or increase their length in an upwardly fashion from the clamping base element (8) towards the base (10), thus achieving better results, are placed.

[0024] Another key part of the invention is the creation of a heat isolation chamber inside the housing (2). To achieve this, on the one hand a protective plate (7) between the sinking element (13) and the power supply (6) has been arranged, and on the other hand, a protective plate (5) between the controller (4) and the power supply (6). Thus the only temperature existing inside the housing (2) is that provided by the power supply (6) and the controller (4).

Claims

1. Lighting device comprising
a connection means (1) coupled to the socket or the like, through which the power supply enters,
a housing (2) for protecting the electronic elements, inside of which is at least one controller (4) and the power supply (6),
a printed circuit board (11) intended to support and connect the electronic elements,
cables (3) for connecting the different elements,
a diffuser element (12) that protects the printed circuit board (11),
characterized in that between the protection housing (2) and the printed circuit board (11) a heat sinking element (13) is placed, the electronic elements being arranged on the printed circuit board(11) a plurality of LEDs.

2. Lighting device, according to the previous claim, **characterized in that** its structure is sealed, leaving its interior isolated from any external agent, able to be used as a direct spot of light, and allowing eliminating the large structures for proteccting of current spot heads.

3. Lighting device, according to the previous claims, **characterized in that** the heat sinking element (13) consists of a base structure (10), with a central tube (14) through which the connection cables (3) pass, with a clamping base element (8) that couples the housing (2), placing between the base (10), the tube (14) and the clamping base element (8) sinking discs (9), so that the heat circulates more quickly thus obtaining an optimum cooling.

4. Lighting device, according to the previous claims, **characterized in that** all of the sinking discs (9) are equal.

5. Lighting device, according to claims 1 and 2, **characterized in that** the length of the sinking discs (9) goes upwardly from the clamping base element (8) towards the base (10).

6. Lighting device, according to the previous claims, **characterized in that** inside the housing (2),
a protective plate (7) is arranged between the sinking element (13) and the power supply (6),
and a protective plate (5) between the controller (4) and the power supply (6),
so that these create a heat insulation chamber wherein the only temperature existing inside housing (2) is that provided by the power supply (6) and the controller (4).

7. Lighting device, according to the previous claims, **characterized in that** each controller (4) independently manages the operation of a group of LEDs of the plurality thereof arranged in the printed circuit board (11), so even if a part of the lighting melts it still does its function.

8. Lighting device, according to the previous claims, **characterized in that** the design of the diffuser element (12) is a function of the emission and projection angle, as well as the dispersion or concentration required depending on the needs.

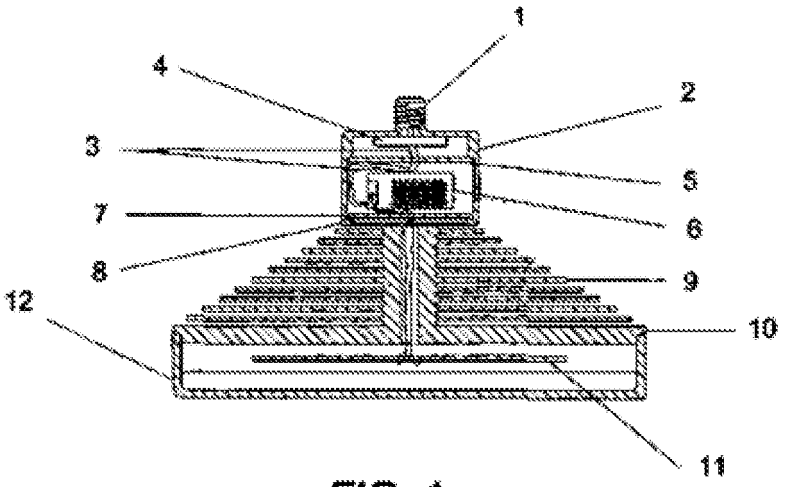


FIG. 1

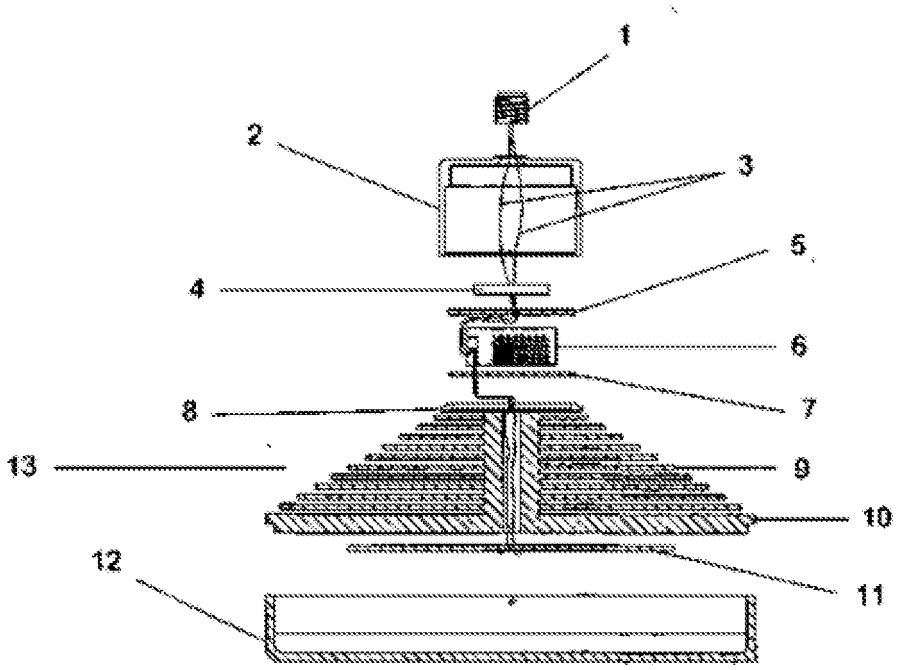


FIG. 2

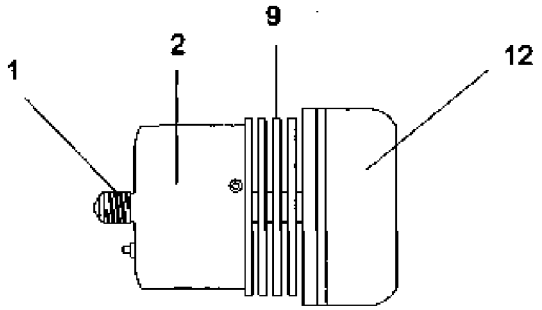


FIG. 3

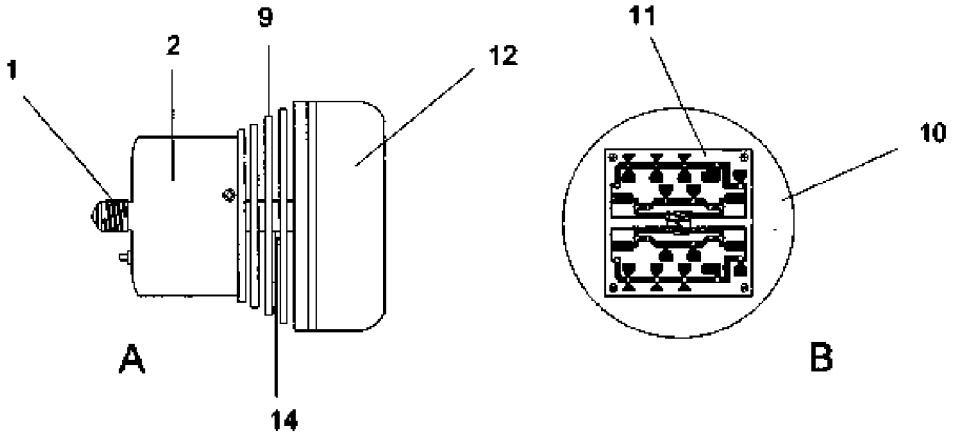


FIG. 4

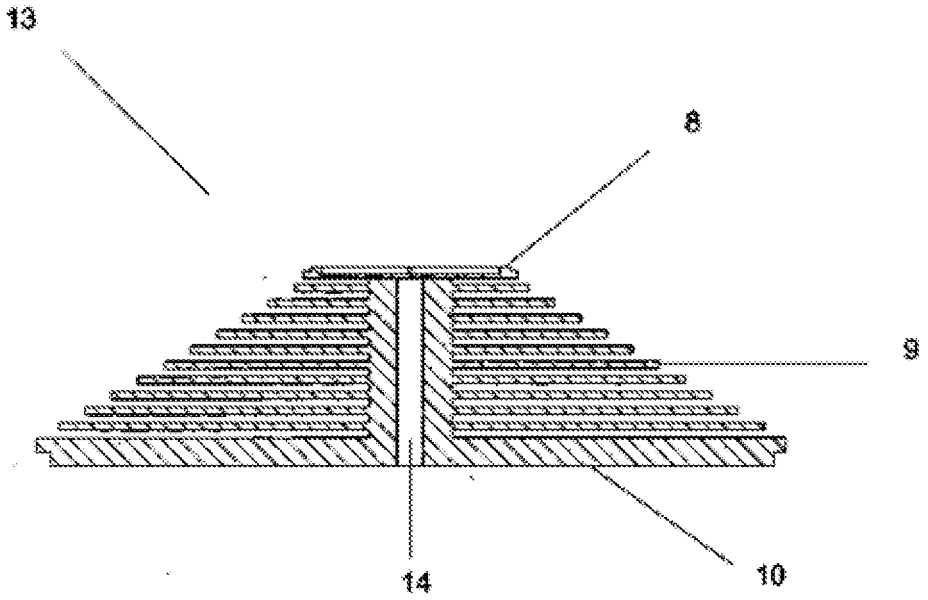


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ ES 2009/000123

A. CLASSIFICATION OF SUBJECT MATTER

F21V 29/00 (2006.01)
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)
F21V 29/00

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)

INVENES,EPODOC, WPI, TXT, Internet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2006262544 A (PIEPGRAS et al.) 23.11.2006, paragraphs [158-255]; images.	1,2 3-8
Y	US 2009010022 A (TSAI et al.) 08.01.2009, paragraphs [30-31]; images.	3-8
X Y	US 2006262542 A (IBBITSON et al.) 23.11.2006, paragraph [11],[15],[19-20],[56-67],[76-80] and [85]; figures 2-7.	1,2 3-8
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X	US 2007195527 A (RUSSELL et al.) 23.08.2007, paragraph [14]; paragraph [19]; paragraphs [70-79]; paragraphs [85-95]; images.	1,2

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
22.October.2009 (22.10.2009)	**(27/10/2009)**
Name and mailing address of the ISA/ O.E.P.M. Paseo de la Castellana, 75 28071 Madrid, España. Facsimile No. 34 91 3495304	Authorized officer P. Tauste Ortiz Telephone No. +34 91 349 85 46

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INTERNATIONAL SEARCH REPORT

International application No.
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