

LIGHT EMITTING DIODE (LED) LIGHT

TECHNICAL FIELD

[0001] Various embodiments relate generally to a light emitting diode (LED) light.

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BACKGROUND

[0002] With energy becoming more expensive and with the recent global carbon emission concern, it is desirable to reduce energy consumption. A large percentage of energy consumed is for lighting purposes. Fluorescent tubes have been widely used for providing light. However, fluorescent tubes are generally not energy efficient and not environmental friendly. Therefore, one way of reducing energy consumption may be by e.g. providing an alternative light source which is more energy efficient. One alternative light source is light emitting diode (LED) light which is more energy efficient as compared to fluorescent tubes.

15 [0003] Figure 1 shows a schematic cross-sectional view of a conventional LED light 100. The LED light 100 has an aluminum casing 102 which may serve as a heat sink. The LED light 100 also has a diffuser 104. The aluminum casing 102 is engaged with the diffuser 104 to form a LED light casing 106. A space 108 is provided in the LED light casing 106. A LED printed circuit board (PCB) 110 having one or more LEDs 112 is
20 disposed in the space 108 and is secured to the aluminum casing 102. With the LED PCB 110 being secured to the aluminum casing 102, the LED light 100 may become a potential electrical shock hazard to a user.

[0004] The LED light 100 has a power supply module 114 which is shrink wrapped with an insulator 116. The power supply module 114 is disposed in the space 108 below the LED PCB 110. The space 108 provided in the LED light casing 106 is usually small. Thus, it may be difficult to place electronic components of the LED light 100 into the LED light casing 106. Due to constraints on cost and the space for electronic components, the power supply module 114 used may be of a non-isolated type. This may cause the LED PCB 110, which is connected to an output of the power supply module 114, to be a potential electrical shock hazard.

[0005] Thus, it is desirable to maintain the electrical safety aspect of the LED light. It is also desirable to keep the LEDs of the LED light cool to maintain better efficacy and longer lifespan of the LEDs.

SUMMARY

[0006] According to one embodiment of the present invention, a light emitting diode (LED) light is provided. The LED light includes a conductive casing having a circumferential wall; a non-conductive casing having a circumferential wall, the non-conductive casing being engaged with the conductive casing to form a cavity; and a circuit board having at least one LED; wherein the circuit board is disposed in the cavity and is supported by the circumferential wall of the non-conductive casing.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0007] In the drawings, like reference characters generally refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis

instead generally being placed upon illustrating the principles of the invention. In the following description, various embodiments of the invention are described with reference to the following drawings, in which:

[0008] Figure 1 shows a schematic cross-sectional view of a conventional light emitting diode (LED) light.

[0009] Figure 2 shows a schematic diagram of a LED light according to one embodiment of the present invention.

[0010] Figure 3 shows a schematic diagram of another example of a LED light according to one embodiment of the present invention.

[0011] Figures 4a to 4d show schematic diagrams of electrical connections of a power module of a LED light to a main power supply according to one embodiment of the present invention.

DETAILED DESCRIPTION

[0012] Embodiments of a light emitting diode (LED) light will be described in detail below with reference to the accompanying figures. It will be appreciated that the embodiments described below can be modified in various aspects without changing the essence of the invention.

[0013] Figure 2 shows a schematic diagram of a light emitting diode (LED) light 200.

The LED light 200 includes a conductive casing 202 having a circumferential wall 204, and a non-conductive casing 206 having a circumferential wall 208. The non-conductive casing 206 is engaged with the conductive casing 202 to form a cavity 210. The LED light 200 further includes a circuit board 212 having at least one LED 214. The circuit

board 212 is disposed in the cavity 210 and is supported by the circumferential wall 208 of the non-conductive casing 206. The circuit board 212 is arranged such that a surface 216 of the circuit board 212 having the at least one LED 214 faces the inner surface 218 of the circumferential wall 208 of the non-conductive casing 206.

5 **[0014]** The conductive casing 202 of the LED light 200 has a plurality of indentations 220 formed on an outer surface 222 of the circumferential wall 204 of the conductive casing 202. Each indentation 220 extends longitudinally along the conductive casing 202. For illustration purposes, only two indentations 220 are shown in Figure 2. The two indentations 220 are formed on different portions of the outer surface 222 of the
10 circumferential wall 204 of the conductive casing 202 such that the two indentations 220 are aligned.

[0015] In one embodiment, the conductive casing 202 includes at least one heat dissipating element (not shown) formed on the outer surface 222 of the circumferential wall 204 of the conductive casing 202. The at least one heat dissipating element may
15 include but is not limited to grooves and fins. The outer surface 222 of the circumferential wall 204 of the conductive casing 202 may be textured or designed with grooves or fins to increase the surface area of the conductive casing 202 for improving heat dissipation.

[0016] In one embodiment, the conductive casing 202 is semi-cylindrical. The shape
20 of the conductive casing 202 may vary in other embodiments. The conductive casing 202 includes thermal conductive material. The thermal conductive material may include but is not limited to aluminum or aluminum alloy.

[0017] The non-conductive casing 206 of the LED light 200 includes a first plurality of ribs 224 formed on the inner surface 218 of the circumferential wall 208 of the non-conductive casing 206. For illustration purposes, only two first ribs 224 are shown in Figure 2. Each first rib 224 is a continuous structure extending longitudinally along the non-conductive casing 206 and extending from the non-conductive casing 206 into the cavity 210. The two first ribs 224 are formed on different portions of the inner surface 218 of the circumferential wall 208 of the non-conductive casing 206 such that the two first ribs 224 are aligned.

[0018] The non-conductive casing 206 further includes a second plurality of ribs 226 and a third plurality of ribs 228 formed on the inner surface 218 of the circumferential wall 208 of the non-conductive casing 206. For illustration purposes, only two second ribs 226 and two third ribs 228 are shown in Figure 2. Each second rib 226 is a continuous structure extending longitudinally along the non-conductive casing 206 and extending from the non-conductive casing 206 into the cavity 210. The two second ribs 226 are formed on different portions of the inner surface 218 of the circumferential wall 208 of the non-conductive casing 206 such that the two second ribs 226 are aligned. Similarly, each third rib 228 is a continuous structure extending longitudinally along the non-conductive casing 206 and extending from the non-conductive casing 206 into the cavity 210. The two third ribs 228 are formed on different portions of the inner surface 218 of the circumferential wall 208 of the non-conductive casing 206 such that the two third ribs 228 are aligned.

[0019] In one embodiment, each first rib 224 may be made up of a discontinuous series of structures arranged longitudinally along the non-conductive casing 206.

Similarly, each second rib 226 and each third rib 228 may also be made up of a discontinuous series of structures arranged longitudinally along the non-conductive casing 206.

[0020] The non-conductive casing 206 includes but is not limited to a diffuser. The non-conductive casing 206 is made of any suitable materials, for example plastic but not limiting thereto. The non-conductive casing 206 may be transparent. In one embodiment, the non-conductive casing 206 is semi-cylindrical. The shape of the non-conductive casing 206 may vary in other embodiments. Depending on the shape of the non-conductive casing 206, each first rib 224 may make a different angle with a corresponding portion of the inner surface 218 of the circumferential wall 208 of the non-conductive casing 206 to which the first rib 224 is attached. If the non-conductive casing 206 has a shape of a square or a rectangle, each first rib 224 may make an angle of about 90° with the corresponding portion of the inner surface 218 to which the first rib 224 is attached. If the non-conductive casing 206 is semi-hemispherical, as shown in Figure 2, each first rib 224 may make an angle of less than 90° with the corresponding portion of the inner surface 218 to which the first rib 224 is attached. The same applies for each of the second ribs 226 and the third ribs 228.

[0021] To engage the conductive casing 202 with the non-conductive casing 206, each indentation 220 of the conductive casing 202 is formed to correspond to each first rib 224 of the non-conductive casing 206. Each first rib 224 is received in the corresponding indentation 220 to engage the non-conductive casing 206 with the conductive casing 202. Each first rib 224 is inserted into one end of the corresponding indentation 220 and is guided along the corresponding indentation 220 until the first rib

224 is entirely received in the corresponding indentation 220. The first rib 224 is snugly fitted in the corresponding indentation 220. The non-conductive casing 206 is engaged with the conductive casing 202 forms a LED light casing 229.

[0022] In one embodiment, a distance between each of the first plurality of ribs 224 and the conductive casing 202 is the same. A distance between each of the second plurality of ribs 226 and the conductive casing 202 is the same. A distance between each of the third plurality of ribs 228 and the conductive casing 202 is the same. The distance between each of the first plurality of ribs 224 and each of the third plurality of ribs 228 is larger than the distance between each of the first plurality of ribs 224 and each of the second plurality of ribs 226. A gap 240 is provided between the first plurality of ribs 224 and the second plurality of ribs 226. Portions 242 of the conductive casing 202 are received in the gap 240 to engage the non-conductive casing 206 with the conductive casing 202. Further, the distance between each of the third plurality of ribs 228 and the conductive casing 202 is larger than the distance between each of the second plurality of ribs 226 and the conductive casing 202. Thus, a gap 230 is provided between the second plurality of ribs 226 and the third plurality of ribs 228.

[0023] The circuit board 212 is received in the gap 230 between the second plurality of ribs 226 and the third plurality of ribs 228. In other words, the circuit board 212 is supported by the second plurality of ribs 226 and the third plurality of ribs 228.

[0024] In one embodiment, the second plurality of ribs 226 extends further into the cavity 210 than the first plurality of ribs 224 and the third plurality of ribs 228. There may be a distance (d) of at least about 1.5mm between copper traces (not shown) on the circuit board 212 and the conductive casing 202. The distance (d) may vary in different

embodiments. The distance (d) between the copper traces on the circuit board 212 and the conductive casing 202 may prevent electrical shocks.

[0025] The LED light 200 further includes a power module 232 disposed in the cavity 210 and between the circuit board 212 and an inner surface 234 of the circumferential wall 204 of the conductive casing 202. The power module 232 is shrink wrapped with an electrical insulator 236. The electrical insulator 236 may prevent electrical shocks that may be caused by the power module 232. The power module 232 is electrically coupled to the circuit board 212 via two wires 238. The electrical connections between the power module 232 and the circuit board 212 may be DC connections.

10 [0026] As shown in Figures 4a to 4d, the power module 232 is connected to two pins 402 at each longitudinal end 404a, 404b of the LED light casing 229. The power module 232 is electrically coupled to the main power supply (not shown) via the pins 402. The electrical connections between the power module 232 and the main power supply may be AC connections. The electrical connections between the power module 232 and the main power supply via the pins 402 can vary in different embodiments. In one embodiment, as shown in Figure 4a, the power module 232 is connected to each pin 402 via a wire 406a respectively. In another embodiment, as shown in Figure 4b, the power module 232 is connected to the two pins 402 at each longitudinal end 404a, 404b via a wire 406b respectively. One end 408 of each wire 406b is split into two connecting ends 410 for connecting with the two pins 402 at each longitudinal end 404a, 404b. In yet another embodiment, as shown in Figure 4c, the power module 232 is connected to each pin 402 of the longitudinal end 404a via a wire 406c respectively. The power module 232 is not connected to the pins 402 of the longitudinal end 404b. The pins 402 of the longitudinal

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end 404b are electrically connected. In yet another embodiment, as shown in Figure 4d, the power module 232 is connected to each pin 402 of the longitudinal end 404a via a wire 406d respectively, and is connected to the pins 402 of the longitudinal end 404b via a wire 406e. One end 412 of the wire 406e is split into two connecting ends 414 for
5 connecting with the two pins 402 of the longitudinal end 404b.

[0027] Figure 3 shows a schematic diagram of another example of the LED light 300. In this embodiment, each of the second plurality of ribs 226 comprises an extension portion 302 which extends from the second rib 226 towards the conductive casing 202. Each extension portion 302 is substantially perpendicular to the respective second rib
10 226. The extension portions 302 may increase a safety electrical isolation distance (d) between the copper traces (not shown) on the circuit board 212 and the conductive casing 202 to prevent electrical shocks.

[0028] While embodiments of the invention have been particularly shown and described with reference to specific embodiments, it should be understood by those
15 skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention as defined by the appended claims. The scope of the invention is thus indicated by the appended claims and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced.

CLAIMS

What is claimed is:

- 5 1. A light emitting diode (LED) light, comprising:
 a conductive casing having a circumferential wall;
 a non-conductive casing having a circumferential wall, the non-conductive casing
 being engaged with the conductive casing to form a cavity; and
 a circuit board having at least one LED; wherein the circuit board is disposed in
10 the cavity and is supported by the circumferential wall of the non-conductive casing,
 wherein the conductive casing comprises a plurality of indentations formed on an
 outer surface of the circumferential wall of the conductive casing.
2. The LED light of claim 1,
15 wherein the non-conductive casing comprises a first plurality of ribs formed on an
 inner surface of the circumferential wall of the non-conductive casing.
3. The LED light of claim 2,
 wherein each of the first plurality of ribs of the non-conductive casing is received
20 in the corresponding indentation of the conductive casing to engage the non-conductive
 casing with the conductive casing.
4. The LED light of claims 2 or 3,

wherein the first plurality of ribs comprise two ribs, each rib is a continuous structure extending longitudinally along the non-conductive casing and extending from the non-conductive casing into the cavity.

5 5. The LED light of claim 4,

wherein the two first ribs are formed on different portions of the inner surface of the circumferential wall of the non-conductive casing such that the two first ribs are aligned.

10 6. The LED light of claim 5,

wherein the plurality of indentations comprise two indentations formed on different portions of the outer surface of the circumferential wall of the conductive casing such that the two indentations are aligned, and wherein each of the two indentations corresponds to each of the two first ribs.

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7. The LED light of any one of claims 2 to 6,

wherein a distance between each of the first plurality of ribs and the conductive casing is the same.

20 8. The LED light of any one of claims 2 to 7,

wherein the non-conductive casing further comprises a second plurality of ribs and a third plurality of ribs formed on the inner surface of the circumferential wall of the non-conductive casing to support the circuit board.

9. The LED light of claim 8,

wherein the second plurality of ribs comprise two ribs and the third plurality of ribs comprise two ribs, each rib is a continuous structure extending longitudinally along the non-conductive casing and extending from the non-conductive casing into the cavity.

10. The LED light of claim 11,

wherein the two second ribs are formed on different portions of the inner surface of the circumferential wall of the non-conductive casing such that the two second ribs are aligned.

11. The LED light of any one of claims 8 to 10,

wherein a distance between each of the second plurality of ribs and the conductive casing is the same.

12. The LED light of any one of claims 8 to 11,

wherein the two third ribs are formed on different portions of the inner surface of the circumferential wall of the non-conductive casing such that the two third ribs are aligned.

13. The LED light of any one of claims 8 to 12,

wherein a distance between each of the third plurality of ribs and the conductive casing is the same.

14. The LED light of claim 13,

wherein the distance between each of the third plurality of ribs and the conductive casing is larger than the distance between each of the second plurality of ribs and the
5 conductive casing.

15. The LED light of any one of claims 8 to 14,

wherein a gap is provided between the second plurality of ribs and the third plurality of ribs.

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16. The LED light of claim 15,

wherein the circuit board is received in the gap between the second plurality of ribs and the third plurality of ribs.

15 17. The LED light of any one of claims 8 to 16,

wherein the second plurality of ribs extend further into the cavity than the first plurality of ribs and the third plurality of ribs.

18. The LED light of claim 17,

20 wherein each of the second plurality of ribs comprises an extension portion which extends from the second rib towards the conductive casing.

19. The LED light of any one of claims 1 to 18,

wherein the conductive casing comprises at least one heat dissipating element formed on an outer surface of the circumferential wall of the conductive casing.

20. The LED light of claim 19,

5 wherein the at least one heat dissipating element comprises grooves or fins.

21. The LED light of any one of claims 1 to 20,
wherein the conductive casing is semi-cylindrical.

10 22. The LED light of any one of claims 1 to 21,
wherein the conductive casing comprises thermal conductive material.

23. The LED light of claim 22,
wherein the thermal conductive material comprises aluminium or aluminium
15 alloy.

24. The LED light of any one of claims 1 to 23,
wherein the non-conductive casing comprises a diffuser.

20 25. The LED light of any one of claims 1 to 24,
wherein the non-conductive casing is semi-cylindrical.

26. The LED light of any one of claims 1 to 25,

wherein a surface of the circuit board having the at least one LED faces the inner surface of the circumferential wall of the non-conductive casing.

27. The LED light of claim 28,

5 further comprising a power module disposed in the cavity and between the circuit board and an inner surface of the circumferential wall of the conductive casing.

28. The LED light of claim 27,

wherein the power module is shrink wrapped with an electrical insulator.