

AN LED LIGHTING DEVICE HAVING ELASTICALLY BIASED ROTATIONAL END CAPS

5 TECHNICAL FIELD

[0001] The present invention relates to the field of light emitting diode ("LED") lighting devices. In particular, it relates to an LED lighting device having spring-biased rotational end-caps that is capable of being used with pre-existing fluorescent
10 lighting fixtures.

BACKGROUND

[0002] Fluorescent lighting devices (i.e., fluorescent light bulbs or fluorescent light
15 tubes) have been commercially available since 1938. By 1951, over 51% of lighting devices in use were fluorescent lighting devices (refer to <http://edison-techcenter.org/fourescentlampdev.html>). Use of fluorescent lighting devices as an alternative to incandescent lighting devices has grown rapidly since then. While fluorescent lighting devices are advantageous over incandescent lighting
20 devices in that they consume less electrical energy for any given light output and operate at lower temperatures, fluorescent lighting devices are not without their drawbacks. As set out at column 1, lines 50 - 54 of United States Patent 6,936,968 B2 ("the '968 Patent"), fluorescent lighting devices suffer from the following disadvantages:-

- 25 a. The ionisable material and fill gases used to generate the illumination pattern are hazardous materials;
- b. Fluorescent lighting devices rely on ballast transformers, which tend to fail frequently and thus result in the fluorescent lighting device requiring frequent
30 replacement; and
- c. The energy efficiency, which relates to the energy costs, of operating a fluorescent lighting device has not improved over decades despite increasing energy costs, which makes fluorescent lighting devices a less cost-efficient
35 lighting solution.

[0003] In view of the above-mentioned disadvantages, it was recognised that there was a need to find an alternative to the fluorescent lighting device. It is in this context that LED lighting devices began to gain prominence. The history of commercially useful LEDs, began in the 1960s with the creation of gallium-arsenic-phosphorus LEDs that produced a characteristic red light used as indicators in a number of electronic devices. In the 1970s, several significant advances in LED lighting technology were achieved; by using different elements and wavelengths. However, it was only in the 1980s, however, did LED lighting truly come into its own. with the creation of the gallium-aluminum- arsenide LED. The gallium-aluminum-arsenide LED lighting device was capable of being manipulated to display red, yellow, orange, and green light and was ten times brighter than previous LED models. With the development of indium-gallium-aluminum-phosphide LEDs in the latter part of the 1980s, the LED lighting field became one of the dominant commercial lighting solutions for all sorts of applications (refer to <http://www.extremetacticaldynamics.com/history-led-lighting.php>).

[0004] Today, LED lighting devices are considered to be one of the most innovative and cost effective means of providing lighting. LED lighting devices require less energy and produce less ambient heat than other light sources. LED lighting devices also last longer than traditional incandescent, fluorescent and halogen bulbs, which results in cost savings on repairs and replacement costs (refer to [http. /www.extremetacticaldynamics.com/history-led-lighting.php](http://www.extremetacticaldynamics.com/history-led-lighting.php)). Given the advantages of LED lighting devices over prevalent fluorescent lighting devices, there has been an increasing shift towards phasing out existing fluorescent lighting devices and to replace them with LED lighting devices.

[0005] An embodiment of a typical LED lighting device is described in the '968 Patent at column 2, lines 11 - 22. The LED light tube described in the '968 Patent comprises an elongated, cylindrical tube, a base (or end) cap at each end, wherein the end cap includes a first and second prong extending from the base cap such that LEDs within the cylindrical tube are in electrical connection with regular AC power sources.

[0006] Although there are several benefits in embracing LED lighting devices, the shift towards using LED lighting devices faces a widespread problem. Due to the use of fluorescent lighting devices being so prevalent and widespread globally, existing lighting fittings, such as troffer fixtures, for example, are catered towards fluorescent lighting devices and not for LED lighting devices. A troffer fixture is described in the '968 Patent as follows:-

"...a housing and a tube holder. The tube holder comprises electrical sockets in electrical communication with the LED light tube. The electrical sockets are adapted to receive a first and second prong in the end cap of the LED tube..." (see column 2, lines 25 - 29 of the '968 Patent).

[0007] Although the troffer fixture described in the '968 Patent is with respect to an LED lighting device, generally, most typical troffer fixtures serve the dual purpose of supporting or holding a fluorescent lighting device, and providing an electrical connection between the fluorescent lighting device and the AC power supply.

[0008] The costs for replacing florescent lighting fixtures, such as the troffer lighting fixture, for example, will be significant due to their widespread implementation and use. As such, there have been attempts to adapt LED lighting devices such that those LED lighting devices can be used with existing fluorescent lighting fixtures as a means to reduce the costs involved when shifting over from a fluorescent lighting device to an LED lighting device.

[0009] An example of such an attempt is disclosed in United States Patent 8,066,411 B1 ("**the '411 Patent**"). The '411 Patent discloses an LED lighting tube having an elongated cylindrical housing with apertures along the cylindrical housing. The apertures contain a reflector. The cylindrical housing also houses a circuit board mounted with an LED. The LED aligns with the aperture such that when light is emitted by the LED, the emitted light passes through the aperture thereby providing illumination to the environment outside the cylindrical housing.

[00010] The invention of the "411 Patent also includes a rotatable electrical coupling connected to the ends of the cylindrical housing. The rotatable electrical coupling includes a limiter that limits the extent of the rotation of the cylindrical housing

relative to the rotatable electrical coupling to a maximum angle of rotation of about 190 degrees (see column 3, lines 45 - 46 of the '411 Patent). The rotatable electrical coupling is in electrical connection with the circuit board includes a first and second prong capable of being in electrical connection with existing fluorescent lighting fixtures and AC power supply (see column 1 , lines 20 - 22, and Figures 9 and 10 of the '411 Patent.

[0011] Thus the device of the '411 Patent permits an LED lighting tube to be capable of integration into existing standard linear fluorescent fixtures.

[0012] Nevertheless, there is still a need for an LED lighting device that is retrofitted to be compatible with existing lighting fixtures, especially lighting fixtures intended for fluorescent lighting devices. There is also a need for such an LED lighting device to be capable of easy (i) assembly and/or manufacture, and (ii) installation in a cost - effective manner. In this respect, an LED lighting device as described below, and as defined in the claims appended hereto, meets the aforesaid objectives.

[0013] The document CN102278636 describes an LED fluorescent lamp having a replaceable power supply module and is useful to the skilled person to understand the present invention. The prior art US 5,904,415 describes a lighting device end cap comprising two portions having independent electrical leads, as disclosed in the preamble of claim 1.

DESCRIPTION OF THE INVENTION

[0014] A first aspect of the present invention relates to an end cap for a lighting device in accordance with claim 1. The lighting device may be a fluorescent tube lighting device, a halogen tube lighting device or an LED tube lighting device, for example. The first portion is also in electrical connection with said lighting device.

[0015] In a specific exemplary embodiment, the first portion of the housing may be coupled to the end of the lighting device using screws such that the first at least substantially cylindrical wall may be inserted into the end of the lighting device. Alternatively, the first at least substantially cylindrical wall of the first portion of the

housing may have screw threads such that it may be screwed into the end of the lighting device, which itself may have complementary threading to receive the first at least cylindrical wall of the first portion.

5 **[0016]** In one exemplary embodiment, the size (diameter and circumference) of the substantially circular planar surface of the second portion of the housing may be similar or identical to the size of the substantially circular planar surface of the first housing portion. In this embodiment, the at least substantially cylindrical wall of the second portion may be adapted to be capable of being either rigidly or non-rigidly
10 coupled to the second at least substantially cylindrical wall of the first portion.

[0017] A first portion of the housing may be capable of being coupled to the end of the lighting device via at least two substantially parallel prongs that extend in a substantially perpendicularly manner from the circular planar surface of the first
15 portion. The direction of extension of the two substantially parallel prongs is essentially in the first direction. One prong is adapted such that it is in electrical connection with a positive terminal of the lighting device and the other prong is adapted such that it is in electrical connection with a negative terminal of the lighting device. In all embodiments of the present invention, the two at least substantially
20 parallel prongs of the first portion are in electrical connection with the at least two independent electrical leads of the first portion.

[0018] As with the first portion, the two at least substantially parallel prongs of the second portion are also electrically connected to the at least two independent
25 electrical leads of the second portion.

[0019] The at least two independent electrical leads of the second portion may be a prong that extends perpendicularly from the circular planar surface of the second portion in the first direction such that each electrical lead of the second portion, i.e.,
30 the prong, contacts a corresponding electrical lead of the first portion, i.e., the substantially semi-circular wall. Although the two semi-circular wall electrical leads of the first portion are positioned such that they almost form a complete conductive circular wall, there is no actual contact between the two semi-circular leads. Instead, each of the two prongs contacts a corresponding semi-circular electrical lead. As the
35 second portion is rotated relative to the first portion, each electrical lead prong of the

second portion follows the semi-circular shape of the corresponding semi-circular electrical lead thereby ensuring that electrical connectivity between the prongs and the semi-circular wall is maintained even after the rotation is completed.

5 **[0020]** In another embodiment, the second at least substantially cylindrical wall of the first portion includes at least one plurality of grooves. In an exemplary embodiment, second at least substantially cylindrical wall of the first portion may have two, three or four pluralities of grooves. In such exemplary embodiments, each plurality of grooves may be arranged in a symmetrical arrangement with respect to
10 each other along. The grooves may be arranged along a peripheral edge of a distal end of the second at least substantially cylindrical wall of the first portion. In all the embodiments of the invention having grooves, each groove is adapted to receive therein a protrusion that at least substantially corresponds to the dimension and/or the shape of the groove itself.

15 **[0021]** In a further embodiment, the at least substantially circular planar surface of the second portion may include at least one protrusion. The at least one protrusion may extend perpendicularly from the circular planar surface in the first direction and along the second at least substantially cylindrical wall's inner surface. As such, the
20 protrusion may be located at the circumference of the substantially circular planar surface of the second portion. The at least one protrusion is of a suitable shape and dimension such that it is at least partially receivable by any one of the plurality of grooves at the distal end of the second at least substantially cylindrical wall of the first portion. When the protrusion is received by the groove, the second portion of the
25 housing becomes rotationally locked with respect to the first portion of the housing.

[0022] In yet another embodiment, the at least substantially cylindrical wall of the second portion has indications along its outer surface to indicate various positions that correspond to incremental angles of rotation of the second portion with respect
30 to the first portion. In an exemplary embodiment, the at least substantially cylindrical wall of the second portion may have indications '0', '1', '2', '3' and '4' along the outer surface. The markings on the outer surface or external surface of the second portion may correspond to grooves described above that are on the periphery of the second substantially cylindrical wall of the first portion, which may not be visible when the
35 second portion is coupled to the first portion. As such, the marking '0' may

correspond to a first groove, the marking '1' may correspond to a second groove, the marking '2' may correspond to a third groove, the marking '3' may correspond to a fourth groove and the marking '4' may correspond to a fifth groove. In this exemplary embodiment, each plurality of grooves may include up to five grooves.

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[0023] When the protrusion of the second portion is engaged with the first groove, the indication that corresponds to the first groove is marking '0'. When the second portion is rotated from indication marking '0' to indication marking '1', the protrusion moves to the second groove. Prior to moving to the second groove, the protrusion has to be disengaged from the first groove. The second portion, being resiliently biased against the first portion is thus pulled against the direction of the bias. In so doing, the protrusion disengages from the first groove, i.e., the second portion is now in a withdrawn position.

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[0024] While the second portion is held in its withdrawn position, the second portion is rotated relative to the first portion to the next marking indication '1'. In so doing, the second portion is rotated about an angle of 22.5 degrees. The overall effect of the rotation of the second portion is that the electrical conducting prongs that are capable of being coupled to the electrical socket of the lighting fixture are themselves rotated by the same angle. In this particular embodiment the total angle of rotation that is possible (α) is given by $[22.5 \times 4(\text{grooves})]$, which gives a total of 90 degrees. This allows the electrical conducting prongs that are capable of being coupled to the electrical socket of the lighting fixture in the present exemplary embodiment of being capable of rotations of up to 90 degrees to adapt to the orientation of the electrical sockets of the lighting fixture.

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[0025] In yet another embodiment, the first and second portions of the housing may be separate and discrete parts. Alternatively, the first and second portions may be formed as a single part. Where the first and second portions are formed as separate parts, the first portion may be coupled to the second portion. In this regard, any coupling means described herein, in particular coupling means between the first portion and the lighting device, first portion and second portion and second portion and lighting fixture, may be achieved by coupling means selected from the group including, but not limited to, snap-fit means, tight-fit means screw-fit means.

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[0026] In any of the embodiments described herein, the elastic member is a spring. The type of spring that may be used may be selected from the group including, but not limited to, a compression spring, a conical compression spring, a torsion spring, an extension spring or a helical spring, for example.

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[0027] A second aspect of the invention relates to an LED lighting tube in accordance with claim 13.

[0028] By providing electrical connection from the power supply to the circuit board, the end caps enable the LED to be capable of providing illumination.

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[0029] It should be noted that all the various embodiments described above in relation to the first aspect of the invention are also applicable to the second aspect of the invention insofar as the features of the second aspect of the invention are to be found in the various embodiments of the first aspect of the invention.

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[0030] Although various aspects and embodiments of the present invention have been described above, the following illustrations of exemplary embodiments and accompanying description serve to further aid in the understanding and clarity of those various embodiments of the invention. However, it should be noted that the scope of the invention is by no means limited to the exemplary embodiments described and illustrated hereafter, but rather, as set out in the claims that are appended hereto.

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25 **BRIEF DESCRIPTION OF THE DRAWINGS**

[0031] **FIGURE 1** is an exploded isometric view of an end cap in accordance with a first aspect of the present invention for use at one end of a lighting device in accordance with a second aspect of the present invention;

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FIGURE 2 is another exploded isometric view of the end cap of **Figure 1**;

FIGURE 3A is an exploded isometric view of an exemplary embodiment of an end cap for use at the other end of the lighting device in accordance with a second aspect of the present invention;

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FIGURE 3B is another exploded isometric view of the end cap of **Figure 3A**;

FIGURE 4A is an illustration of an exemplary embodiment of an end cap in accordance with the first aspect of the present invention, attached to a lighting device in accordance with the second aspect of the present invention;

FIGURE 4B is another illustration of the embodiment of **Figure 4A** in a withdrawn position;

FIGURE 5A is an illustration of the embodiment of **Figure 4A** as it is being rotated; and

FIGURE 5B is an illustration of the embodiment of **Figure 4A** in a rotated position.

DETAILED DESCRIPTION OF THE DRAWINGS

[0032] **FIGURE 1** is an end cap for a lighting device that is suitable for use in the second aspect of the invention, illustrated in Figures 4A-5B. The end cap's housing has two separate and distinct portions, i.e., a first portion **2** and a second portion **3**. Both the first and second portions are cylindrical in shape. The first portion **2** has a first cylindrical wall **6** extending in a first direction from a central circular planar surface **2A**. The first portion also has a second cylindrical wall **4** extending from the circumference of the central circular planar surface **2A** in a second direction, which is opposite the first direction. The first cylindrical wall **6** is adapted to be connected to an end of a lighting tube both physically and electrically. The physical coupling of the first portion **2** to the end of the lighting tube is achieved by screws **8A** and **8B**. As for the electrical connection, this is explained later below.

[0033] The first portion includes a cavity defined by the circular planar surface **2A** as a base and the second cylindrical wall **4**. Within this cavity is a pair of independent electrical leads **10**. The electrical leads **10** are substantially semi-circular in shape and are also formed in the form of a wall that extends perpendicularly from the base, i.e., the circular planar surface **2A**. The electrical leads **10** are affixed to the circular planar surface **2A**. The second cylindrical wall **4** has at its peripheral edge, which is

distal from the circular planar surface **2A**, at least one plurality of grooves **12**. Each groove **12** is adapted to receive, as least partially, a corresponding protrusion from the second portion **3**.

5 **[0034]** The second portion **3** also has a circular planar surface **3A** from which a cylindrical wall **1** extends. The cylindrical wall **1** extends from the circumference of the circular planar surface **3A**. In the centre of the circular planar surface **2A** is a hole **5A**. The hole **5A** extends inwards in the form of a tube **5C** and is adapted to accommodate therein an elastic member, in this example, a coil spring **9A**. The coil
10 spring **9A** is secured to the second portion **3** and indirectly to the first portion **2** at a corresponding hole **5B** by screw **9B**, which is partially threaded. This permits the second portion to be capable of sliding along the non-threaded portion of the screw **9B** when the first and second portions **2**, **3** are coupled together. The second portion also has a pair of electrical conducting prongs **7A** and **7B** arranged in an equidistant
15 manner.

[0035] **FIGURE 2** is another exploded isometric view of the end cap of **Figure 1**. In this view, the cavity as defined by the circular planar surface and the first cylindrical wall **6** can be seen. The first portion **2** has two electrical conducting prongs **23A** and
20 **23B** extending from the cavity defined by the circular planar surface **6A** and the first cylindrical wall **6**. The electrical prongs **23A** and **23B** are in electrical connection with the electrical leads **10**. As mentioned earlier, the first portion **2** is secured to the end of the lighting tube by screws **8A** and **8B**. The circular planar surface is of a given thickness. The indicator arrow **24** is located on the width (or thickness) of the circular
25 planar surface **2A**.

[0036] Turning to the second portion **3**, the circular planar surface **3A** and cylindrical wall **1** define a cavity within the second portion **3**. Within this cavity, there is another pair of electrical conducting prongs **21A** and **21B** that extends vertically from the
30 circular planar surface **3A**. The prongs **23A** and **23B** are in electrical connection with the prongs **21A** and **21B**. The prongs **21A** and **21B** are of sufficient length such that they contact the electrical leads **10** when the first and second portions **2**, **3** are assembled together.

[0037] **FIGURE 3A** is an exploded isometric view of a second end cap for use at the other end of the lighting device in accordance with the second aspect of the present invention. This aspect of the invention refers to an end cap containing a fuse therein. With regard to the first portion **2**, the same description as provided above applies. However, the first portion **2** does not include any electrical leads or electrical conducting prongs.

[0038] **FIGURE 3B** is another exploded isometric view of the second end cap of **Figure 3A**. In this illustration, a fuse **31** is shown to be secured to the circular planar surface **3A** of the second portion. The fuse **31** is in electrical connection to the prongs **7A** and **7B** (not visible).

[0039] **FIGURE 4A** is an illustration of an exemplary embodiment of a second aspect of the present invention. In this aspect of the invention, the first portion **2** of the housing of the end cap is affixed to an LED lighting tube **44** in accordance with the second aspect of the present invention. On the surface of the first portion is an arrow indicator **42**.

[0040] The second portion **3** of the housing also has indicator markings '0', '1', '2', '3' and '4' along the cylindrical wall **1** of the second portion **3**. In **Figure 4A** the arrow indicator **42** is positioned such that it is aligned to marking indication '0'. The second portion **3** is coupled to the first, portion **2** about the central axis of rotation **5A** of the first portion **2** and the second portion **3**. In this position, the second portion **3** is elastically biased against the first portion **2**. The second portion **2** also has two independent electrical prongs **7A** and **7B** that are adapted for connecting with an electrical socket of a lighting fixture.

[0041] **FIGURE 4B** is another illustration of the embodiment of **Figure 4A** in a withdrawn position. To enter the withdrawn position, the second portion **3** is capable of being translated in a linear direction as indicated by the arrows. This is done by pulling the second portion **3** against the direction of the elastic bias. This results in the elastic member **9B**, which in this exemplary embodiment is a coil spring, to stretch within its elastic limit. Concurrently, when the second portion **3** is pulled, within the housing a protrusion (not shown) affixed to the inner surface of cylindrical wall **1** of the second portion **3**, and that is engaged with a groove **12** of the second

cylindrical wall **4** of the first portion **2** disengages from said groove **12**. The second portion **3** is now able to rotate in a clockwise direction with respect to the first portion **2**.

5 **[0042] FIGURE 5A** is an illustration of the embodiment of **Figure 4A** as it is being rotated. As shown, the second portion **3** is rotated in a clockwise direction (as indicated by the arrow) with respect to the first portion **2**. As can be seen, the second portion **3** has been rotated such that indicator **42** points to indicator marking '3'. In this exemplary embodiment, each interval between the indicator markings
10 corresponds to an angular rotation of about 22.5 degrees. As such, in rotating the second portion **3** up to indicator marking '3', results in an angular rotation of about 67.5 degrees. This results in the prongs **7A** and **7B** also being rotated by the same angle of rotation with respect to the first portion. During the entire withdrawal and rotation phases, the first portion remains static and fixed to an end of the lighting
15 tube **44**.

[0043] FIGURE 5B is an illustration of the embodiment of **Figure 4A** in a rotated position. With the rotation complete, the indicator marking '3' is aligned with the indicator arrow **42**. The second portion **3** is then released and slides linearly towards
20 the first portion **2** due to the second portion **3** being elastically biased against the first portion **2**. Within the housing, when the second portion **3** is released, concurrently the protrusion (not shown) that is affixed to the inner surface of cylindrical wall **1** of the second portion **3**, also slides towards the first portion **2** and re-engages with the groove **12** of the second cylindrical wall **4** of the first portion **2**. The second portion **3**
25 is now locked and no longer able to rotate with respect to the first portion **2**.

[0044] As mentioned earlier, the above description of the exemplary embodiments of the present invention merely serve to aid in the understanding of the underlying principle behind the invention. The present invention is not to be construed as being
30 limited to the illustrated embodiments but rather, to the extent as defined in the claims that follow.

CLAIMS

What is claimed is:

1. A lighting device end cap comprising:-

a housing, said housing having a first portion (2) and a second portion (3), wherein the first portion (2) comprises:-

a substantially circular planar surface (2A); a first at least substantially cylindrical wall (6) that extends from the circumference of the substantially circular planar surface (2A) in a first direction perpendicular to the circular planar surface (2A), wherein the first cylindrical wall (6) is adapted to be capable of coupling to the end of the lighting device (44); and

a second at least substantially cylindrical wall (4) that extends from the circular planar surface (2A) in a second direction that is also perpendicular to the circular planar surface (2A) but opposite the first direction;

wherein the first portion (2) is adapted to be capable of being coupled to an end of a lighting device (44) via at least two substantially parallel prongs (23A, 23B) extending perpendicularly from the circular planar surface (2A) in the first direction, wherein one prong is in electrical connection with a positive terminal of the lighting device (44) and the other prong is in electrical connection with a negative terminal of the lighting device (44), such that the first portion (2) is in electrical connection with said lighting device (44), and wherein the second portion (3) is adapted to be capable of being coupled to an electrical socket of a lighting fixture such that the second portion (3) is in electrical connection with a power supply; and

the first portion (2) and the second portion (3) of the end cap each comprise at least two independent electrical leads (10, 21A, 21B), said at least two independent electrical leads (21A, 21B) extending from the second portion (3) to contact said at least two corresponding electrical leads (10) extending from the first portion (2) such that the power supply and the lighting device (44) are in electrical connection **characterised in that** the lighting device end cap comprises at least one elastic member (9A), said elastic member (9A) being coupled to the first (2) and second (3) portions along a common central axis of rotation of the first (2) and second (3) portions such that the second portion (3) is elastically coupled to and biased against the first portion (2), thereby providing the second portion (3) with restricted linear movement in a direction against the elastic bias and with rotational movement about the central axis relative to the first portion (2), and

wherein each of the at least two independent electrical leads (10) of the first portion (2) comprise at least a substantially semicircular wall (10) that extends perpendicularly in the second direction from the circular planar surface (2A) of the first portion (2), and the at least two independent electrical leads (21A, 21B) of the second portion (3) are prongs which extend perpendicularly from the circular planar surface (3A) of the second portion (3) in the first direction such 25 that each electrical lead (21A, 21B) of the second portion (3) contacts the substantially semi-circular wall (10).

2. The device according to claim 1, wherein the second portion (3) comprises:

a substantially circular planar surface (3A); and an at least substantially cylindrical wall (1) that extends from the circumference of the substantially circular planar surface (3A) in the first direction perpendicular to the circular planar surface (3A), wherein the first cylindrical wall (1) of the second portion (3) is adapted to be capable of coupling to the second at least substantially cylindrical wall (4) of the first portion (2); and wherein the second portion (3) is capable of being coupled to the electrical socket of the lighting fixture via at least two substantially parallel prongs (7A, 7B) extending perpendicularly from its substantially circular planar surface (3A) in a second direction opposite to the first direction, said prongs (7A, 7B) being adapted to electrically connect with the power supply via the electrical socket of the lighting fixture such that one prong is in electrical connection with a positive terminal of the electrical socket of the lighting fixture and the other prong is in electrical connection with a negative terminal of the electrical socket.

3. The device according to claim 1 or claim 2, wherein the two at least substantially parallel prongs (23A, 23B) of the first portion (2) are in electrical connection with the at least two independent electrical leads (10) of the first portion (2) and wherein the two at least substantially parallel prongs (7A, 7B) of the second portion (3) are electrically connected to the at least two independent electrical leads (21A, 21B) of the second portion (3).
4. The device according to claims 1 - 3, wherein each of the two prongs (21A, 21B) contacts a corresponding substantially semi-circular wall (10), and as the second portion (3) is rotated relative to the first portion (2), each prong (21A, 21B) of the second portion (3) follows the substantially semi-circular shape of the corresponding substantially semi-circular electrical wall (10) thereby ensuring that electrical connectivity between the prongs (21A, 21B) and the substantially semi-circular wall (10) is maintained even after the rotation is completed.

5. The device according to any of claims 1 - 4, wherein the second at least substantially cylindrical wall (4) of the first portion (2) comprises at least one plurality of grooves (12), wherein each of the at least one plurality of grooves (12) is in a symmetrical arrangement from each other along a peripheral edge of the distal end of the second at least substantially cylindrical wall (4) of the first portion (2) and wherein each groove (12) of the plurality of grooves (12) is adapted to receive therein a protrusion that at least substantially corresponds to the shape of the groove (12).
6. The device according to any of claims 2 - 5, wherein the at least substantially circular planar surface (3A) of the second portion (3) comprises at least one protrusion extending perpendicularly therefrom in the first direction and along the second portions (3) at least substantially cylindrical wall's (1) inner surface, said at least one protrusion being at least partly receivable by any one of the plurality of grooves (12) at the distal end of the second at least substantially cylindrical wall (4) of the first portion (2) such that the second portion (3) is rotationally locked with respect to the first portion (2).
7. The device according to any of claims 2 - 6, wherein the wherein the at least substantially cylindrical wall (1) of the second portion (3) has indications along its outer surface to indicate various positions that correspond to incremental angles of rotation of the second portion (3) with respect to the first portion (2).
8. The device according to any of claim 7, wherein each incremental angle of rotation of the second portion (3) with respect to the first portion (2) is between 0 degrees to 90 degrees.
9. The device according to any of claims 1 - 8, wherein the first (2) and second (3) portions of the housing are separate and discrete parts.
10. The device according to any of claims 1 - 9, wherein the first portion (2) is coupled to the second portion (3).

11. The device according to any of claims 1 - 10 wherein the coupling means between the first portion (2) and the lighting device (44), first portion (2) and second portion (3) and second portion (3) and lighting fixture is selected from the group consisting of snap-fit means, tight-fit means or screw-fit means.
12. The device according to any of claims 1 - 11, wherein the elastic member (9A) is a spring (9A) selected from the group consisting of a compression spring, a conical compression spring, a torsion spring, an extension spring or a helical spring.
13. An LED lighting tube (44) comprising:-
 - an elongated hollow cylindrical body having a first end and a second end;
 - at least one circuit board within the cylindrical body having at least one LED in electrical connection with the at least one circuit board;
 - a first lighting device end cap according to any of claims 1-12, said lighting device end cap affixed at the first end of the elongated hollow cylindrical body and in electrical connection with the at least one circuit board; and
 - a second lighting device end cap, said lighting device end cap affixed at the second end of the 35 elongated hollow cylindrical body, wherein the second lighting device end cap comprises:-
 - a housing, said housing having a first portion (2) and a second portion (3), wherein the first portion (2) comprises:-
 - a substantially circular planar surface (2A); a first at least substantially cylindrical wall (6) that extends from the circumference of the substantially circular planar surface (2A) 45 in a first direction perpendicular to the circular planar surface (2A), wherein the first cylindrical wall (6) is adapted to be capable of coupling to the end of the lighting device (44); and
 - a second at least substantially cylindrical wall (4) that extends from the circular planar surface (2A) in a second direction that is also

perpendicular to the circular planar surface (2A) but opposite the first direction;

wherein the first portion (2) is adapted to be capable of being coupled to an end of a lighting device (44), and

wherein the second portion (3) comprises:

a substantially circular planar surface (3A); and

an at least substantially cylindrical wall (1) that extends from the circumference of the substantially circular planar surface (3A) in the first direction perpendicular to the circular planar surface (3A); wherein the at least substantially cylindrical wall (1) of the second portion (3) is adapted to be capable of non-rigidly coupling to the second at least substantially cylindrical wall (4) of the first portion (2);

wherein the second portion (3) is adapted to be capable of being coupled to an electrical socket of a lighting fixture, via at least two substantially parallel prongs (7A, 7B) extending perpendicularly from its substantially circular planar surface (3A)

in a second direction opposite to the first direction, such that the second portion (3) is in electrical connection with the lighting fixture such that the second portion (3) is in electrical connection with a power supply; said prongs (7A, 7B) being adapted to electrically connect with the power supply via the electrical socket of the lighting fixture such that one prong is in electrical connection with a positive terminal of the electrical socket of the lighting fixture and the other prong is in electrical connection with a negative terminal of the electrical socket;

wherein the second portion (3) comprises at least one fuse (31) located within the second portion (3) and in electrical connection with the power supply; and

at least one elastic member (9A), said elastic member (9A) being coupled to the first (2) and second (3) portions along a common central axis of rotation of the first (2) and second (3) portions such that the second portion (3) is elastically coupled to and biased against the first portion (2), thereby providing the second portion (3) with restricted linear movement in a direction against the elastic bias, and with rotational movement about the central axis relative to the first portion (2);

wherein the first lighting device end cap according to any of claims 1-12, and the second lighting device end cap, are capable of being in electrical connection with an electrical socket of a lighting fixture and a power supply, thereby supporting the LED lighting tube (44) in position with respect to the lighting fixture, and providing electrical connection from the lighting fixture to the LED such that the LED is capable of providing illumination.

14. An LED lighting tube (44) as claimed in claim 13, wherein the fuse (31) is secured to the substantially circular planar surface (3A) of the second portion (3), and wherein the fuse (31) is in electrical connection with the prongs (7A, 7B).