(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 947 677 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
23.07.2008 Bulletin 2008/30

(51) Int Cl.:
H01J 61/35 *(2006.01)* *H01J 61/32* *(2006.01)*

(21) Application number: **08250183.4**

(22) Date of filing: **15.01.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

(30) Priority: **17.01.2007 CN 200710004475**

(71) Applicant: **Mass Technology (H.K.) Ltd.**
Rm 2902-6, Tower 6, The Gateway,
9 Canton Road, Tsimshatsui
Kowloon, Hong Kong (HK)

(72) Inventor: **Foo, Onn Fah**
Tsimshatsui, Kowloon (HK)

(74) Representative: **Prentice, Raymond Roy et al**
Brookes Batchellor LLP
102-108 Clerkenwell Road
GB-London EC1M 5SA (GB)

(54) Electronic energy saving lamp capable of shielding radiation

(57) An electronic energy saving lamp capable of radiation shielding comprises a lamp cap (1), a lamp tube (2), an electronic ballast connected with the lamp cap (1) and the lamp tube (2), a device for mounting the lamp tube and the electronic ballast and a housing (3) enclosing the electronic ballast and the device, wherein a layer of shielding material (5) for electromagnetic radiation shielding is applied on one or more parts of the electronic energy saving lamp through which electromagnetic radiation is diffused from the inside to the outside of the lamp. For example, a layer of shielding material is applied on the lamp tube (2) or a glass bulb (4) of the electronic energy saving lamp, wherein the layer of shielding material is formed of indium tin oxide, or a shielding material formed with a mixture of absolute ethyl alcohol, $SnCl_4$ or $SnCl_2$, and $InCl_3$ or $CdCl_3$ or $SbCl_3$, which is evenly spread and has a high light transmittance whereby the illumination efficiency of the electronic energy saving lamp will not be affected and the electromagnetic radiation can be effectively shielded.

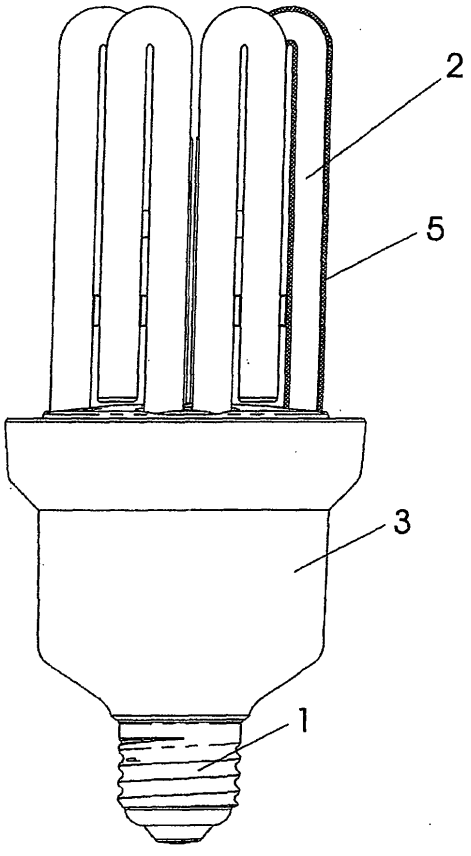

Fig. 1

EP 1 947 677 A2

Description

[0001] The present invention relates to an electronic energy saving lamp, and more particularly, to an electronic energy saving lamp capable of radiation shielding, and wherein on one or more parts of the electronic energy saving lamp arranged on a path of electromagnetic radiation diffused from inside to outside, such as the body of a lamp tube or a glass bulb, a layer of shielding material is applied for electromagnetic radiation shielding.

[0002] It is well known that remarkable energy saving effect, low starting voltage and long lifespan are some of advantages for an electronic energy saving lamp such that it becomes more and more welcomed by customers. However, the working principle of the lamp is to convert a low frequency AC voltage source into a high frequency voltage source whereby harmful electromagnetic radiation is produced while the lamp is active, and it gets particularly worse for a high power electronic energy saving lamp.

[0003] With respect to the electromagnetic radiation, the prevention of which is now effected in many ways in various fields apart from the electronic energy saving lamp. For example, a microwave oven might accompany with a shield dedicated thereto, a radiation screen might be arranged on a computer and people engaged in the relevant fields might be equipped with anti-radiation clothes, etc. However, the radiation of the energy saving lamp and particularly the high power electronic energy saving lamp is generally ignored by the public. Even now there is no any significant nor essential means being employed to shield the human body from the high frequency electromagnetic radiation which is produced by the electronic energy saving lamp and might cause hidden danger thereto.

[0004] An aim of the present invention is to shield the electromagnetic radiation, which is produced by the high power electronic energy saving lamp and which might cause hidden danger to the human body, by providing an electronic energy saving lamp capable of radiation shielding; wherein the radiation shielding technique thereof is, for example, to apply a layer of shielding material on the body of a lamp tube, a glass bulb and/or a housing of the electronic energy saving lamp for electromagnetic radiation shielding. Such technique is effective with respect to a high power electronic energy saving lamp and can eliminate the potential damage to the human body caused by the electromagnetic radiation.

[0005] The technical solution for achieving the above aim is an electronic energy saving lamp capable of radiation shielding according to the present invention, which comprises a lamp cap, a lamp tube, an electronic ballast connected with the lamp cap and the lamp tube, a device for mounting the lamp tube and the electronic ballast, and a housing enclosing the electronic ballast and the device, characterized in that on one or more parts of the electronic energy saving lamp through which electromagnetic radiation is diffused from inside to outside of the lamp, a layer of electromagnetic radiation shielding material is applied.

[0006] The layer of shielding material can be earthed via a conductor, preferably, it is formed of indium tin oxide (ITO, its chemical formula is In_2O_3/SnO_2), or a shielding material formed with a mixture of absolute ethyl alcohol, $SnCl_4$ or $SnCl_2$, and $InCl_3$ or $CdCl_3$ or $SbCl_3$. According to one embodiment of the invention, the shielding material comprises 79-98 (wt. %) of absolute ethyl alcohol, 1.2-18.1 (wt. %) of $SnCl_4$ or $SnCl_2$, and 0.1-4.5 (wt. %) of $InCl_3$ or $CdCl_3$ or $SbCl_3$. More preferably, the shielding material comprises 88-92 (wt.%) of absolute ethyl alcohol, 5-10 (wt.%) of $SnCl_4$, and 2-3 (wt.%) of $InCl_3$.

[0007] Preferably, the layer of shielding material has a thickness of 01 - 10 μm. The layer of shielding material is preferably applied on the lamp tube and can be applied on an internal or external wall of the lamp tube.

[0008] Alternatively, the layer of shielding material can be applied on the inside of the housing or it can be applied on both the inside of the housing and on the lamp tube.

[0009] In a preferred embodiment of the present invention, the layer of shielding material applied on the inside of the housing is a metal shield, which is made of a metal or alloy having good conductivity, such as copper, aluminum or aluminum alloy, and is attached firmly on the inside of the housing and connected via a conductor to a rectified negative terminal of the electronic ballast of the electronic energy saving lamp.

[0010] In another preferred embodiment of the present invention, the layer of shielding material is applied on a glass bulb enclosing the lamp tube and mounted at a lower end of the housing. The layer of shielding material can be applied on an internal or external wall of the glass bulb.

[0011] The layer of shielding material can also be applied on both the inside of the housing and the glass bulb. The layer of shielding material applied on the housing is preferably a metal shield, which is made of a metal or alloy having good conductivity, such as copper, aluminum or aluminum alloy, and is attached firmly on the inside of the housing and connected via a conductor to a rectified negative terminal of the electronic ballast of the electronic energy saving lamp.

[0012] The layer of shielding material applied on the lamp tube and glass bulb is desirably evenly spread and has a high light transmittance such that the light passing through the layer of shielding material might not be affected by it.

[0013] To summarize, an electronic energy saving lamp capable of radiation shielding according to the present invention is characterized in that, on one or more parts (particularly the lamp tube, glass bulb and/or housing thereof) of the electronic energy saving lamp through which electromagnetic radiation diffused from inside to outside of the lamp, a layer of shielding material for electromagnetic radiation shielding is applied, wherein the layer of shielding material can effectively shield the electromagnetic radiation diffused from inside to outside of

the lamp thereby preventing the electromagnetic radiation from endangering the human body. Further, the layer of shielding material applied on the lamp tube and glass bulb of the present invention can be formed of indium tin oxide or a colorless and transparent liquid mixture blended with absolute ethyl alcohol, $SnCl_4$ or $SnCl_2$, and $InCl_3$ or $CdCl_3$ or $SbCl_3$. The illumination efficiency of the electronic energy saving lamp will not be affected by controlling the thickness of the layer of shielding material which is of good conductivity, and the layer of shielding material can be earthed via an earthing conductor whereby to earth the induced current generated during the operation of the electronic energy saving lamp such that the electromagnetic radiation can be further reduced, which in turn facilitates the enhancement of operational safety of the electronic energy saving lamp and the optimization of the environment in which the human race work and live. In the present invention, the layer of shielding material applied on the inside of the housing of the electronic energy saving lamp can be selectively replaced with a metal shield formed of a conducting material, and the shield is connected to a rectified negative terminal of the electronic ballast of the electronic energy saving lamp thereby enabling the shielding of the electromagnetic radiation generated by the ballast in a more reliable way.

[0014] The invention will now be described in detail, by way of example, with reference to the drawings, in which:-

Figure 1 is a part sectioned view of an electronic energy saving lamp capable of radiation shielding wherein a layer of shielding material is applied on a lamp tube;

Figure 2 is a part sectioned view of an electronic energy saving lamp capable of radiation shielding wherein a layer of shielding material is applied on a housing;

Figure 3 is a part sectioned view of an electronic energy saving lamp capable of radiation shielding showing that a layer of shielding material is applied on a lamp tube and a housing, wherein the layer of shielding material applied on the housing is a metal shield;

Figure 4 is a part sectioned view of an electronic energy saving lamp capable of radiation shielding wherein a layer of shielding material is applied on a glass bulb; and

Figure 5 is a part sectioned view of an electronic energy saving lamp capable of radiation shielding showing that a layer of shielding material is applied on a lamp tube inside a glass bulb and a housing, wherein the layer of shielding material applied on the housing is a metal shield.

[0015] In the drawings, like parts are denoted by like reference numerals.

[0016] Reference will first be made to Figures 1 to 3 of the drawings, which illustrate an electronic energy saving lamp capable of radiation shielding of the present invention, respectively. The lamp basically comprises a lamp cap 1, a lamp tube 2, an electronic ballast (not shown), a device (not shown) and a housing 3. The electronic ballast is respectively connected to conductive contacts of the lamp cap 1 with its input end and feet of the lamp tube 2 with its output end, and the device is adapted for the mounting of the lamp tube 2 and the electronic ballast, and the housing 3 is mounted at the bottom end of the lamp cap 1 by enclosing the electronic ballast and the device. While the structure of the lamp is not the key point of the present invention, it will not be described herein and the detail of which can be referred to a conventional electronic energy saving lamp. As can be seen from Figures 1-3, a layer of shielding material for electromagnetic radiation shielding is applied on one or more parts of the electronic energy saving lamp through which electromagnetic radiation is diffused from the inside to the outside of the lamp.

[0017] A preferred shielding material for use in the present invention is indium tin oxide (IYO), which is of better electromagnetic radiation shielding capability and will not affect the luminous flux of the lamp. Alternatively, the layer of shielding material might be formed with a mixture of three substances: 1. absolute ethyl alcohol; 2. $SnCl_4$ or $SnCl_2$; 3. $InCl_3$ or $CdCl_3$ or $SbCl_3$; wherein the absolute ethyl alcohol amounts to 79-98 (wt. %), $SnCl_4$ or $SnCl_2$ amounts to 1.2-18.1 (wt. %), and $InCl_3$ or $CdCl_3$ or $SbCl_3$ amounts to 0.1-4.5 (wt. %). In the latter case, the layer of shielding material of the present invention might be preferably formed with a mixture of 88-92 (wt. %) of absolute ethyl alcohol, 5-10 (wt. %) of $SnCl_4$, and 2-3 (wt. %) of $InCl_3$. For example, such a shielding material can be formed with 1L of absolute ethyl alcohol, 90g of $SnCl_4$, and 26g of $InCl_3$, which is a colorless and transparent liquid with a high light transmittance thereby allowing light rays to be effectively diffused through the shielding material such that the illumination efficiency of the electronic energy saving lamp applied with the shielding material will be basically unaffected. The thickness of the layer of shielding material is preferably of 0.1-10 μm so as to ensure the proper shielding of electromagnetic radiation and the luminous flux of the electronic energy saving lamp applied with the shielding material to be substantially unaffected. Further, the foregoing shielding material is also a conducting material such that it can be earthed via a conductor thereby the induced current generated during the operation of the electronic energy saving lamp can be introduced into earth.

[0018] In order to paste or apply the shielding material onto the required parts of the electronic energy saving lamp, common technical means in the art can be employed and the same will not be thoroughly described herein.

[0019] In Figure 1, the lamp tube 2 of the electronic energy saving lamp is applied with the foregoing layer of shielding material 5, which is adapted for shielding the electromagnetic radiation diffused from the lamp tube 2. According to the present invention, the layer of shielding material 5 can be selectively applied either on the internal wall or external wall of the lamp tube 2. The layer of shielding material applied on the lamp tube 2 should be evenly spread such that the light of the electronic energy saving lamp can be uniformly spread through the layer of shielding material.

[0020] In the electronic energy saving lamp as shown in Figure 2, the layer of shielding material 5' is applied on the inside of the housing 3 for the shielding of the electromagnetic radiation generated by the electronic ballast. As shown in Figure 3, layers of shielding material 5, 5' can be applied concurrently on the inside of the housing 3 and the lamp tube 2 of the electronic energy saving lamp thereby allowing more effective shielding of the electromagnetic radiation and preventing the human body from damage caused by the electromagnetic wave. In Figure 3, the layer of shielding material applied on the housing 3 differs from the layer of shielding material 5 pasted on the lamp tube 2 in that it is a metal shield 5'-1 made of a metal or alloy of good conductivity. In the present embodiment, the metal shield is made of copper. For achieving a better shielding effect, the metal shield is devised to be of substantially the same configuration as that of the housing, while its diameter is slightly smaller than that of the housing. Thus, it can be attached firmly on the inside of the housing 3 and connected via a conductor to a rectified negative terminal of the electronic ballast of the electronic energy saving lamp, and by which the electromagnetic radiation generated by the electronic ballast can be effectively shielded and the induced current generated during the operation of the electronic energy saving lamp can be also introduced into earth.

[0021] Reference will now be made to Figures 4 and 5 in which another electronic energy saving lamp is illustrated which comprises not only all of the parts as that shown in the foregoing embodiments, but also a glass bulb 4. The glass bulb 4 is a spherical part mounted at the bottom end of the housing 3 in such a manner that the lamp tube 2 is enclosed by it.

[0022] The embodiment as shown in Figure 4 differs from that shown in Figure 1 in that the layer of shielding material for electromagnetic radiation shielding is applied on the glass bulb 4 rather than on the lamp tube 2. Similarly, the layer of shielding material 5 can be applied on not only an internal wall but also an external wall of the glass bulb 4. The layer of shielding material applied on the glass bulb 4 should be evenly spread thereby enabling the light of the electronic energy saving lamp to be uniformly spread through the layer of shielding material. Preferably, layers of shielding material 5, 5' can be applied on both the inside of the housing 3 and the glass bulb 4 such that the electromagnetic radiation can be shielded in a more reliable way.

[0023] The layer of shielding material applied on the glass bulb 4 is the same as that on the lamp tube 2. The material adapted for use can be indium tin oxide; and alternatively, it might be a colorless and transparent liquid formed with a mixture of absolute ethyl alcohol, $SnCl_4$ or $SnCl_2$, and $InCl_3$ or $CdCl_3$ or $SbCl_3$. The layer of shielding material is colorless, transparent, and has a high light transmittance such that it brings no effect to the light transmittance of the glass bulb 4 of the electronic energy saving lamp. As the layer of shielding material 5 is a conducting material, it can be earthed via an earthing conductor.

[0024] As to the electronic energy saving lamp having a glass bulb, the layer of shielding material 5 can be also applied on the internal wall or external wall of the lamp tube 2 enclosed by the glass bulb 4, as can be seen in Figure 5. In the electronic energy saving lamp as shown in Figure 5, a metal shield 5'-1 is further provided on the inside of the housing 3; wherein the metal shield, just like that shown in Figure 3, is made of a metal or alloy of good conductivity, such as copper, aluminum or aluminum alloy; and it is attached firmly on the inside of the housing 3 and connected via a conductor to a rectified negative terminal of the electronic ballast of the electronic energy saving lamp. It should be understood that no layer of shielding material needs to be applied on the glass bulb 4 in case the layer of shielding material 5 applied on the lamp tube 2 of the present embodiment is sufficient for shielding the electromagnetic radiation, and then it can be acted as a protection means for the lamp tube 2.

[0025] Obviously, the layer of shielding material of the present invention capable of radiation shielding can be applied on the inside of the housing 3 and the lamp tube 2, or the glass bulb 4 and the inside of the housing 3, or a combination thereof. In this way, the hidden danger caused by the electronic energy saving lamp, and more particularly the high power and high frequency electromagnetic radiation can be effectively shielded or eliminated, which is beneficial to the health of human beings.

[0026] The layer of shielding material of the present invention is simple in configuration, easy to manufacture, low in cost and high in efficiency. It can be adopted widely on various electronic energy saving lamp to reduce the damage to the health of the users caused by the electromagnetic radiation generated therefrom.

[0027] To summarize, the description presented hereinbefore relates to merely some of the preferred embodiments of the present invention. It should be appreciated that the technical solutions obtained by the skilled person in the art via logical analysis, deduction or limited experiments on the basis of the prior art with reference to the teachings of the present invention shall all fall into the scope of the claims of the present invention.

Claims

1. An electronic energy saving lamp capable of radia-

tion shielding, comprising a lamp cap (1), a lamp tube (2), an electronic ballast connected with the lamp cap (1) and the lamp tube (2), a device for mounting the lamp tube and the electronic ballast and a housing (3) inside which the electronic ballast and the device are arranged; **characterized in that**, on one or more parts of the electronic energy saving lamp, through which electromagnetic radiation is emitted from inside to outside of the lamp, a layer of electromagnetic radiation shielding material (5, 5', 5' - 1) is applied.

2. An electronic energy saving lamp according to claim 1, wherein indium tin oxide is used as the shielding material.

3. An electronic energy saving lamp according to claim 1, wherein the shielding material forming the shielding layer comprises absolute ethyl alcohol, $SnCl_4$ or $SnCl_2$, and $InCl_3$ or $CdCl_3$ or $SbCl_3$.

4. An electronic energy saving lamp according to claim 3, wherein the shielding material comprises 79-98 (wt. %) of absolute ethyl alcohol, 1.2-18.1 (wt. %) of $SnCl_4$ or $SnCl_2$, and 0.1-4.5 (wt. %) of $InCl_3$ or $CdCl_3$ or $SbCl_3$.

5. An electronic energy saving lamp according to claim 4, wherein the shielding material comprises 88-92 (wt. %) of absolute ethyl alcohol, 5-10 (wt. %) of $SnCl_4$, and 2-3 (wt. %) of $InCl_3$.

6. An electronic energy saving lamp according to any one of claims 2 to 5, wherein the layer of shielding material has a thickness of 0.1-10 μm.

7. An electronic energy saving lamp according to any one of the preceding claims, wherein the layer of shielding material is applied on the lamp tube (2).

8. An electronic energy saving lamp according to claim 7, wherein the layer of shielding material is applied on an internal or external wall of the lamp tube (2).

9. An electronic energy saving lamp according to any one of claims 1 to 6, wherein the layer of shielding material is applied on the inside of the housing (3).

10. An electronic energy saving lamp according to any one of claims 1 to 6, wherein the layer of shielding material is applied on the inside of the housing (3) and on the lamp tube (2).

11. An electronic energy saving lamp according to claim 9 or claim 10, wherein the layer of shielding material applied on the inside of the housing (3) is a metal shield (5'), which is made of a metal or alloy having good conductivity and closely fitted against the inside of the housing (3) and connected via a conductor to a rectified negative terminal of the electronic ballast of the electronic energy saving lamp.

12. An electronic energy saving lamp according to claim 1, wherein the layer of shielding material (5) is applied on a glass bulb (4) mounted at a lower end of the housing (3) by which the lamp tube (2) is surrounded.

13. An electronic energy saving lamp according to claim 12, wherein the layer of shielding material (5) is applied on an internal or external wall of the glass bulb (4).

14. An electronic energy saving lamp according to claim 12, wherein the layer of shielding material (5' - 1) is further applied on the inside of the housing (3).

15. An electronic energy saving lamp according to claim 14, wherein the layer of shielding material (5' - 1) applied on the housing (3) is a metal shield, which is made of a metal or alloy having good conductivity and closely fitted against the inside of the housing and connected via a conductor to a rectified negative terminal of the electronic ballast of the electronic energy saving lamp.

16. An electronic energy saving lamp according to claim 11 or claim 15, wherein the metal is copper, aluminum, or the alloy is aluminum alloy.

17. An electronic energy saving lamp according to any one of claims 7 to 10 or 12 to 14, wherein the layer or layers of shielding material (5) applied on the lamp tube (2) and/or the glass bulb (4) have good evenness and high light transmittance.

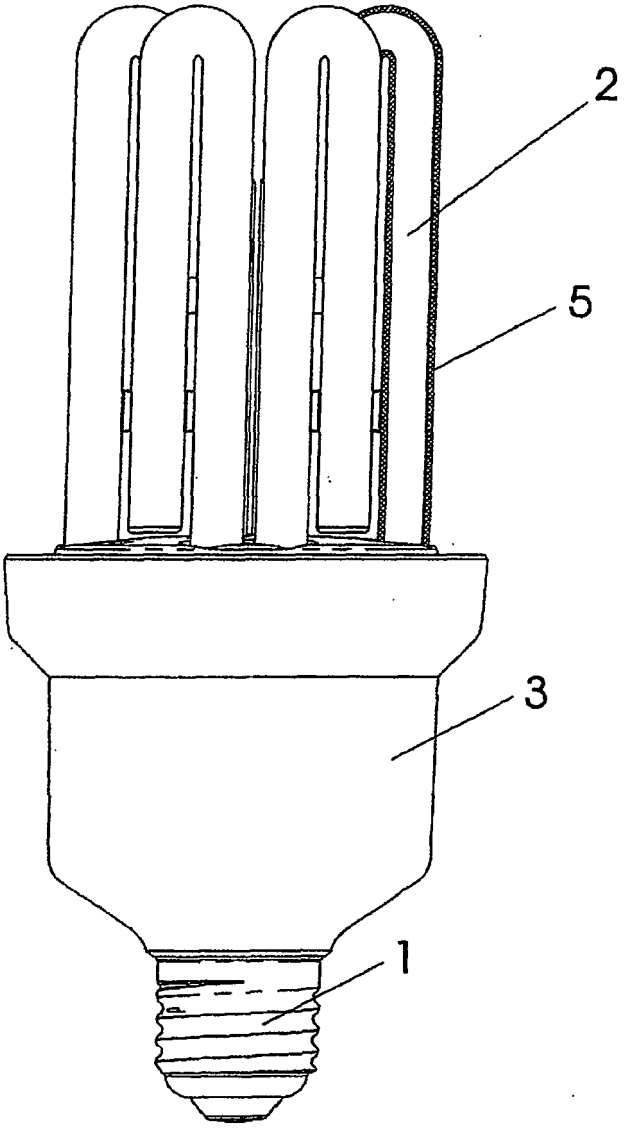

Fig. 1

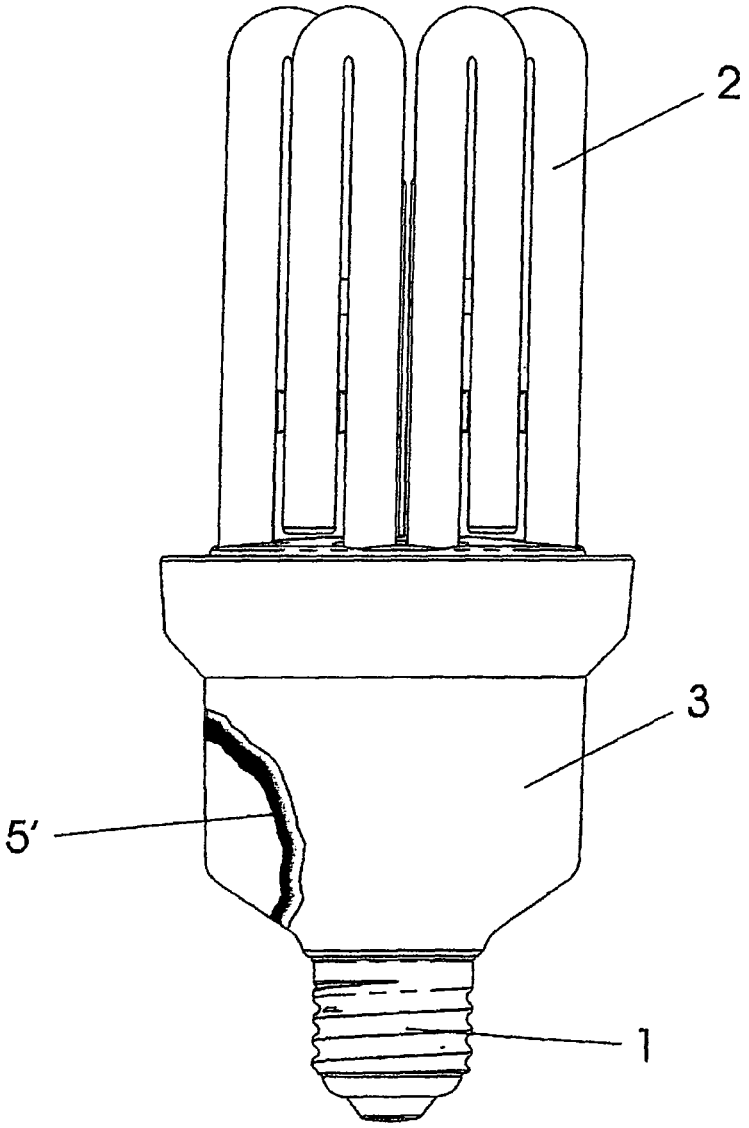

Fig. 2

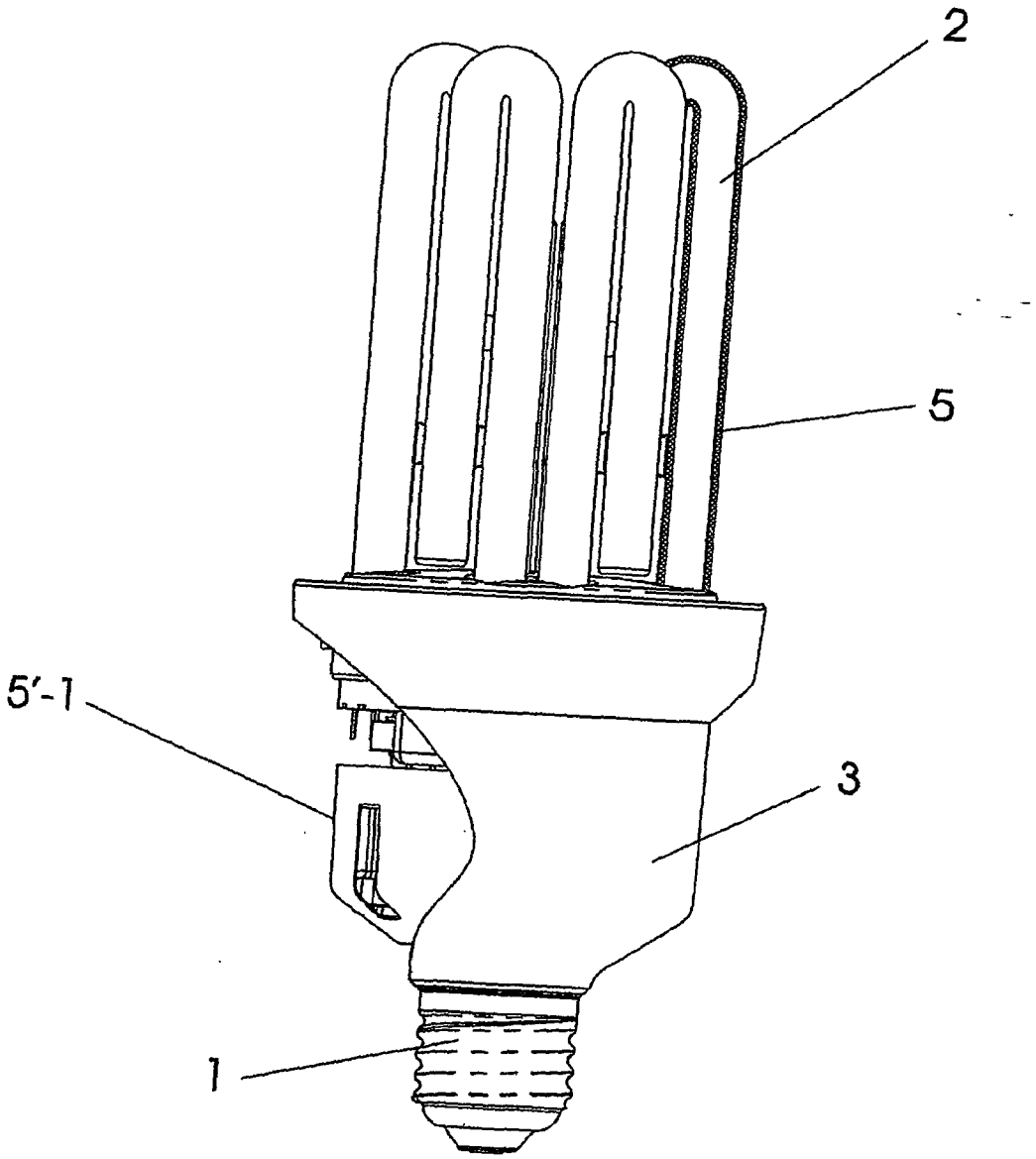

Fig. 3

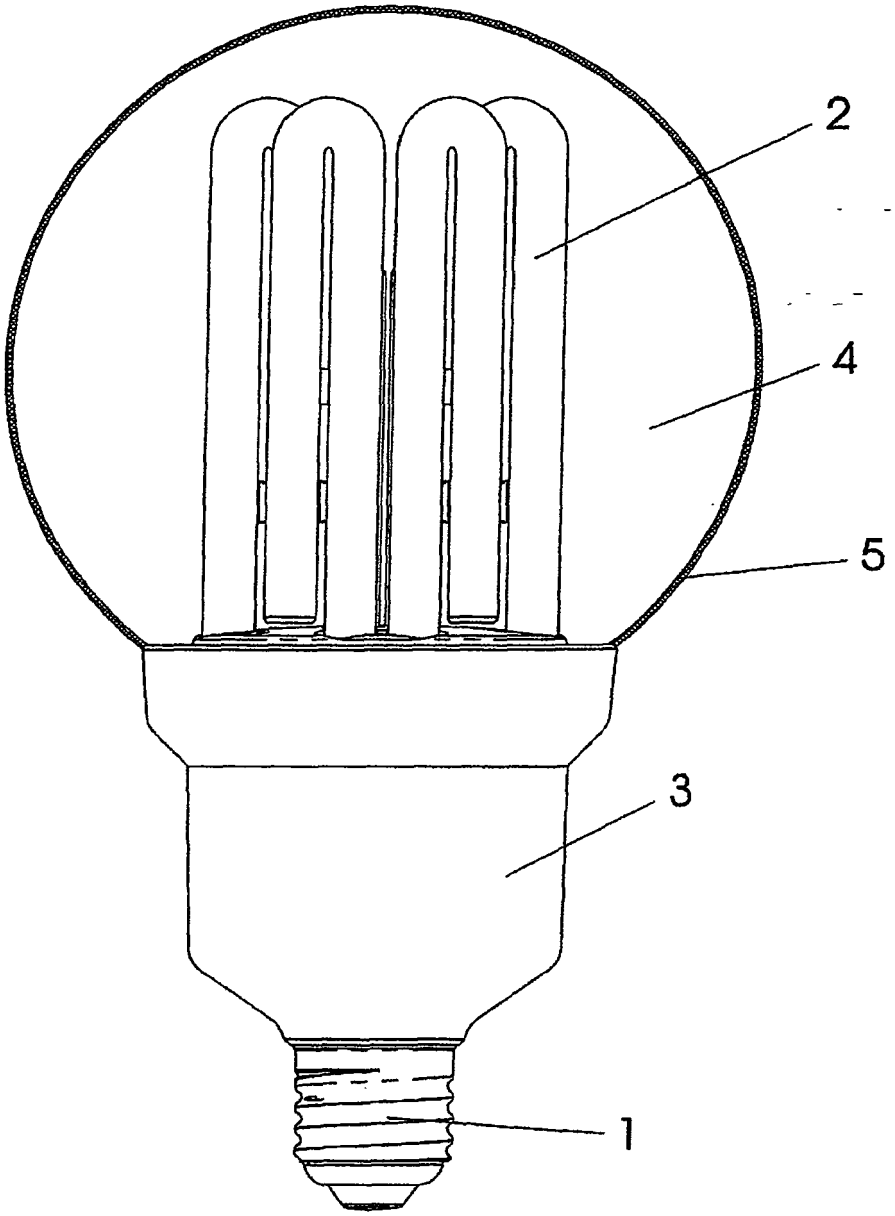

Fig. 4

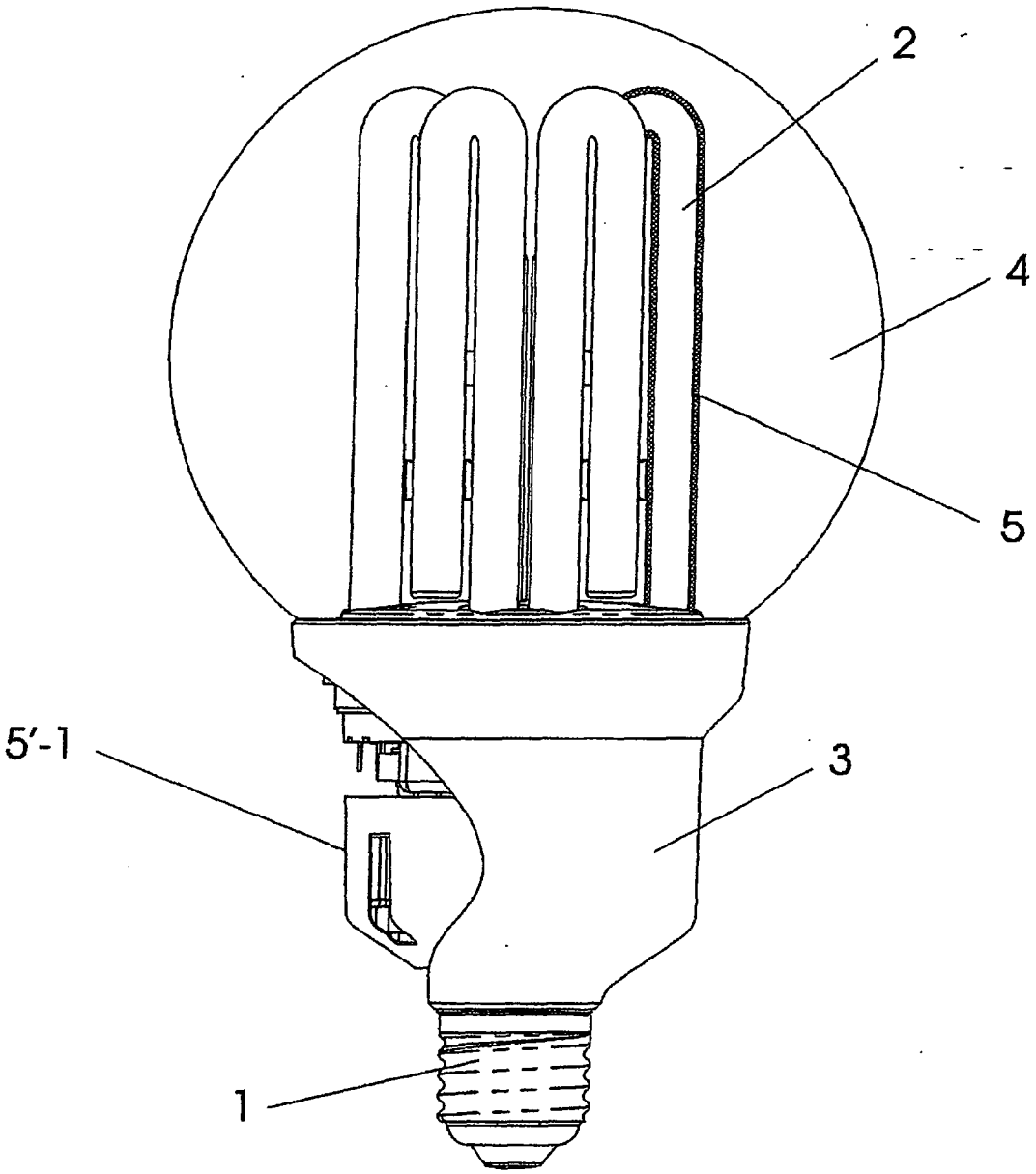

Fig. 5