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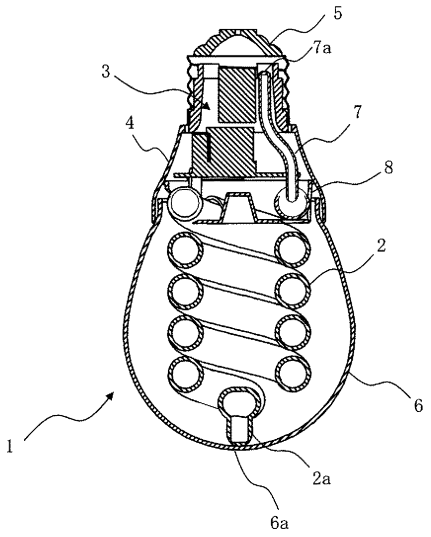
(54) BULB TYPE FLUORESCENT LAMP

(57) A bulb type fluorescent lamp in which the temperature at a coolest point can be lowered regardless of vertical orientation of a light emitting tube and stabilized output is attained at the time of normal lighting. The bulb type fluorescent lamp (1) encapsulating mercury comprises a light emitting tube (2), a ballast (3) for lighting the light emitting tube (2), a plate (8) having one side for holding the light emitting tube (2) and the other side being fixed with the ballast (3), a housing (4) having a base (5) and containing the ballast (3), and an outer tube globe (6) covering the light emitting tube (2). The bulb type fluorescent lamp (1), **characterized in that** provided are a protrusion (2a) formed at the distal end (7a) on the side opposite to the base (5) of the light emitting tube (2) and becoming the coolest point when the light emitting tube (2) is lighted while directing the base (5) upward, and an exhaust pipe (7) extending from the light emitting tube (2) into the housing (4) while penetrating the plate (8) in order to exhaust the interior of the light emitting tube (2) and having the tip end (7a) becoming the coolest point when the light emitting tube (2) is lighted while directing the base (5) downward.

[FIG. 3]



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Description

Technical Field:

[0001] The present invention relates to an electric bulb-shaped fluorescent lamp constituted in such a manner that, in said fluorescent lamp, mercury is enclosed in place of amalgam, whereby the luminous flux build-up characteristic is improved, and at the same time, the part which becomes the coolest point is formed at the tip end of the lamp in case the cap is positioned upwards, while, in case the cap is positioned downwards, the said part is formed at the tip end of a sealed pipe extended up to a point near the cap, so that, either at the base-up time when the cap is positioned upwards or at the base-down time when the cap is positioned downwards, a stable optical output can be obtained.

Background Technique

[0002] As a light source which can take the place of an incandescent lamp, an electric bulb-shaped fluorescent lamp which is high in lamp efficiency and long in useful time has been proposed; and, as such an electric bulb-shaped florescent lamp, there is known a fluorescent lamp provided with a double-helical shaped light-emitting tube. Fig. 7 is a front view showing a sectional view of such a conventional electric bulb-shaped fluorescent lamp. As shown in Fig. 7, an electric bulb-shaped fluorescent lamp 1 comprises a double helix-shaped, light-emitting tube 2, a stabilizer 3 for lighting this light-emitting tube 2, a housing 4 accommodating the stabilizer 3 and having a cap 5, and an outer tubular globe 6 covering the light-emitting tube 2. Within the light-emitting tube 2, mercury is sealed up as a single substance (Amalgam is not used) for improvement of the luminous flux building-up characteristic, besides a mixture gas as a buffer gas.

[0003] The light-emitting tube 2 has its glass tube end inserted into a plate 8 and fixed to said plate 8 by means of an adhesive such as, e.g. silicon.

[0004] In the lower end portion of the light-emitting tube 2, there is formed a projecting portion 2a swollen out downwards (in the direction opposite with respect to the cap 5) ; and this projecting portion 2a and the lower end portion of the inner wall of the outer tube globe 6 are thermally coupled together by a thermally conductive medium 15.

[0005] The reason for providing the projecting portion 2a is that, as a result of providing the projecting portion 2a, the space within the projecting portion 2a gets off the track of the electrons flowing between the electrodes, as a result of which the temperature (the coolest-point temperature) within the projection 2a is further lowered.

[0006] Further, the reason why the light-emitting tube 2 and the outer tube globe 6 are thermally coupled together by means of a thermally conductive medium 15 is that, when the electric bulb-shaped fluorescent lamp 1 is lit to raise the temperature of the light-emitting tube 2, the resulting heat is transmitted to the outer tube globe 6 through the thermally conductive medium 15, in which case the rise in the temperature of the light-emitting tube 2, particularly the rise in the temperature of the coolest portion formed in the lowermost end portion of the light-emitting tube 2 can be suppressed. In this way, it can be ensured that, when the light-emitting tube 2 is lit up ordinarily in the state in which the electrode of said light-emitting tube 2 is positioned upwards, the temperature at the coolest point of the light-emitting tube can be lowered by the coolest point on the projecting portion provided at the top of the light-emitting tube and the thermally conductive medium 15 (See, for example, Patent Literature 1).

Patent Literature 1: JP Patent Application Disclosure No. 2004-87397.

Disclosure of the Invention

Problem to be Solved by the Invention

[0007] In the case of the conventional electric bulb-shaped fluorescent lamp, the coolest point of the light-emitting tube is formed in the top portion of the light-emitting tube, so that, in the state in which the light-emitting tube is mounted with its cap placed at the upside thereof, the coolest-point temperature is low, and a stable output can be obtained, but, to the contrary, in the state in which the light-emitting tube is mounted with the cap held downwards, the coolest-point temperature rises, and thus, a stable output cannot be obtained, which has been a problem.

[0008] The present invention has been made in order to give a solution to the above-mentioned problem, and it is the object of the invention to provide an electric bulb-shaped fluorescent lamp constituted in such a manner that, without regard to whether the light-emitting tube is directed upwards or downwards, the temperature at the coolest point can be decreased, and, during the normal lighting-up time, a stable output can be assured.

Means for the Solution of the Problem

[0009] The electric bulb-shaped fluorescent lamp according to the present invention which comprises a light-emitting tube, a stabilizer for lighting said light-emitting tube, a plate which holds said light-emitting tube at one side thereof, while, at the other side thereof, a stabilizer is mounted, a housing which accommodates said stabilizer therein and has a cap, and an outer tube globe covering said light-emitting tube, wherein mercury is enclosed in said electric bulb-shaped fluorescent lamp, characterized in that there are provided a projecting portion and an exhaust tube, said projecting portion being formed at the tip end, on the side opposite to the cap of said light-emitting tube, said projecting portion becoming the coolest point when the light-emitting tube is lit up in

a state mounted with said cap positioned upwards, while said exhaust tube being provided in order to exhaust the interior of said light-emitting tube and extending from the light-emitting tube through said plate into the interior of said housing, wherein the tip end of said exhaust tube becomes the coolest point when said light-emitting tube is lit up in a mounting state in which said cap is placed downwards.

Effect of the Invention

[0010] The electric bulb-shaped fluorescent lamp according to the present invention is constructed as mentioned above, due to which the temperature at the coolest point thereof can be lowered, and a stable output can be obtained at the time of ordinary lighting thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

[Fig. 1] shows Embodiment 1 of the present invention; more concretely, Fig. 1 is a front view of the electric bulb-shaped fluorescent lamp 1.
[Fig. 2] shows Embodiment 1 of the present invention; more concretely, Fig. 2 is a plan view of the electric bulb-shaped fluorescent lamp 1.
[Fig. 3] shows Embodiment 1 of the present invention; more concretely, Fig. 3 is a front sectional view of the electric bulb-shaped fluorescent lamp 1.
[Fig. 4] shows Embodiment 1 of the present invention; more concretely, Fig. 4 is a front view showing the internal structure of the electric bulb-shaped fluorescent lamp 1.
[Fig. 5] shows Embodiment 1 of the present invention; more concretely, Fig. 5 is a plan view showing the internal structure of the electric bulb-shaped fluorescent lamp 1.
[Fig. 6] shows Embodiment 2 of the present invention; more concretely, Fig. 6 is a front sectional view of the electric bulb-shaped fluorescent lamp 1.
[Fig. 7] is a front sectional view of the conventional electric bulb-shaped fluorescent lamp 1.

Explanation of Reference Numerals and Symbols

[0012] 1: Light bulb-shaped fluorescent lamp, 2: Light-emitting tube, 2a: Projecting portion, 3: Stabilizer, 4: Housing, 5: Cap, 6: Outer tube globe, 6a: Lower end portion, 6b: Opening portion, 7: Exhaust tube, 7a: Tip end, 8: Plate, 15: Heat-conductive medium.

Best Mode for carrying out the Invention

Embodiment 1

[0013] Figs. 1 to 5 show Embodiment 1 of the present invention, of which Fig. 1 is a front view of the electric bulb-shaped fluorescent lamp 1, Fig. 2 is a plan view of the electric bulb-shaped fluorescent lamp 1, Fig. 3 is a front view showing a section of the electric bulb-shaped fluorescent lamp 1, Fig. 4 is a front view showing the internal structure of the electric bulb-shaped fluorescent lamp 1, and Fig. 5 is a plan view showing the internal structure of the electric bulb-shaped fluorescent lamp 1. Referring to the drawings, the electric lamp-shaped fluorescent lamp 1 comprises a double spiral-shaped light-emitting tube 2, a stabilizer (lighting circuit) 3 for lighting this light-emitting tube 2, a housing 4 accommodating the stabilizer 3 therein and has a cap 5, and an outer tube globe 6 covering the light-emitting tube 2.

[0014] The end portion of the light-emitting tube 2 is inserted into the plate 8 and fixed to it by means of an adhesive such as, e.g. silicon, as shown in Fig. 3. On the side of the plate 8 which side is opposite to the light-emitting tube 2, the stabilizer 3 comprising various electronic parts is mounted.

[0015] To the tip end of the opposite side of the cap 5 of the light-emitting tube 2, a projecting portion 2a is formed by swelling out a glass tube. The projecting portion 2a is contacted with the lower end portion 6a of the outer tube globe 6 and thermally coupled to it. The reason for providing the projecting portion 2a is that, by forming this projecting portion 2a, the space in the projecting portion 2a comes off from the path of the electrons which flow between the electrodes, whereby the temperature (the temperature at the coolest point) in the projecting portion 2a is further lowered.

[0016] From one end of the light-emitting tube 2, an exhaust tube 7 for exhausting the air in the light-emitting tube 2 extends through a plate 8 as far as the upper portion of the space in which the stabilizer 3 in the housing 4 is accommodated. This is aimed at separating the tip end 7a of the exhaust tube 7 from the light-emitting tube 2 which becomes high in temperature when said light-emitting tube 2 emits light.

[0017] Next, the operation will be described.

[0018] First, description will be made concerning the case where the electric bulb-shaped fluorescent lamp 1 is mounted in the state in which the cap 5 is positioned above. If, in this case, the electric bulb-shaped fluorescent lamp 1 is turned on and the temperature in the light-emitting tube 2 rises, then the heat thus caused is transmitted from the projecting portion 2a directly to the outer tubular globe 6, as a result of which the rise in temperature of the light-emitting tube 2, particularly, the rise in temperature at the coolest point formed in the protruding portion 2a at the lower end portion of the light-emitting tube 2 is suppressed. Accordingly, the light-emitting tube 2 can assure a stabilized output.

[0019] Next, description will be made concerning the case where the electric bulb-shaped fluorescent lamp 1 is mounted in a state with the cap 5 positioned downwards. In this case, the tip end 7a of the exhaust tube 7 is positioned apart from the light-emitting tube 2 and extends as far as the vicinity of the low-temperature stabi-

lizer 3, so that, even if the electric bulb-shaped fluorescent lamp 1 is lit to raise the temperature of the light-emitting pipe 2, the tip end 7a of the exhaust tube 7 is lower in temperature than the other portions of the light-emitting tube 2, and thus, the coolest point is formed there. Further, since mercury exists at the tip end 7a of the exhaust tube 7 which (tip end 7a) is the coolest point positioned in the lower end portion of the light-emitting tube 2, the mercury vapor pressure within the light-emitting tube 2 is determined by the temperature thereof; and thus, an appropriate mercury vapor pressure results, whereby a stable output can be obtained.

[0020] As mentioned above, according to this embodiment of the present invention, either in case the electric bulb-shaped fluorescent lamp 1 is mounted in the state with the cap 5 located upwards or in case the electric bulb-shaped fluorescent lamp 1 is mounted in the state with cap 5 positioned downwards, the lower end portion (This lower end portion is the protruding portion 2a in the former case, but it is the leading end 7a of the exhaust tube 7 in the latter case) of the light-emitting tube 2 becomes the coolest point, and thus, a stabilized output can always be obtained.

Embodiment 2.

[0021] Fig. 6 shows Embodiment 2 of the present invention; more specifically, said Fig. 6 is a front sectional view of the electric bulb-type fluorescent lamp 1.

[0022] In the case of Embodiment 1, the projecting portion 2a is contacted with the outer tube globe 6, whereby the projecting portion 2a and the outer tube globe 6 are thermally coupled together, but it is also permissible to provide an opening 6b in that portion of the outer tubular globe 6 which is positioned in the neighborhood of the projecting portion 2a, so that the projecting portion 2a is cooled by the air flowing into the outer tubular globe 6 from the outside to thereby suppress the rise of the temperature in the coolest point location.

[0023] In case of this Embodiment of the present invention, if the electric bulb-shaped fluorescent lamp 1 is lit to raise the temperature of the light-emitting tube 2, then the projecting portion 2a is cooled by a cool wind entering through the opening portion 6b formed in the outer tubular globe 6, and thus, the rise in temperature of the coolest-point location is suppressed, so that the light-emitting tube 2 can obtain a stabilized output.

[0024] In the above, description has been made concerning electric bulb-shaped fluorescent lamps in each of which the light-emitting tube 2 is alike of a double spiral type, but the present invention is not limited to such type. That is, the light-emitting tube 2 may be any other type such as a bent-shaped type or the like.

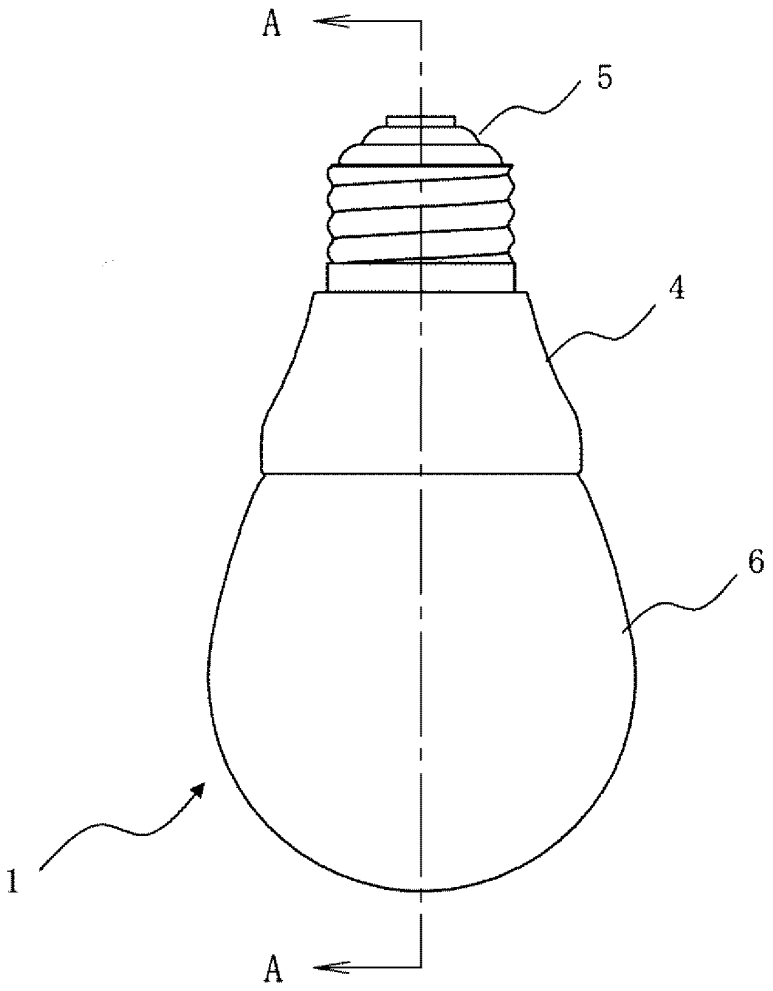
[0025] In the above, there are shown such embodiments of the present invention that, in each case, the tip end 7a of the exhaust tube 7 is positioned in the upper portion of the space in which the stabilizer 3 of the housing 4 is accommodated, but the tip end 7a of the exhaust tube 7 may be positioned anywhere within the space which accommodates the stabilizer 3 of the housing 4.

[0026] Further, as methods for cooling the projecting portion 2a of the light-emitting tube 2, there have been described the method of contacting the projecting portion 2a with the outer tubular globe 6 and the method of forming an opening portion 6b in that portion of the outer tubular globe 6 which is located near the projecting portion 2a, but other methods can also be adopted instead.

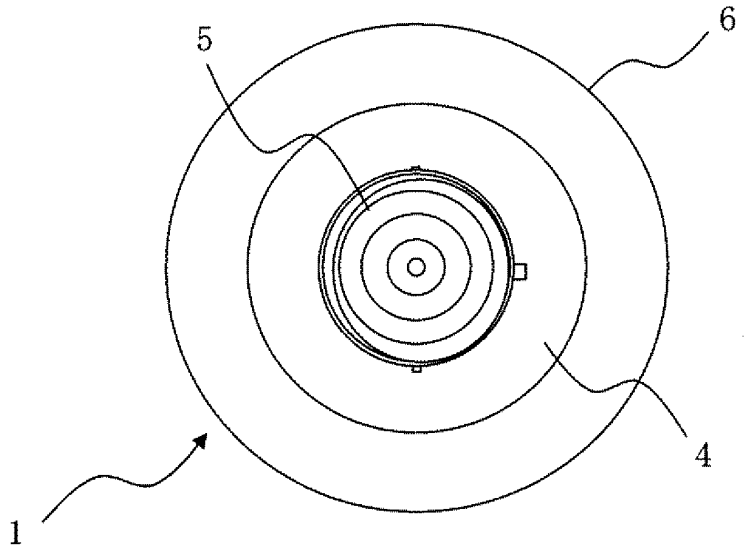
Claims

1. An electric bulb-shaped fluorescent lamp which comprises a light-emitting tube, a stabilizer for lighting said light-emitting tube, a plate which holds said light-emitting tube on one side thereof and, on the other side thereof, said stabilizer is mounted, a housing which accommodates said stabilizer therein and has a cap, and an outer tubular globe covering said light-emitting tube, wherein mercury is enclosed in said electric bulb-shaped fluorescent lamp,
characterized in that
said electric bulb-shaped fluoroscopic lamp further comprises a projecting portion formed at the tip end of said light-emitting tube, said tip end being located at the side opposite to said cap of said light-emitting tube, wherein said projecting portion becomes the coolest point when said light-emitting tube is lit in the mounting state in which said cap is positioned upwards, and
an exhaust tube which is provided for evacuating the interior of said light-emitting tube and extends as far as the inside of said housing through said plate from said light-emitting tube, wherein the tip end of said exhaust tube becomes the coolest point when said light-emitting tube is lit in the state in which said cap is positioned downwards.

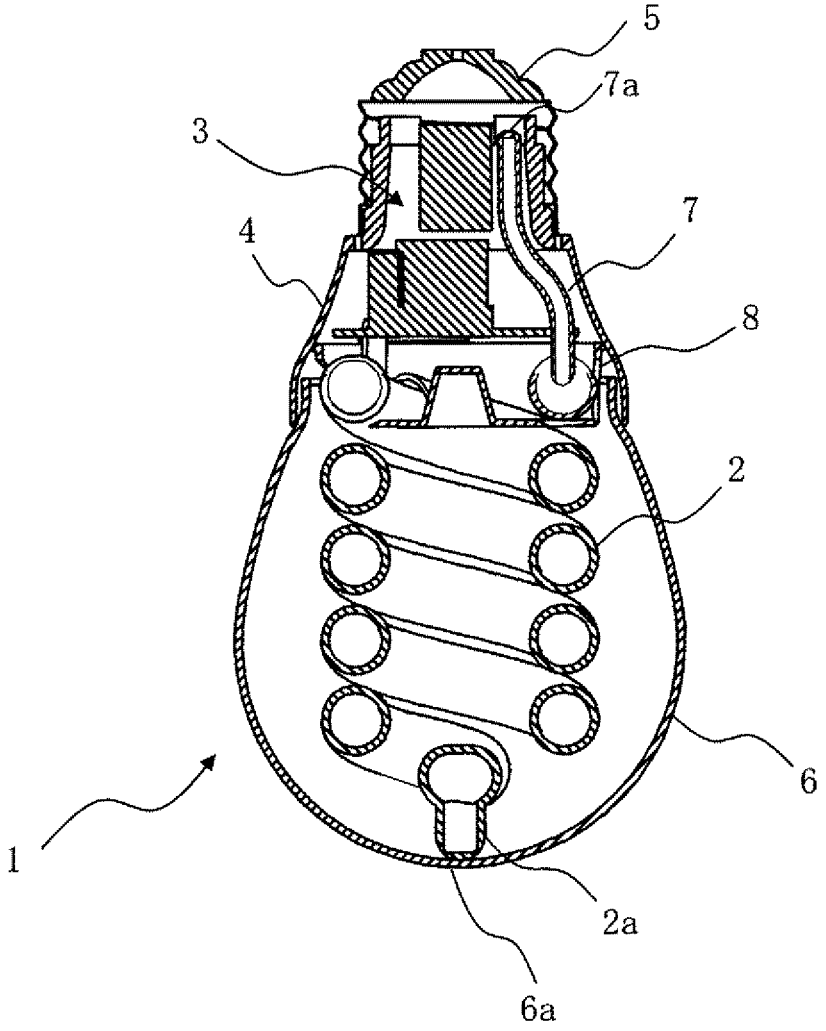
[FIG. 1]



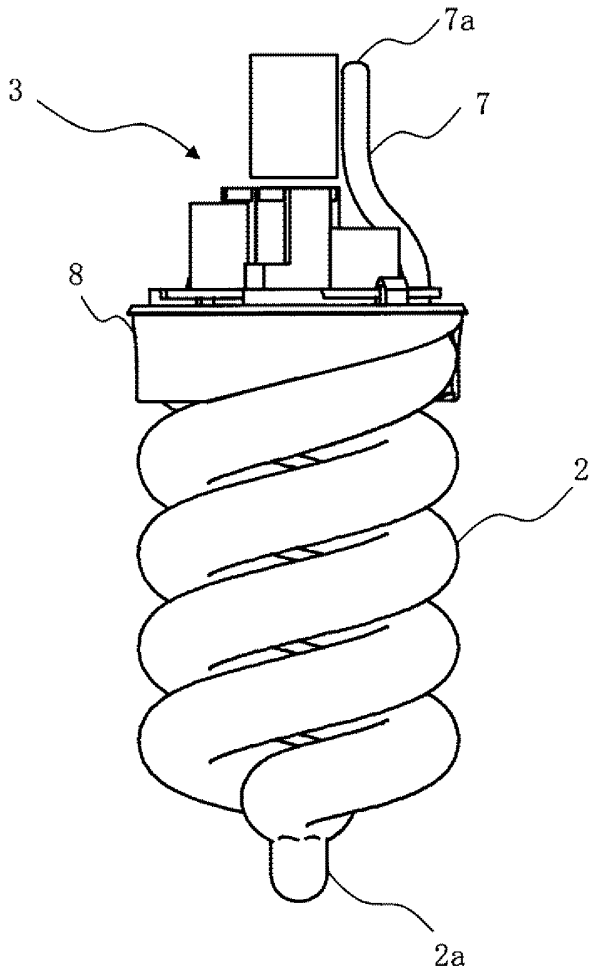
[FIG. 2]



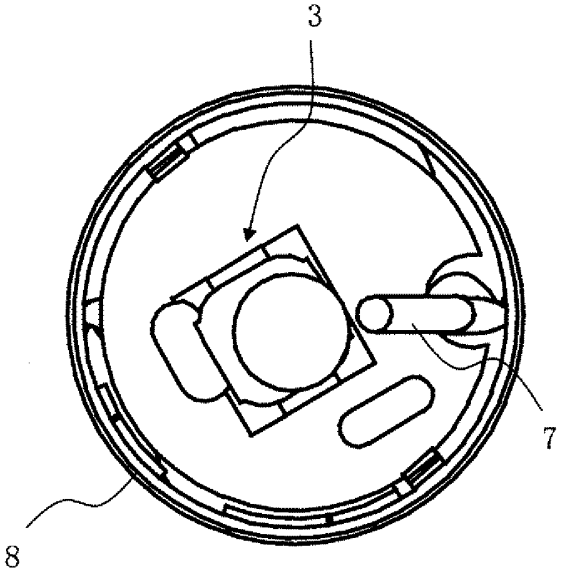
[FIG. 3]



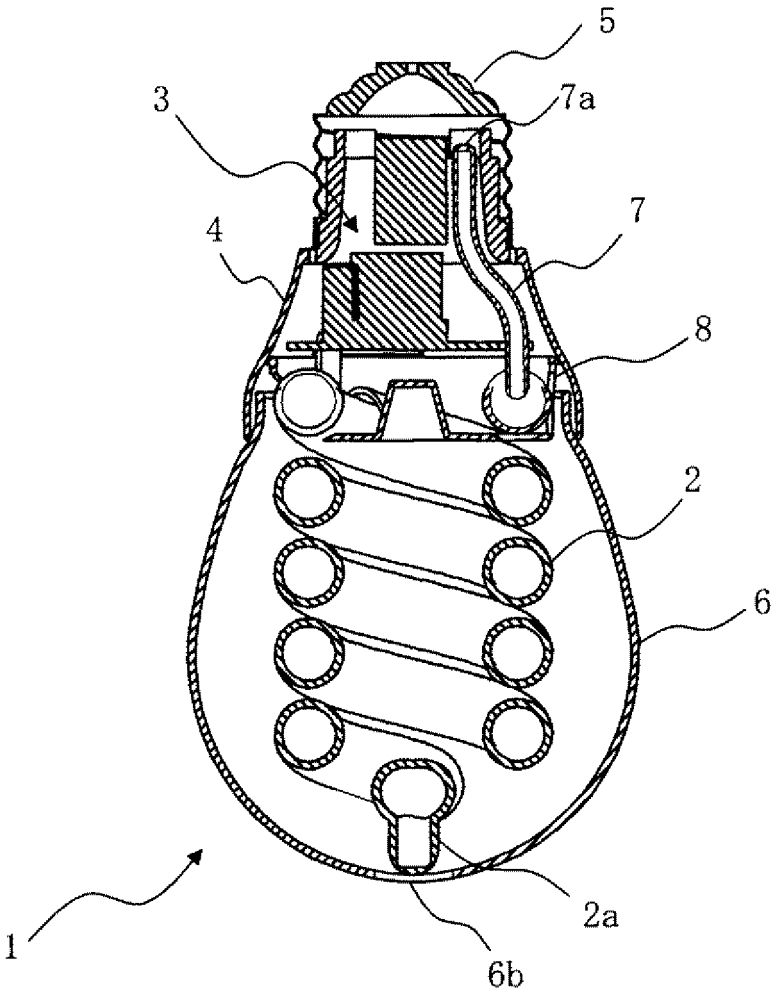
[FIG. 4]



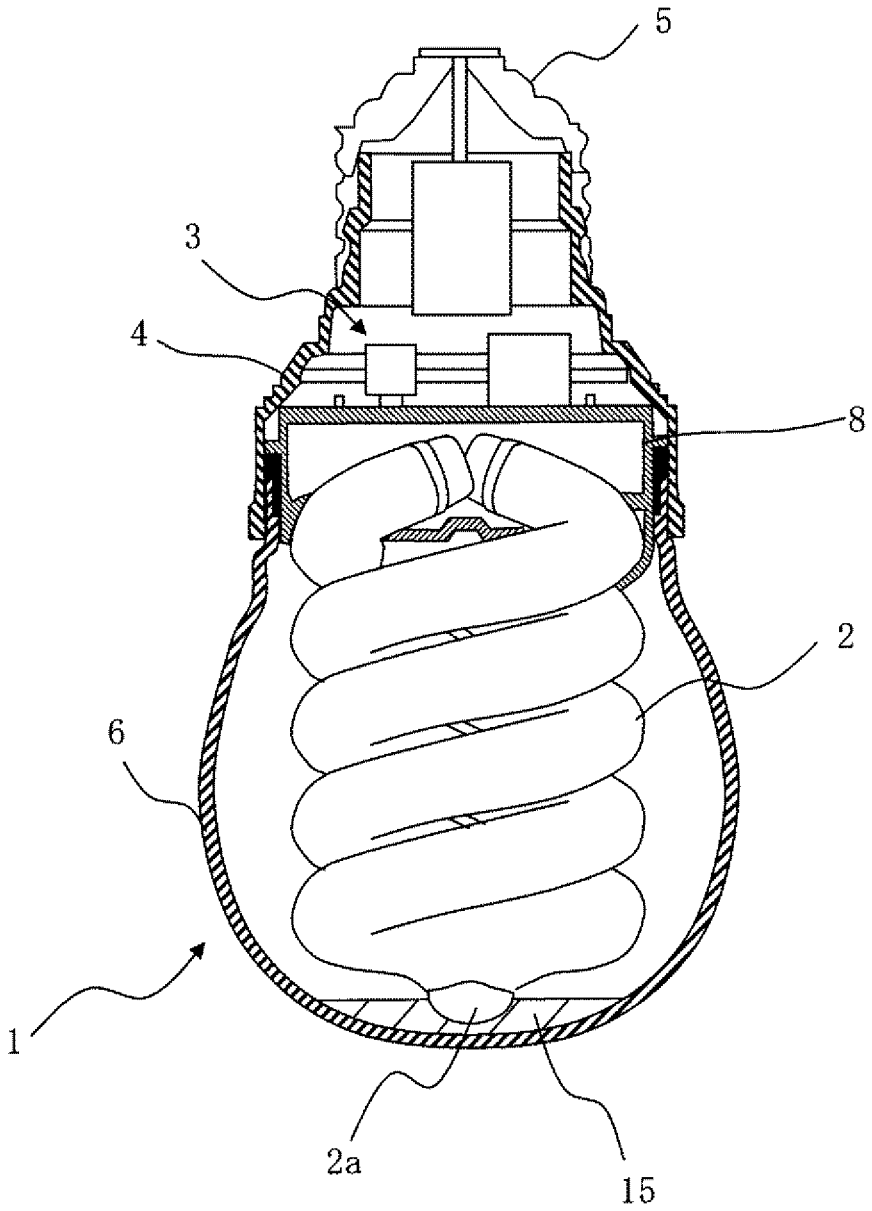
[FIG. 5]



[FIG. 6]



[FIG. 7]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/307855

A. CLASSIFICATION OF SUBJECT MATTER
F21S2/00(2006.01), ***F21V23/00***(2006.01), ***H01J61/30***(2006.01), *F21Y103/025* (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)
F21S2/00, F21V23/00, F21Y103/025, H01J61/30

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2006
Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2004-265736 A (Matsushita Electric Industrial Co., Ltd.), 24 September, 2004 (24.09.04), Full text & US 2004/232815 A1 & CN 1527351 A	1
Y	JP 2004-146331 A (Toshiba Lighting & Technology Corp.), 20 May, 2004 (20.05.04), Par. Nos. [0015], [0109], [0119]; Figs. 1 to 3, 5 & US 2004/17156 A1 & CN 1489175 A	1

☒ 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
04 July, 2006 (04.07.06)	18 July, 2006 (18.07.06)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/307855

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 147820/1984(Laid-open No. 63759/1986) (NEC Home Electronics Ltd.), 30 April, 1986 (30.04.86), Page 4; Par. Nos. [0011] to [0019] (Family: none)	1

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2004087397 A **[0006]**