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

(11) EP 1 670 288 A1

(12) EUROPEAN PATENT APPLICATION

published in accordance with Art. 158(3) EPC

(43) Date of publication:
14.06.2006 Bulletin 2006/24

(21) Application number: **04773622.8**

(22) Date of filing: **29.09.2004**

(51) Int Cl.:
H05B 3/44 *(1968.09)* ***H01K 1/32*** *(1968.09)*
H01K 7/00 *(1968.09)*

(86) International application number:
PCT/JP2004/014697

(87) International publication number:
WO 2005/032215 (07.04.2005 Gazette 2005/14)

(84) Designated Contracting States:
FR IT

(30) Priority: **30.09.2003 JP 2003341782**

(71) Applicant: **Harison Toshiba Lighting Corporation**
Imabari-shi,
Ehime 794-8510 (JP)

(72) Inventors:
- **GOGAMI, Yasutaka c/o HARISON TOSHIBA LIGHTING CORP**
Ehime 794-8510 (JP)
- **SHIGEEDA, Hidenori c/o HARISON TOSHIBA LIGHTING CO**
Ehime 794-8510 (JP)
- **OOTANI, Tetsuo c/o HARISON TOSHIBA LIGHTING CORP**
Ehime 794-8510 (JP)

(74) Representative: **Kramer - Barske - Schmidtchen**
Radeckestrasse 43
81245 München (DE)

(54) TUBE AND BALL

(57) A bulb includes: a heating tube 2 having a heating portion accommodating a filament 3, a pair of sealing end portions 5b subjected to pinch sealing on both axial sides of the heating portion to provide airtight sealing, and a pair of lead wires connected to the filament and extending outward in an airtight manner from the pair of sealing end portions 5b; an optical film 10 formed by coating an optical film solution to a portion of an outer surface of the heating tube excluding a non-coating region 9 to which the optical film solution is not coated, the non-coating region 9 extending, from a position S spaced apart by a predetermined distance 1 to the filament side from an inner end ie of one of the pair of sealing end portions, to an outer end Oe of the one sealing end portion; and a frosted portion 11 formed by performing frosting treatment on the non-coating region. According to the this structure, the anti-glare effect of the heating tube can be improved.

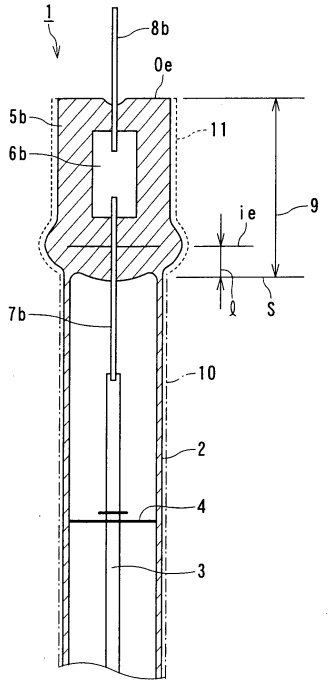

FIG. 1

EP 1 670 288 A1

Description

Technical Field

[0001] The present invention relates to a bulb which is formed by applying an optical film on an outer surface of a halogen lamp or the like used as a heating lamp, for example.

Background Art

[0002] As a conventional example of tubular heating lamps for emitting infrared rays and visible light used for studios, industrial or domestic heating applications, and the like, there is provided one having a tungsten filament received within a radiation-transmitting bulb thereof with a reflective film being formed on the outer surface of the bulb (see, for example, Patent Document 1).

[0003] The reflective film includes, for example, a plurality of high refractive-index layers mainly composed of Ta_2O_5 capable of operating at temperatures equal to or lower than about 950°C, and a plurality of low refractive-index layers mainly composed of SiO_2. The reflective film has a band-pass characteristic with respect to the radiation to be transmitted through the bulb.

[0004] Further, as an example of a lamp used as an infrared light source, there is known a lamp having an optical film formed on the surface of the bulb. The optical film absorbs light within a visible light wavelength band while selectively transmitting light within an infrared wavelength range (see, for example, Patent Document 2).

[Patent Document 1] Japanese Patent Laid-open Publication No. SHO 60-1751

[Patent Document 2] Japanese Patent Laid-open Publication No. 2002-352612

[0005] However, the heating lamp described in Patent Document 1 involves the problem of glare at a time when directly looking into the bulb. In order to prevent or reduce this glare, it is necessary to sufficiently reduce the emission of visible light.

[0006] Further, in order to achieve this matter, the numbers of the high refractive-index layers and low refractive-index layers must be increased. However, an increase in the number of these layers (films) forming the optical film drives up the manufacturing cost, and also causes a decrease in the heat resistance of the optical film, which in turn causes peeling or cracks or color shading upon lighting.

[0007] While a conceivable solution to avoid this problem is to form the bulb using a colored glass, this also causes a decrease in the transmittance of infrared rays, which disadvantageously reduces the efficiency of infrared emission.

[0008] The present invention has been made in view of the above-described circumstances. Accordingly, it is an object of the present invention to provide an inexpensive bulb having superior anti-glare characteristics.

Disclosure of The Invention

[0009] According to the invention as claimed in Claim 1 of the present invention, there is provided a bulb including: a heating tube having a heating portion accommodating a heat source, a pair of sealing end portions subjected to pinch sealing on both axial sides of the heating portion to provide airtight sealing, and a pair of lead wires connected to the heat source and extending outward in an airtight manner from the pair of sealing end portions; an optical film formed by coating an optical film solution to portions of an outer surface of the heating tube excluding a non-coating region to which the optical film solution is not coated, the non-coating region extending, from a position spaced apart by a predetermined distance toward the heating portion from an inner end of one of the pair of sealing end portions, to an outer end of this one sealing end portion; and a frosted portion formed by performing frosting treatment on the non-coating region.

[0010] According to the invention according to claim 2 of the present invention, there is provided a bulb including: a heating tube having a heating portion accommodating a heat source, a pair of sealing end portions subjected to pinch sealing on both axial sides of the heating portion to provide airtight sealing, and a pair of lead wires connected to the heat source and extending outward in an airtight manner from the pair of sealing end portions; a frosted portion formed by performing frosting treatment on the non-coating region; and an optical film formed on the frosted portion.

Brief Description of the Drawings

[0011]

Fig. 1 is a longitudinal sectional view of an essential portion of a halogen lamp according to a first embodiment of the present invention.

Fig. 2 is a partially cutaway longitudinal sectional view showing a general construction of the halogen lamp shown in Fig. 1.

Fig. 3 is a partially cutaway longitudinal sectional view of a halogen lamp according to a second embodiment of the present invention.

Fig. 4 is an enlarged view of the IV portion shown in Fig. 3.

Fig. 5 is a partially cutaway longitudinal sectional view of a halogen lamp according to a third embodiment of the present invention.

Best Mode for Carrying Out the Invention

[0012] Hereunder, the best embodiments of the present invention will be described with reference to the attached drawings, in which the same or equivalent portions are denoted by the same reference numerals.

[0013] Fig. 1 is an enlarged longitudinal sectional view of an essential portion of the first embodiment showing an axial end portion of a tubular halogen lamp as an example of a bulb according to the present invention, and Fig. 2 is a partially cutaway sectional view of substantially the entire halogen lamp shown in Fig. 1.

[0014] As shown in these drawings, a halogen lamp 1 is of a tubular type frequently used, for example, as a heater for heating food or the like. The halogen lamp 1 has a heating tube 2 made of silica glass or the like having radiation transmitting property.

[0015] The heating tube 2 has a tungsten filament 3 as an example of a heat source concentrically arranged in the heating tube 2. The filament 3 is supported concentrically with the heating tube 2 by means of a plurality of anchors 4, 4 ... axially arranged within the heating tube 2. Further, inside the heating tube 2, a pair of flat, rectangular sealing end portions 5a, 5b are formed by pinch seals containing a required amount of halogen (I, Br, Cl, F) together with insert gas such as argon and formed by radially crushing both axial end portions of the heating tube 2. Rectangular molybdenum foils 6a, 6b are embedded in the sealing end portions 5a, 5b, respectively.

[0016] The molybdenum foils 6a, 6b are connected, at their inner end portions, to the opposite axial ends of the filament 3 through a pair of inner lead wires 7a, 7b, respectively. The outer end portions thereof are connected to a pair of outer lead wires 8a, 8b, respectively. The outer lead wires 8a, 8b extend to the outside from the respective sealing end portions 5a, 5b in an airtight manner.

[0017] Further, as shown in Figs. 1 and 2, an optical film 10 is formed on the entire outer surface of the heating tube 2 except for a non-coating region 9 formed in one of the pair of sealing end portions 5a, 5b, for example, on the sealing end portion (5b) side. The thus formed optical film 10 may be a reflective film formed of a single layer that consists of a low refractive-index film mainly composed of, for example, SiO_2, or of a high refractive-index film mainly composed of Fe_2O_3, or an anti-glare film of multiple layers formed by alternately forming those two films.

[0018] The non-coating region 9 of the optical film 10 is a region where an optical film solution for forming the optical film is not coated. The non-coating region 9 is set as the entire outer surface extending from a starting point S, which is set as a point spaced apart from an inner end "ie" of one sealing end portion of the heating tube 2, for example, the sealing end portion 5b by a predetermined distance 1 of, for example, 3 mm, to an outer end "Oe" located on the one sealing end portion 5b side. In this regard, it suffices that the predetermined distance 1 from the inner end "ie" to the starting point S be at least 3 mm or more, the predetermined distance 1 can be varied appropriately according to the entire length of the heating tube 2.

[0019] Fig. 1 is an enlarged side sectional view showing an upper portion, as seen in the drawing, of the heating tube 2 for explaining the step of coating the outer surface of the heating tube 2 with the optical film solution for forming the optical film 10 on the outer surface of the heating tube 2.

[0020] That is, as shown in Fig. 1, while holding the heating tube 2 substantially vertically upright so that one sealing end portion, for example, the sealing end portion 5b comes above, the heating tube 2 is dipped into the optical film solution until the level of the solution reaches the starting point S near the upper sealing end portion 5b. Subsequently, after the elapse of a required period of time, the heating tube 2 is pulled vertically upwards again from the optical film solution.

[0021] According to this process, the optical film solution is coated to a portion of the outer surface of the heating tube 2 below the starting point S and not coated to the non-coating region 9 above the starting point S at all. No optical film solution is thus coated to the portion of the predetermined distance ℓ between the starting point S and the one sealing end portion 5b, thereby making it possible to prevent or reduce liquid bank or pooling formed when the optical film solution is coated to the portion of the predetermined distance ℓ. Accordingly, the liquid dripping or uneven liquid coating due to the presence of the liquid bank can be prevented or reduced.

[0022] That is, in order to coat the optical film solution, when the heating tube 2 is erected substantially vertically so that the one sealing end portion 5b comes above, a conical portion with gradually decreasing diameter is formed in the portion from the inner end "ie" of the sealing end portion 5b to the heating portion side located downward in Fig. 1. Accordingly, when the heating tube 2 is pulled up vertically outwards after being dipped into the optical film solution, a part of the optical film solution is liable to accumulate On the outer surface of this conical portion, which will cause the liquid bank.

[0023] However, as described above, with the heating tube 2, the optical film solution is not coated to the non-coating region 9 extending from the starting point S to the outer end "Oe" of the upper sealing end portion 5b, whereby the occurrence of liquid dripping or uneven coating due to the pooling of the optical film solution can be prevented or reduced.

[0024] In this regard, in the case of a conventional halogen lamp, the uneven optical film coating can be observed through visual observation at the boundary between the one sealing end portion and the heating portion, and further, the variation range of reflectance with the optical film being a reflective film was about 10%.

[0025] In contrast, with the halogen lamp 1 according to this embodiment, no unevenness of the optical film coating was observed through visual observation at the boundary between the one sealing end portion 5b and the heating portion, and further, the variation range of reflectance was on the order of about 1 to 3% and the variation was confirmed for hardly any of the experimental products.

[0026] Therefore, according to the heating tube 2, the coating unevenness of the optical film solution can be prevented from occurring at the boundary between the one sealing end portion 5b and the heating portion on the filament 3 side. However, since the optical film 10 is not formed in the non-coating region 9, leakage of light occurs to cause a reduction in anti-glare effect.

[0027] Then, in this embodiment, the entire outer surface of the non-coating region 9 of the heating tube 2 is formed as a frosted portion 11. The frosted portion 11 is formed by subjecting the entire outer surface of the non-coating region 9 of the heating tube 2 to a frosting treatment through an etching treatment or the like to thereby form a large number of minute irregularities thereon. Further, the frosted portion 11 may be formed in an overlapping manner over a part of the optical film 10.

[0028] Therefore, according to such heating tube as descried above, the light leaking to the outside from the non-coating region 9 is scattered by the large number of minute irregularities of the frosted portion 11, thus achieving an improvement in terms of the anti-glare effect.

[0029] Further, the outer surface area of the frosted portion 11 is increased entirely by the formation of the large number of minute irregularities on the outer surface thereof, so that an improvement can be achieved in terms of the heat radiation effect of the molybdenum foil 6b of the one sealing end portion 5b.

[0030] Fig. 3 is a partially cutaway longitudinal sectional view of a halogen lamp 1A according to the second embodiment of the present invention. The characteristic feature of this halogen lamp 1A resides in that a frosted portion 11A is formed through an etching treatment or the like as indicated by the broken line in the drawing on the portion of the outer surface of the halogen lamp 1 shown in each of Figs. 1 and 2 excluding the non-coating region 9, and in that, as indicated by the chain and dot line in the drawing, an infrared ray-transmitting/visible light-blocking multilayer film 10A as an example of an optical film is formed on the frosted portion 11A. Otherwise, the halogen lamp 1A is of substantially the same construction as that of the halogen lamp 1 described above. Further, Fig. 4 is an enlarged longitudinal sectional view of the portion IV in Fig. 3 showing the frosted portion 11A formed with a large number of irregularities through the frosting treatment of the outer surface of the heating tube 2, and the infrared ray-transmitting/visible light-blocking multilayer film 10A formed on the frosted portion 11A.

[0031] Therefore, according to such halogen lamp 1A as described above, the infrared rays emitted from the filament 3 can be scattered by the frosted portion 11A of the outer surface of the heating tube 2, whereby the amount of the infrared rays emitted from the heating tube 2 can be made substantially uniform.

[0032] Further, since the infrared ray-transmitting/visible light-blocking multilayer film 10A is formed on the frosted portion 11A of the heating tube 2, the anti-glare effect can be further improved due to the light scattering effect of the frosted portion 11A and the anti-glare effect of the infrared ray-transmitting/visible light-blocking multilayer film 10A.

[0033] The following Table 1 is a comparison table concerning the anti-glare effect and wavelength transmittance between the halogen lamp A according to the second embodiment described above and a halogen lamp (non-treated product) not provided with the frosted portion 11A and the infrared ray-transmitting/visible light-blocking multilayer film 10A.

[Table 1] Comparison Table of anti-glare effect/wavelength transmittance

Wavelength (nm)	Non-treated product	Product with infrared ray-transmitting/visible light blocking multilayer film (present invention)
280 - 2500	100	100
600 - 780	6.0 or higher	1.5 or higher, 5.0 or lower

[0034] Note that the frosted portion 11A may be formed through the frosting treatment on the entire outer surface of the non-coating region 9 of the one sealing end portion 5b.

[0035] Fig. 5 is a partially cutaway longitudinal sectional view of a halogen lamp 1B according to the third embodiment

of the present invention. The characteristic feature of the halogen lamp 1A resides in that the filament 3 of the halogen lamp 1A shown in Fig. 3 is replaced by a filament 3B, which is formed by connecting a plurality of coil portions 3a together by a plurality of joining wires 3c, and in that frosted portions 11B indicated by the broken line in the drawing are selectively formed only on the portions of the outer surface of the heating tube 2 corresponding to the coil portions 3a. Otherwise, the halogen lamp 1B is of the substantially same construction as that of the halogen lamp 1A described above, and an infrared ray-transmitting/visible light-blocking multilayer film 10B indicated by the chain and dot line in the drawing is formed on substantially the entire outer surface of the heating tube 2 excluding the non-coating region 9.

[0036] With the halogen lamp 1B described above as well, the anti-glare protection can be doubly secured by each frosted portion 11B and the infrared ray-transmitting/visible light-blocking multilayer film 10B against the infrared rays emitted from each coil portion 3a of the filament 3B, thus further improving the anti-glare effect.

[0037] Further, in the halogen lamp 11B, the frosted portions 11B thereof are not formed on the substantially entire outer surface of the heating tube 2 but only on the portions of the outer surface of the heating tube 2 corresponding to the respective coil portions 3a, so that the frosting treatment can be performed easily and quickly.

Industrial Applicability

[0038] According to the present invention, the anti-glare effect of a heating tube can be improved.

Claims

1. A bulb comprising:

a heating tube having a heating portion accommodating a heat source, a pair of sealing end portions subjected to pinch sealing on both axial sides of the heating portion to provide airtight sealing, and a pair of lead wires connected to the heat source and extending outward in an airtight manner from the pair of sealing end portions;
an optical film formed by coating an optical film solution to a portion of an outer surface of the heating tube excluding a non-coating region to which the optical film solution is not coated, the non-coating region extending, from a position spaced apart by a predetermined distance toward the heating portion from an inner end of one of the pair of sealing end portions, to an outer end of the one sealing end portion; and
a frosted portion formed by performing frosting treatment on the non-coating region.

2. A bulb comprising:

a heating tube having a heating portion accommodating a heat source, a pair of sealing end portions subjected to pinch sealing on both axial sides of the heating portion to provide airtight sealing, and a pair of lead wires connected to the heat source and extending outward in an airtight manner from the pair of sealing end portions;
a frosted portion formed by performing frosting treatment on the non-coating region; and
an optical film formed on the frosted portion.

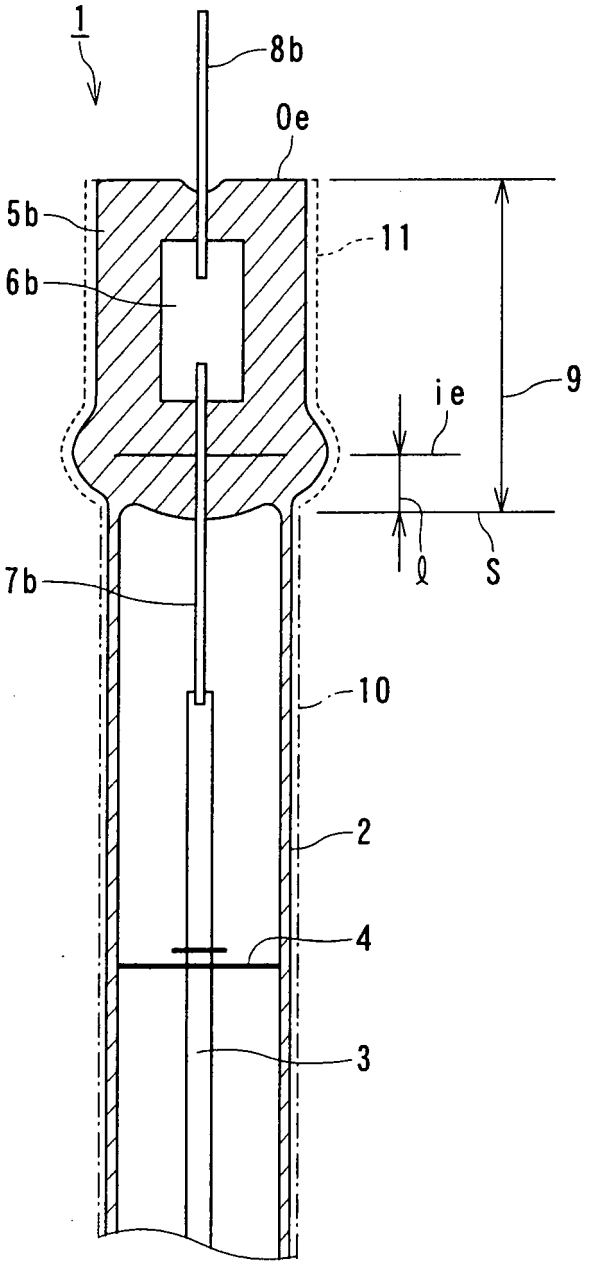

FIG. 1

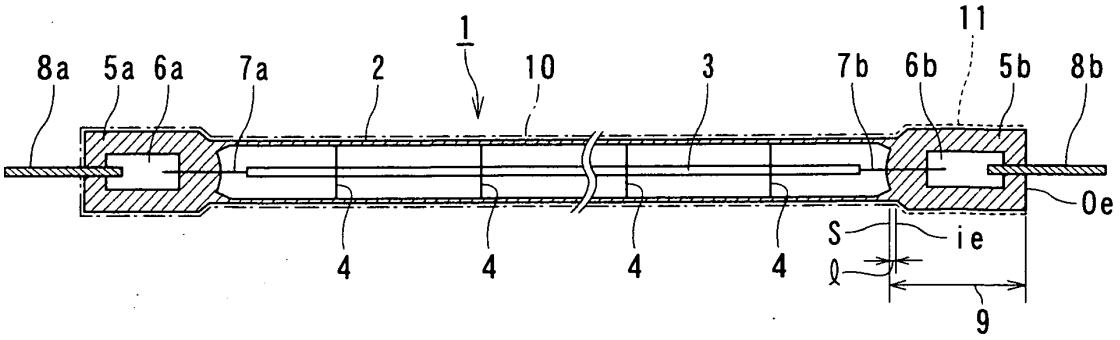
1
11
8a
5a
6a
7a
2
10
3
7b
6b
5b
8b
4
4
4
4
Oe
S
ie
ℓ
9

FIG. 2

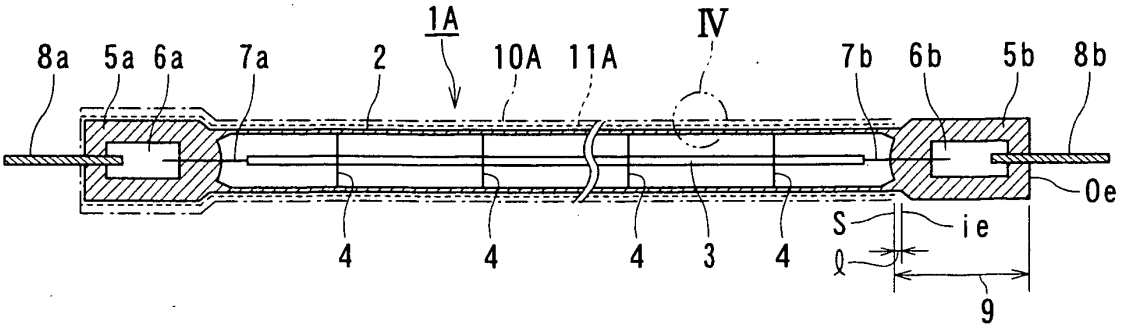
1A
IV
8a
5a
6a
7a
2
10A
11A
7b
6b
5b
8b
4
4
4
3
4
Oe
S
ie
ℓ
9

FIG. 3

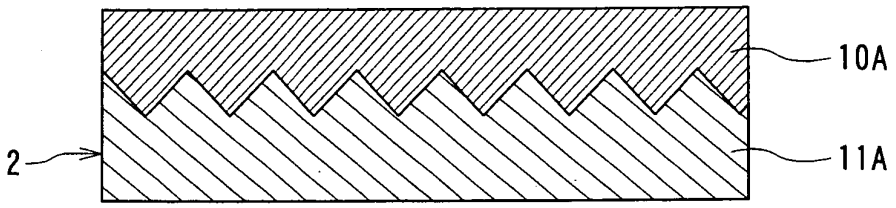
10A
2
11A

FIG. 4

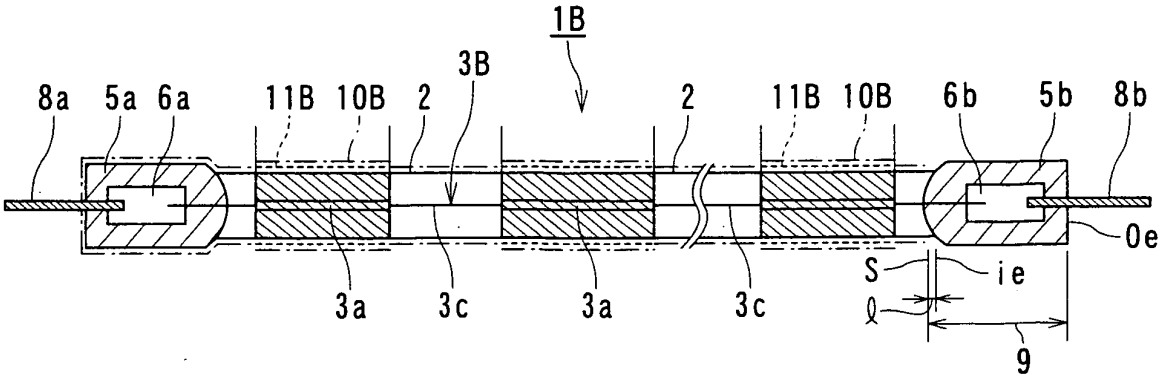
1B
3B
8a
5a
6a
11B
10B
2
2
11B
10B
6b
5b
8b
0e
3a
3c
3a
3c
S
ie
Q
9

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/014697

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] H05B3/44, H01K1/32, H01K7/00

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)
Int.Cl[7] H05B3/44, H01K1/32, H01K7/00, H05B3/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-2004	Jitsuyo Shinan Toroku Koho	1996-2004
Kokai Jitsuyo Shinan Koho	1971-2004	Toroku Jitsuyo Shinan Koho	1994-2004

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	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 27210/1993(Laid-open No. 80253/1994) (Koito Manufacturing Co., Ltd.), 08 November, 1994 (08.11.94), Full text; Figs. 1 to 4 (Family: none)	1-2
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 46693/1987(Laid-open No. 155252/1988) (Ushio Inc.), 12 October, 1988 (12.10.88), Full text; Fig. 1 (Family: none)	1-2

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 December, 2004 (20.12.04)	11 January, 2005 (11.01.05)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/014697

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y X	JP 11-86804 A (Ushio Inc.), 30 March, 1999 (30.03.99), Full text; Fig. 1 (Family: none)	1 2
Y	JP 1-319244 A (Ushio Inc.), 25 December, 1989 (25.12.89), Full text; Figs. 1 to 6 (Family: none)	1-2
Y	JP 59-221968 A (Toshiba Corp.), 13 December, 1984 (13.12.84), Full text; Figs. 1 to 2 (Family: none)	1-2

Form PCT/ISA/210 (continuation of second sheet) (January 2004)