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

(11) EP 0 389 717 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
11.09.1996 Bulletin 1996/37

(51) Int Cl.[6]: **H01J 61/35**, H01J 61/40, C03C 17/25

(21) Application number: **89312420.6**

(22) Date of filing: **29.11.1989**

(54) **Ultraviolet ray-shielding tube**

Ultraviolettstrahlenschutzrohr

Tube de protection contre les rayons ultraviolets

(84) Designated Contracting States:
DE GB NL

(30) Priority: **28.03.1989 JP 73874/89**

(43) Date of publication of application:
03.10.1990 Bulletin 1990/40

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Printed by Jouve, 75001 PARIS (FR)

Description

The present invention relates to an ultraviolet ray-shielding tube. More particularly, the present invention relates to an ultraviolet ray-shielding tube for a discharge lamp.

It is known that various types of luminescent lamps, for example, mercury lamps, metal halide vapor lamps, sodium lamps, xenon lamps and halogen lamps, have an excellent luminance and brightness, a high illumination efficiency, and a long durability, and thus are useful for illuminating buildings such as shops, and as fish-luring lamps.

Luminescent lamps irradiate strong ultraviolet rays in addition to visible rays, and due to recent increases in the luminance or brightness of the luminescent lamps, for example, halogen lamps, the ultraviolet ray-radiation therefrom can no longer be ignored. Namely, when these lamps are used to illuminate, for example, department stores, the ultraviolet rays cause a discoloration and deterioration of the goods, and when used as fish-luring lights, the ultraviolet rays burn the skin of the users and may cause skin cancer or a deterioration of the eyesight of the users. Therefore, it is necessary that some form of shielding from the ultraviolet rays emitted by luminescent lamp be provided.

Several attempts have been made to shield the ultraviolet rays, as shown in the following description:

(1) In a metal vapor luminescent lamp, a coating layer of a titanium dioxide is formed on an outside or inside surface of a tube or bulb in which a luminescent source is contained.
(2) In a xenon lamp, a tube or bulb for containing a luminescent source is made from a transparent quartz containing 10 to 300 ppm of at least one member selected from titanium dioxide and cerium oxide.

Nevertheless, in the above-mentioned ultraviolet ray-shielding tubes, titanium dioxide or cerium oxide is utilized as the ultraviolet ray-shielding material, but these compounds are disadvantageous in that they have the following properties:

(1) A high refractive index and a poor transparency, and thus the luminance of the luminescent lamp is lowered.
(2) When titanium dioxide is used in the form of fine particles, the particles absorb visible rays, and thus the luminance or brightness and color-rendering property of the lamp are lowered, due to a relatively large size of these particles.
(3) When an organic titanium compound is employed, it is difficult to form a coating layer having a large thickness, and thus the resultant coating layer exhibits an unsatisfactory ultraviolet ray-shielding property.
(4) The transparent quartz containing titanium dioxide or cerium oxide is expensive. Also there is an upper limit to the amount of titanium dioxide or cerium oxide that can be added to the quartz, and thus the ultraviolet ray-shielding property of the resultant quartz tube or bulb is still unsatisfactory.

Generally, ultraviolet ray-shielding coating materials must satisfy all of the following requirements:

(1) The coating material must be able to shield ultraviolet rays at a wave length of around 400 nm or less.
(2) The coating material must be stable for practical use over a long period.
(3) The coating material must be harmless to the human body.

The conventional ultraviolet ray-shielding agents however, cannot satisfy all of the above-mentioned requirements.

GB-A-2 184 356 discloses that zinc oxide having an average particle site from 70 to 300 µm is a UV shielding agent but that the UV shielding effect is not sufficient when particle size below 70 µm is selected.

An object of the present invention is to provide an ultraviolet ray-shielding tube for luminescent lamps, which has a high transparency to and a low scattering of visible rays, and provides, an effective shield against ultraviolet rays.

The above-mentioned object can be attained by the ultraviolet ray-shielding tube of the present invention for luminescent lamps.

The present invention provides an ultraviolet ray-shielding tube for visible ray irradiation luminescent lamps, comprising:

a transparent substrate tube for sealing a light emission source therein, and
at least one ultraviolet ray-shielding coating formed on at least one surface of the substrate tube, comprising a binder capable of transmitting visible rays therethrough, and a shielding material consisting of extremely fine zinc oxide particles having an average size of 0.1µm or less and dispersed in the binder in a mixing ratio of the zinc oxide particles to the binder of 1:10 to 10:1, said coating having a thickness of 0.5 to 50µm; with the proviso that the tube is not a tube of a lamp having a coating of thickness 4, 10, 30 or 50µm formed from a coating agent employing a hydrolysed tetraethoxysilane solution as a binder and zinc oxide grains having a grain size of 0.03µm as shielding material.

Lamps having tubes as excluded by the proviso are disclosed (but taught against) in EP-A-383,634, published after the filing date of this application.

The ultraviolet ray-shielding tube of the present invention provides an effective shield against ultraviolet rays without reducing the luminance or brightness and the color-rendering property of the luminescent lamps.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1A is a cross-sectional view of a halogen luminescent lamp to which ultraviolet ray-shielding tube of the present invention is applied;

Fig. 1B is a magnified cross-sectional view of a portion B of the ultraviolet ray-shielding tube shown in Fig. 1A;

Fig. 2 is a graph showing a relationship between a wave length and a relative intensity of light emission of rays irradiated from a halogen luminescent lamp through a conventional outer bulb;

Fig. 3 is a graph showing a relationship between a wave length and a relative intensity of light emission of the rays irradiated from a halogen luminescent lamp through an ultraviolet ray-shielding tube of the present invention;

Fig. 4A is a cross-sectional view of a mercury luminescent lamp provided with an ultraviolet ray-shielding outer tube according to the present invention;

Fig. 4B is a magnified cross-sectional view of a portion B of the ultraviolet ray-shielding tube shown in Fig. 4B;

Fig. 5 is a graph showing a relationship between a wave length and a relative intensity of light emission of the rays irradiated from a conventional mercury luminescent lamp;

Fig. 6 is a graph showing a relationship between a wave length and a relative intensity of light emission of the rays irradiated through an ultraviolet ray-shielding tube of the present invention when applied to a mercury luminescent lamp;

Fig. 7A is a cross-sectional view of another mercury luminescent lamp provided with an ultraviolet ray-shielding inner tube according to the present invention;

Fig. 7B is a magnified cross-sectional view of a portion B of the ultraviolet ray-shielding inner tube shown in Fig. 7A; and,

Fig. 8 is a graph showing a relationship between a wave length and a relative intensity of light emission of rays irradiated through an ultraviolet ray-shielding tube of the present invention applied to a mercury luminescent lamp, as shown in Fig. 7A and 7B.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The ultraviolet ray-shielding agent which may be used in the present invention to prepare tubes for luminescent lamps, comprises a binder capable of transmitting visible rays therethrough and extremely fine zinc oxide (ZnO) particles having an average size of 0.1 μm or less, and dispersed in the binder. The mixing ratio of the zinc oxide particles to the binder is from 1:10 to 10:1.

The upper end wave length in the ultraviolet ray-absorption of zinc oxide is about 380 nm; which is very close to 400 nm, an upper end of the ultraviolet ray band.

The conventional zinc oxide particle having a size of more than 0.1 μm exhibit high visible ray-scattering and shielding properties and thus appear white, and therefore, the conventional zinc oxide particles are used as a white pigment. But when used as a coating material for a luminescent lamp, the conventional zinc oxide particles reduce the luminance and color-rendering property of the luminescent lamp, and thus the conventional zinc oxide particles are useless as a visible ray-transmitting coating material.

The extremely fine zinc oxide particles used in the present invention having a size of 0.1 μm or less have a very sharp end in the ultraviolet ray absorption located at a wave length close to 400 nm and can transmit and scatter the visible rays, and therefore, are very suitable as a coating material capable of transmitting and scattering the visible rays and selectively shielding the ultraviolet rays.

In the ultraviolet ray-shielding coating used in the present invention, the extremely fine zinc oxide particles having an average size of 0.1 μm or less are evenly dispersed, preferably in the binder, in a mixing ratio of the zinc oxide particle to the binder, of 1:10 to 10:1, preferably 2:1 to 1:2.

When the mixing ratio is lower than 1/10, the resultant ultraviolet ray-shielding agent exhibits an unsatisfactory ultraviolet ray-shielding effect. Also, a mixing ratio of higher than 10/1 causes the resultant ultraviolet ray-shielding agent layer to exhibit an unsatisfactory mechanical strength.

The binder usable for the present invention must be capable of forming a solid film having a high transparency for visible rays, a satisfactory heat resistance and durability, provide a satisfactory dispersion of the extremely fine zinc dioxide particles therein, and firmly adhere to a substrate tube or bulb for containing an emission source.

Also, the binder should have a thermal expansion coefficient similar to that of the substrate tube.

The binder usable for the present invention preferably comprises at least one member selected from the group-consisting of colloidal silica, polysiloxanes, polyborosiloxanes, polycarbosilanes, and polyphosphazenes.

The colloidal silica is preferably selected from aqueous silica sol and a hydrolysis product of a silicon alkoxide. The polysiloxane can be selected from conventional polysiloxane resins.

The binder may contain specific metal ions or boron to adjust the thermal expansion coefficient of the resultant ultraviolet ray-shielding coating layer to the same level as that of the substrate tube of the luminescent lamp.

The extremely fine zinc oxide particles can be evenly mixed with and dispersed in the binder, together with a solvent for the binder, by using one or more conventional mixing and dispersing devices, for example, a ball mill, sand mill, atomizer, roll mill, homogenizer, and paint shaker.

The ultraviolet ray-shielding tube of the present invention for visible ray-irradiation luminescent lamps comprises a transparent substrate tube for sealing a light emission source therein, and at least one ultraviolet ray-shielding coating layer formed on at least one surface of the substrate tube. The coating layer comprises the ultraviolet ray-shielding agent as mentioned above, and has a thickness of 0.5 to 50 µm, preferably, 3 to 30 µm.

When the thickness is less than 0.5 µm, the resultant coating layer exhibits an unsatisfactory ultraviolet ray-shielding effect. Also, when the thickness is more than 50 µm, the resultant coating layer reduces the luminance and color-rendering property of the tube.

The transparent substrate tube is usually formed of a glass, for example, a quartz glass.

The substrate tube to be coated with the ultraviolet ray-shielding agent may be an outer bulb of a luminescent lamp or an inner tube for sealing a light emission source of a luminescent lamp.

There is no specific restriction on the type of luminescent lamps to which the ultraviolet ray-shielding tube of the present invention can be applied, but usually the luminescent lamp is selected from the group consisting of mercury vapor lamps, metal halide vapor lamps, sodium lamps, xenon lamps, and halogen lamps. For example, the ultraviolet ray shielding coating layer is formed, in a xenon lamp or halogen lamp, on either one or both of the outside and inside surfaces of the outer bulb, and in a mercury vapor lamp, metal halide vapor lamp or sodium lamp, on either one or both of the outside and inside surfaces of an outer bulb or on the outside surface of an inner bulb.

Referring to Figures 1A and 1B, a halogen lamp has a outer bulb 1 made from a quartz glass and a light emission source 2 (tungsten filaments), and an ultraviolet ray-shielding coating 3 is formed on an outside surface of the outer bulb 1; i.e., the coating layer 3 is exposed to the ambient air atmosphere.

Referring to Figs. 4A and 4B, a mercury vapor lamp has an outer bulb 1, main electrodes 4, supplementary electrodes 4, a light-emission inner tube 6, conductive supporting rods 7, an initiating resistance element 9, and an ultraviolet ray-shielding coating 3 is formed on the outside surface of the outer tube 1; i.e., the coating layer 3 is exposed to the ambient air atmosphere.

Referring to Figs. 7A and 7B, an ultraviolet ray-shielding coating 3 is formed on the outside surface of the light-emission inner tube 6. The coating 3 is exposed to the gas atmosphere contained in the outer bulb 1.

The ultraviolet ray-shielding coating can be formed by applying a coating liquid containing the ultraviolet ray-shielding agent of the present invention on a surface of an outer or inner bulb of the luminescent lamp, by a dipping method, spraying method, flow coating method, or brushing method, and solidifying the coated liquid by drying.

EXAMPLES

The present invention will be further explained in the following specific examples, which are representative and do not restrict the scope of the present invention.

Example 1

A mixture of 100 parts by weight of tetraethoxy silane, 300 parts by weight of isopropyl alcohol, and 35 parts by weight of a 0.1N hydrochloric acid aqueous solution was stirred at a temperature of 60° for 2 hours to prepare an aqueous silica colloid dispersion. The resultant aqueous silica colloid dispersion was mixed with 30 parts by weight of zinc oxide particles having a size of from 0.005 µm to 0.02 µm and an average size of 0.01 µm, and the mixture was dispersed in a sand mill for 2 hours to provide a coating liquid. This coating liquid contained extremely fine particles of zinc oxide and silica, 99% by weight of which have a size of 0.1 µm or less.

A quartz outer bulb for a 100 W halogen luminescent lamp was immersed in the coating liquid and taken up at a constant speed to form a liquid coating having an even thickness on the outside surface of the bulb and the liquid coating was dried at a temperature of 150°C for 15 minutes, to provide a transparent coating having a thickness of 1.5 µm.

When a non-coated outer bulb was used, the resultant conventional halogen luminescent lamp had the relationship between a wave length and a relative intensity of emission of irradiated rays through the non-coated outer bulb, as shown in Fig. 2. In Fig. 2, the rays irradiated through the non-coated outer bulb contain a specific intensity of ultraviolet rays having a wave length of 400 nm or less. The conventional lamp exhibited an intensity of illumination and a quantity of ultraviolet ray irradiation as shown in Table 1.

Figure 3 shows a relationship between a wave length and a relative intensity of emission of rays irradiated from the halogen luminescent lamp through the outer bulb coated with the ultraviolet ray-shielding agent. In a comparison of Fig. 3 with Fig. 2, it is clear that the coating formed on the outer bulb surface shielded only the ultraviolet rays, without shielding the visible rays.

The halogen luminescent lamp having the coated outer bulb exhibited the intensities of illumination and quantities of ultraviolet ray irradiation at the initial stage of the lighting operation and at 1000 hours after the start of the lighting operation, as indicated in Table 1.

Example 2

The same coating liquid as mentioned in Example 1 was applied to an outside surface of a quartz outer bulb of a 1000 W mercury vapor luminescent lamp by a flow-coating method and the resultant liquid coating was dried at a temperature of 150°C for 15 minutes.

The above-mentioned procedures were repeated twice to provide a transparent coating having a thickness of 2.5 µm.

Before the application of the coating liquid, the non-coated outer bulb exhibited a spectral transmittance performance as indicated in Fig. 5. Figure 5 shows that the non-coated outer bulb allowed the transmission of ultraviolet rays having a wave length of about 400 nm or less therethrough.

The conventional mercury vapor luminescent lamp having the non-coated outer bulb exhibited the intensity of illumination and quantity of ultraviolet ray irradiation as shown in Table 1.

After coating with the coating liquid containing the ultraviolet ray-shielding agent of the present invention, the resultant coated outer bulb did not allow a transmission of the ultraviolet rays therethrough, as indicated in Fig. 6. Also, from a comparison of Fig. 6 with Fig. 5, it is clear that the coated outer bulb did not shield the visible rays.

The mercury vapor luminescent lamp having the coated outer bulb exhibited the intensities of illumination and quantities of ultraviolet ray irradiation at the initial stage of the lighting operation, and at 1000 hours after the start of the lighting operation, as indicated in Table 1.

Example 3

A light-emission inner bulb made from a quartz glass was immersed in the same coating liquid as described in Example 1 and taken up at a constant speed and the resultant coating formed on the outer surface of the inner bulb was dried at a temperature of 500°C for 30 minutes. The above-mentioned procedures were repeated twice, and the resultant transparent coating had a thickness of 2.0 µm.

The coated inner bulb was inserted into an outer bulb made from a boron-silicic acid glass to provide a 1000 W mercury vapor luminescent lamp as shown in Figs. 7A and 7B.

The resultant mercury vapor luminescent lamp exhibited a spectral transmittance performance as indicated in Fig. 8. Figure 8 clearly shows that the ultraviolet rays having a wave length of about 400 nm or less are shielded by the coated inner bulb.

A comparative conventional mercury vapor luminescent lamp having a non-coated inner bulb exhibited intensity of illumination and quantity of ultraviolet ray irradiation as shown in Table 1.

Also, the mercury vapor luminescent lamp having the coated inner bulb exhibited the intensities of illumination and quantities of ultraviolet ray irradiation at the initial stage of the lighting operation, and at 1000 hours after the start of the lighting operation, as indicated in Table 1.

Comparative Example 1

The same procedures as those described in Example 1 were carried out except that the zinc oxide particles were replaced by titanium oxide particles having a size of from 0.05 to 0.1 µm and an average size of 0.08 µm.

The properties of the comparative lamp having the non-coated bulb and another comparative lamp having the coated bulb are shown in Table 1.

Table 1

Item	Example No.		Example 1	2	3	Comparative Example 1
Type of bulb	Property					
Non-coated	Intensity of illumination (lx)			7,880	7,800	7,800
	Quantity of ultraviolet ray irradiation (mW/m^2)		1.00	1.02	1.02	1.02
Coated	Intensity of illumination (lx)	Initial stage	14,490	8,060	8,260	6,700
		1000 hr after	14,000	7,900	8,100	6,430
	Quantity of ultraviolet ray irradiation (mW/m^2)	Initial stage	0	0	0	0
		1000 hr after	0	0	0	0

Note: The intensity of illumination and quantity of ultraviolet ray irradiation were measured at a point 10 cm from the center of the luminescent lamp in Example 1, and 60 cm from the center of the luminescent lamp in Examples 2 and 3 and Comparative Example 1.

Table 1 clearly shows that, in each of Examples 1 to 3, the resultant ultraviolet ray shielding layer of the present invention did not reduce the intensity of illumination of the luminescent lamp but caused an increase thereof, and had a high durability over a long period of time.

In Comparative example 1, however, the zinc oxide particles having an average size of more than 0.1 µm caused the resultant luminescent lamp to exhibit a reduced intensity of illumination.

Claims

Claims for the following Contracting States : GB, DE

1. An ultraviolet ray-shielding tube for visible ray irradiation luminescent lamps, comprising:

   a transparent substrate tube for sealing a light emission source therein, and
   at least one ultraviolet ray-shielding coating formed on at least one surface of the substrate tube, comprising a binder capable of transmitting visible rays therethrough; and a shielding material consisting of extremely fine zinc oxide particles having an average size of 0,1µm or less and dispersed in the binder in a mixing ratio of the zinc oxide particles to the binder of 1:10 to 10:1, said coating having a thickness of 0.5 to 50µm; with the proviso that the tube is not a tube of a lamp having a coating of thickness 4, 10, 30 or 50µm formed from a coating agent employing a hydrolysed tetraethoxysilane solution as a binder and zinc oxide grains having a grain size 0.03µm as shielding material.

2. The ultraviolet ray-shielding tube as claimed in claim 1, wherein the transparent substrate tube comprises glass.

3. The ultraviolet ray-shielding tube as claimed in claim 1 or 2 wherein said tube is an outer bulb of a luminescent lamp.

4. The ultraviolet ray-shielding tube as claimed in claim 1 or 2 which is an inner tube for sealing a light-emission source of a luminescent lamp.

5. The ultraviolet ray-shielding tube as claimed in claim 3 or 4, wherein the luminescent lamp is selected from mercury vapor lamps, metal halide vapor lamps, sodium lamps xenon lamps, and halogen lamps.

6. The ultraviolet ray-shielding tube as claimed in any of claims 1-5 wherein the binder comprises at least one member selected from colloidal silica, polysiloxanes, polyborosiloxanes, polycarbosilane and polyphosphazenes.

7. A visible ray irradiation luminescent lamp including a ray-shielding tube according to any preceding claim.

Claims for the following Contracting State : NL

1. An ultraviolet ray-shielding tube for visible ray irradiation luminescent lamps, comprising:

   a transparent substrate tube for sealing a light emission source therein, and
   at least one ultraviolet ray-shielding coating formed on at least one surface of the substrate tube, characterised in that said coating comprises a binder capable of transmitting visible rays therethrough; and a shielding material comprising extremely fine zinc oxide particles having an average size of 0.1µm or less and dispersed in the binder in a mixing ratio of the zinc oxide particles to the binder of 1:10 to 10:1, said coating having a thickness of 0.5 to 50µm.

2. The ultraviolet ray-shielding tube as claimed in claim 1, wherein the transparent substrate tube comprises glass.

3. The ultraviolet ray-shielding tube as claimed in claim 1 or 2 wherein said tube is an outer bulb of a luminescent lamp.

4. The ultraviolet ray-shielding tube as claimed in claim 1 or 2 which is an inner tube for sealing a light-emission source of a luminescent lamp.

5. The ultraviolet ray-shielding tube as claimed in claim 3 or 4, wherein the luminescent lamp is selected from mercury vapor lamps, metal halide vapor lamps, sodium lamps xenon lamps, and halogen lamps.

6. The ultraviolet ray-shielding tube as claimed in any of claims 1-5 wherein the binder comprises at least one member selected from colloidal silica, polysiloxanes, polyborosiloxanes, polycarbosilane and polyphosphazenes.

7. A visible ray irradiation luminescent lamp including a ray-shielding tube according to any preceding claim.

Patentansprüche

Patentansprüche für folgende Vertragsstaaten : DE, GB

1. Ultraviolettstrahlenabschirmröhre für sichtbare Strahlen bzw. Strahlung abstrahlende Leuchtstofflampen, umfassend:

   eine transparente Substrat-Röhre zum (dichten) Einschließen einer Lichtemissionsquelle darin, (und) mindestens einen auf mindestens einer Oberfläche der Substrat-Röhre geformten Ultraviolettstrahlenabschirmüberzug, bestehend aus einem Bindemittel, das sichtbare Strahlen durchzulassen vermag, und einem Abschirmmaterial aus äußerst feinen Zinkoxidteilchen einer durchschnittlichen Größe von 0,1 µm oder weniger, welche (Teilchen) im Bindemittel in einem Mischungsverhältnis von Zinkoxidteilchen zu Bindemittel von 1 : 10 bis 10 : 1 dispergiert sind, wobei der Überzug eine Dicke von 0,5 - 50 µm aufweist; mit dem Vorbehalt, daß die Röhre nicht eine Röhre einer Lampe mit einem eine Dicke von 4, 10, 30 oder 50 µm besitzenden Überzug ist, der aus einem Beschichtungsmittel unter Verwendung einer hydrolysierten Tetraethoxysilanlösung als Bindemittel und Zinkoxidkörnchen einer Korngröße von 0,03 µm als Abschirmmaterial geformt ist.

2. Ultraviolettstrahlenabschirmröhre nach Anspruch 1, wobei die transparente Substrat-Röhre aus Glas besteht.

3. Ultraviolettstrahlenabschirmröhre nach Anspruch 1 oder 2, wobei die Röhre ein äußerer Kolben (bulb) einer Leuchtstofflampe ist.

4. Ultraviolettstrahlenabschirmröhre nach Anspruch 1 oder 2, die eine innere Röhre zum (dichten) Einschließen einer Lichtemissionsquelle einer Leuchtstofflampe ist.

5. Ultraviolettstrahlenabschirmröhre nach Anspruch 3 oder 4, wobei die Leuchtstofflampe aus Quecksilberdampf-, Metallhalogeniddampf-, Natrium-, Xenon- und Halogenlampen ausgewählt ist.

6. Ultraviolettstrahlenabschirmröhre nach einem der Ansprüche 1 bis 5, wobei das Bindemittel aus mindestens einem Element oder Stoff, ausgewählt aus kolloidalem Siliziumdioxid, Polysiloxanen, Polyborsiloxanen, Polycarbosiloxan und Polyphosphazenen, besteht.

7. Sichtbaren Strahlen abstrahlende Leuchtstofflampe mit einer Strahlenabschirmröhre nach einem der vorangehenden Ansprüche.

Patentansprüche für folgenden Vertragsstaat : NL

1. Ultraviolettstrahlenabschirmröhre für sichtbare Strahlen bzw. Strahlung abstrahlende Leuchtstofflampen, umfassend:

   eine transparente Substrat-Röhre zum (dichten) Einschließen einer Lichtemissionsquelle darin, (und) mindestens einen auf mindestens einer Oberfläche der Substrat-Röhre geformten Ultraviolettstrahlenabschirmüberzug, dadurch gekennzeichnet, daß der Überzug aus einem Bindemittel, das sichtbare Strahlen durchzulassen vermag, und einem Abschirmmaterial aus äußerst feinen Zinkoxidteilchen einer durchschnittlichen Größe von 0,1 µm oder weniger besteht, welche (Teilchen) im Bindemittel in einem Mischungsverhältnis von Zinkoxidteilchen zu Bindemittel von 1 : 10 bis 10 : 1 dispergiert sind, und der Überzug eine Dicke von 0,5 - 50 µm aufweist.

2. Ultraviolettstrahlenabschirmröhre nach Anspruch 1, wobei die transparente Substrat-Röhre aus Glas besteht.

3. Ultraviolettstrahlenabschirmröhre nach Anspruch 1 oder 2, wobei die Röhre ein äußerer Kolben (bulb) einer Leuchtstofflampe ist.

4. Ultraviolettstrahlenabschirmröhre nach Anspruch 1 oder 2, die eine innere Röhre zum (dichten) Einschließen einer Lichtemissionsquelle einer Leuchtstofflampe ist.

5. Ultraviolettstrahlenabschirmröhre nach Anspruch 3 oder 4, wobei die Leuchtstofflampe aus Quecksilberdampf-, Metallhalogeniddampf-, Natrium-, Xenon- und Halogenlampen ausgewählt ist.

6. Ultraviolettstrahlenabschirmröhre nach einem der Ansprüche 1 bis 5, wobei das Bindemittel aus mindestens einem Element oder Stoff, ausgewählt aus kolloidalem Siliziumdioxid, Polysiloxanen, Polyborsiloxanen, Polycarbosiloxan und Polyphosphazenen, besteht.

7. Sichtbaren Strahlen abstrahlende Leuchtstofflampe mit einer Strahlenabschirmröhre nach einem der vorangehenden Ansprüche.

Revendications

Revendications pour les Etats contractants suivants: GB, DE

1. Tube de protection contre les rayons ultra-violets pour lampes à luminescence à irradiation de rayons visibles comprenant :

   un tube formant substrat transparent pour y sceller une source d'émission de lumière, et
   au moins un revêtement protégeant contre les rayons ultra-violets formé sur au moins une surface du tube formant substrat, comprenant un liant capable de transmettre les rayons visibles à travers lui ; et un matériau de protection consistant en particules extrêmement fines d'oxyde de zinc ayant une grandeur moyenne de 0,1µm ou moins et dispersées dans le liant à un rapport de mélange des particules d'oxyde de zinc au liant de 1:10 à 10:1, ledit revêtement ayant une épaisseur de 0,5 à 50µm ; à condition que le tube ne soit pas un tube d'une lampa ayant un revêtement d'une épaisseur de 4, 10, 30 ou 50µm formé à partir d'un agent de revêtement employant une solution de tétraéthoxysilane hydrolysée en tant que liant et des grains d'oxyde de zinc ayant une grandeur du grain de 0,03µm en tant que matériau de protection.

2. Tube de protection contre les rayons ultra-violets selon la revendication 1 où le tube formant substrat transparent comprend du verre.

3. Tube de protection contre les rayons ultra-violets selon la revendication 1 ou 2 où ledit tube est une ampoule externe d'une lampe à luminescence.

4. Tube de protection contre les rayons ultra-violets selon la revendication 1 ou 2 qui est un tube interne pour sceller une source d'émission de lumière d'une lampe à luminescence.

5. Tube de protection contre les rayons ultra-violets selon la revendication 3 ou 4 où la lampe à luminescence est sélectionnée parmi les lampes à vapeur de mercure, les lampes à vapeur d'halogène métallique et les lampes à sodium, les lampes au xénon et les lampes à halogène.

6. Tube de protection contre les rayons ultra-violets selon l'une quelconque des revendications 1-5 où le liant comprend au moins un élément choisi parmi la silice colloïdale, des polysiloxanes, des polyborosiloxanes, du polycarbosilane et des polyphosphazènes.

7. Lampe luminescente à irradiation de rayons visibles comprenant un tube de protection contre les rayons selon toute revendication précédente.

Revendications pour l'Etat contractant suivant : NL

1. Tube de protection contre les rayons ultra-violets pour des lampes à luminescence à irradiation de rayons visibles comprenant :

un tube formant substrat transparent pour y sceller une source d'émission de lumière, et
au moins un revêtement de protection contre les rayons ultra-violets formé sur au moins une surface du tube formant substrat, caractérisé en ce que ledit revêtement comprend un liant capable de transmettre des rayons visibles à travers lui et un matériau de protection comprenant des particules extrêmement fines d'oxyde de zinc ayant une grandeur moyenne de 0,1µm ou moins et dispersées dans le liant à un rapport de mélange des particules d'oxyde de zinc au liant de 1:10 à 10:1, ledit revêtement ayant une épaisseur de 0,5 à 50µm.

2. Tube de protection contre les rayons ultra-violets selon la revendication 1 où le tube formant substrat transparent se compose de verre.

3. Tube de protection contre les rayons ultra-violets selon la revendication 1 ou 2 où ledit tube est une ampoule externe d'une lampe à luminescence.

4. Tube de protection contre les rayons ultra-violets selon la revendication 1 ou 2 qui est un tube interne pour sceller une source d'émission de lumière d'une lampe à luminescence.

5. Tube de protection contre les rayons ultra-violets selon la revendication 3 ou 4 où la lampe à luminescence est sélectionnée parmi des lampes à vapeur de mercure, des lampes à vapeur d'halogène métallique, des lampes à sodium, des lampes au xénon et des lampes à halogène.

6. Tube de protection contre les rayons ultra-violets selon l'une quelconque des revendications 1-5 où le liant comprend au moins un élément choisi parmi des silices colloïdales, des polysiloxanes, des polyborosiloxanes, du polycarbosilane et des polyphosphazènes.

7. Lampe à luminescence à irradiation de rayons visibles comprenant un tube de protection contre les rayons ultra-violets selon l'une quelconque des revendications précédentes.

Fig.1A

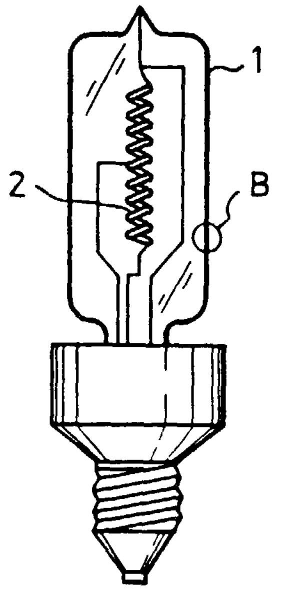

Fig.1B

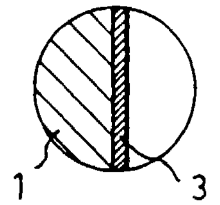

Fig. 2
(PRIOR ART)

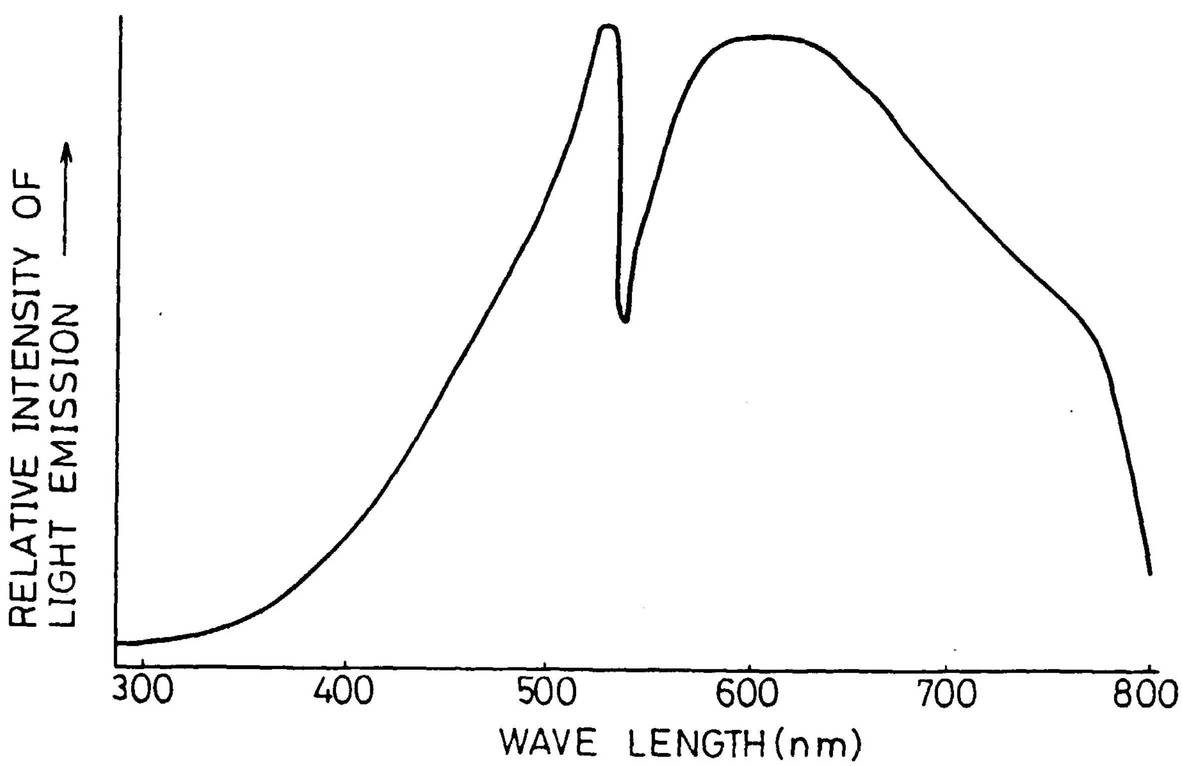

Fig.3

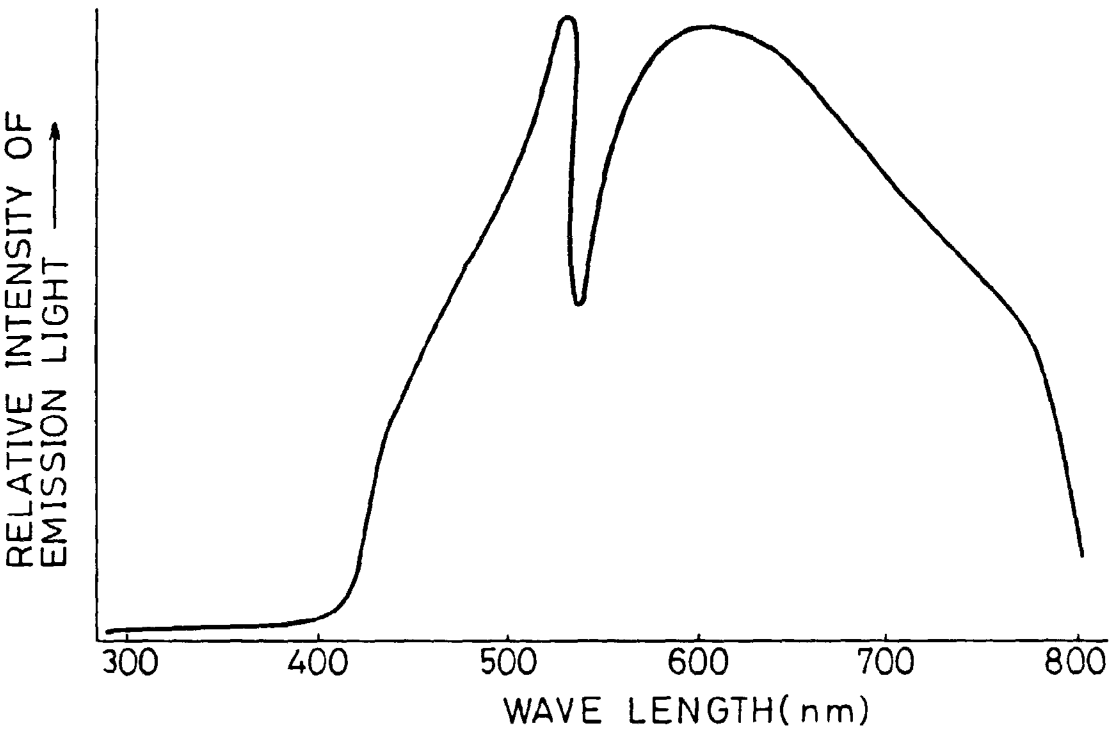

Fig.4A

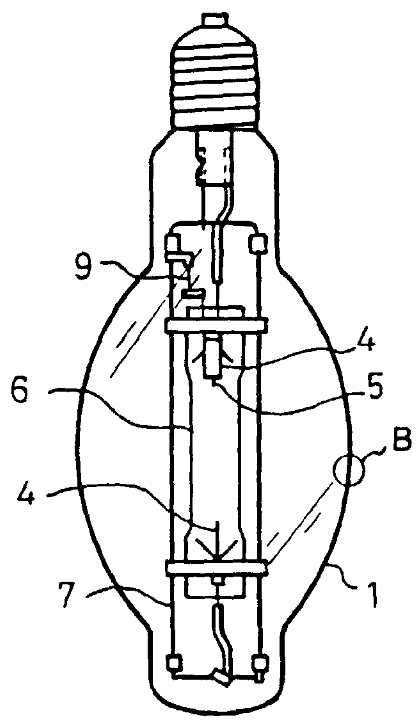

Fig.4B

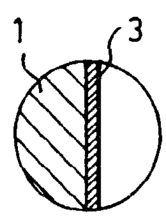

Fig. 5
(PRIOR ART)

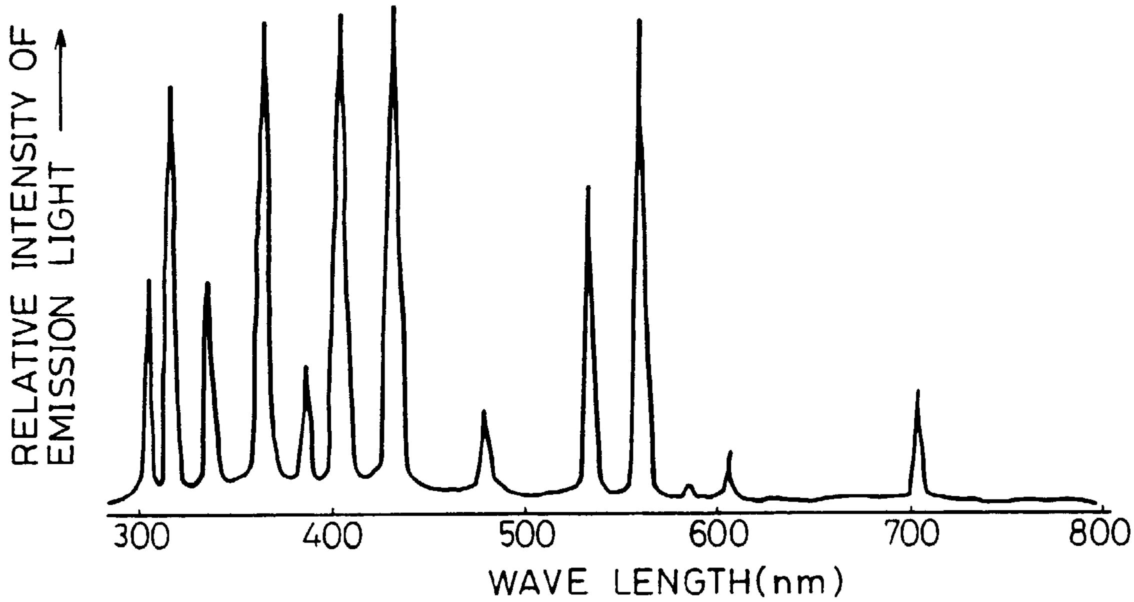

Fig. 6

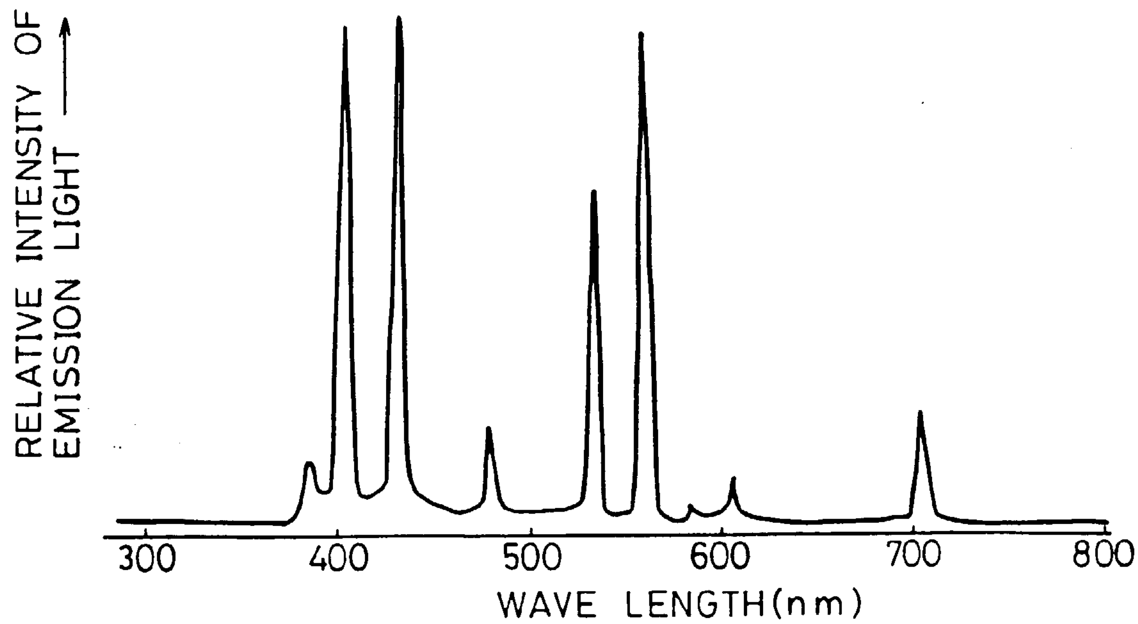

Fig. 7A

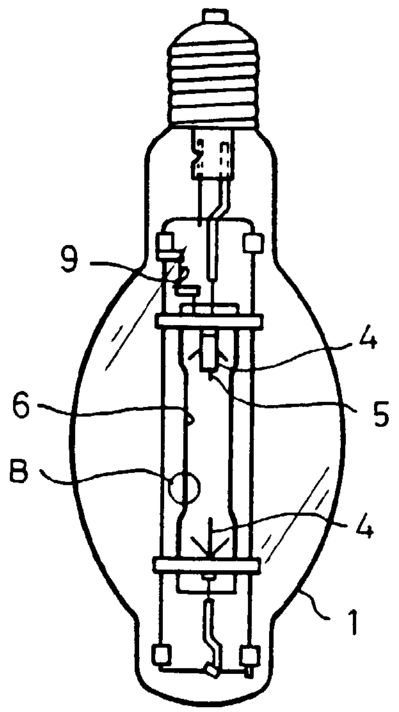

Fig. 7B

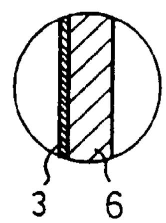

Fig. 8