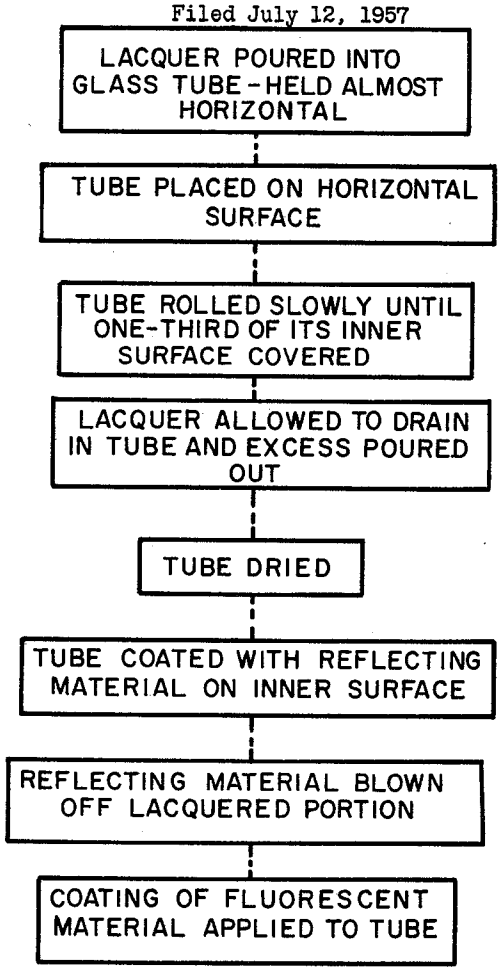
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ELECTRIC LAMPS EMBODYING REFLECTORS

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# ELECTRIC LAMPS EMBODYING REFLECTORS

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The present invention relates to electric lamps embodying reflectors.

One example of such lamps is a fluorescent electric discharge lamp in which a cylindrical glass tube is coated internally over a part of its circumference with a material which is a good reflector of ultra-violet and/or visible light, and a layer of fluorescent material is applied to the interior of the tube over the reflecting material, the fluorescent material extending over both the reflecting material and the inner surface of the tube not covered by the reflecting material. The visible light is then emitted mainly in a preferred direction, namely through the part of the tube not coated with the reflecting material.

The nature of the reflecting layer is such that it provides a good reflecting surface for light radiation but is stable in the discharge tube and does not interact with the fluorescent material or the glass either during the process of lamp manufacture or during the life of the lamp. For these reasons and those of economy, suitable reflecting surfaces are provided by white inert powders, for example magnesium oxide, titanium dioxide, or silica. Moreover, such powders have the advantage over a metallic reflecting surface, such for example as silver, that they can be applied to the glass tube in the form of a paint-like suspension of the finely-divided powder in a liquid medium. The liquid is allowed to dry and the tube baked in order to remove any organic matter and to cause the powder to adhere to the glass. The tube is then coated with fluorescent material in the normal way, that is by coating with the fluorescent powder in liquid suspension, drying and baking, or by electrostatic deposition of the fluorescent powder.

In one known method of providing the reflecting surface, a suspension of the finely-divided reflecting material in a liquid medium is prepared in such a manner that it has a paint-like consistency. The whole inner surface of the glass tube is coated with the suspension, and the tube is dried. About a third of this coating is then removed, either before or after baking of the tube, by inserting suitable scrapers or brushes into the tube. The complete removal of a well-defined portion of the reflecting coating by this method is difficult and becomes increasingly difficult as the length of the tube increases and with small diameter tubing.

In another known method, a suspension of the finely-divided reflecting material in a liquid medium is prepared in such a manner that it has a paint-like consistency. A small quantity of this suspension is so introduced into the tube to be coated that it flows down one side only. The tube is then placed on a horizontal surface and carefully rolled through about 230° so that the reflecting coating is applied to only that portion of the tube where it is required. The excess of suspension is removed and the tube is dried and baked. This method has the advantages over the other known method referred to, that there is no reflecting material to be scraped off the inner surface of the tube and that the extreme edges of the reflecting coating are parallel throughout their length with the long axis of the tube. However, this method suffers from the major disadvantage that it is very difficult to obtain a uniform density of the reflecting coating; there is, for example, a great tendency for the deposit of the coating to be thicker at the centre of the coated strip than at the edges.



The present invention has for its principal object to provide a method which does not suffer from the disadvantages of the known methods referred to and which, in addition, has the advantages that it can be used equally easily whatever the length or diameter of the tube and that it lends itself more readily to mechanised production methods.

The drawing illustrates the process of the present invention.

According to the present invention, a method of providing a light-reflecting coating over a part of the interior surface of an electric lamp envelope comprises the steps of applying a coating of a suitable lacquer or resin to that part of the interior surface which is not to be provided with a reflecting coating, and, when the lacquer or resin coating is dry, applying to the interior surface a suspension of finely-divided reflecting material in a liquid medium which does not dissolve or react chemically with the said lacquer or resin, baking the tube, and removing the reflecting material from that portion of the interior surface previously coated with the lacquer or resin, but not from the remainder of the interior surface, for example by blowing with compressed air. A "suitable" lacquer or resin is one which, when coated with the reflecting material, renders this material non-adherent after baking. Examples of suitable materials for the lacquer or resin coating are solutions of ethyl cellulose in xylene, nitro-cellulose in butyl acetate, and resins of the polymerised methacrylate type in ethyl acetate. Many other organic lacquers which are fluid, easily wet glass, and form a continuous film when the solvent has evaporated are suitable. The lacquer or resin preferably, but not necessarily, contains a small amount of a silicone material.

The suspending medium for the finely-divided reflecting material may be water, and the suspension may be thickened to a paint-like consistency by means of ammonium alginate, methyl cellulose or some other water soluble thickening agent which after drying forms a stable film which can subsequently be completely removed by baking to a temperature below the softening point of glass.

One example of the invention as applied to the manufacture of a fluorescent tube will be given:

*Lacquer Solution*

1 gram of ethyl cellulose and 0.5 ml. of silicone fluid MS1107, which is di-methyl di-chloro silane supplied by Messrs. Hopkin and Williams as a 2% solution in ethyl methyl ketone, are dissolved in 100 mls. of xylene.

*Suspension of Reflecting Material*

150 grams of titanium dioxide are ground in a ball mill with 250 mls. of distilled water and then mixed with 165 mls. of a 2% aqueous solution of a propylene glycol alginate sold under the registered trademark "Manucol Ester." After straining, the suspension is ready for use.

*Method*

A small quantity of the ethyl cellulose lacquer solution is poured into a cylindrical glass tube which is held almost horizontally. The tube is placed on a horizontal surface and kept stationary until the lacquer level is horizontal along the whole length of the tube. If necessary bungs are inserted in the ends of the tube to retain the lacquer. The tube is then slowly rolled until about one third of the inner surface has been covered by the lacquer. The lacquer is allowed to drain back into the centre of the lacquered strip and the excess is then poured out. The tube is dried.

The reflecting material suspension is now used to coat the inner wall of the tube by one of the conventional techniques such as pouring, spraying or welling up, as used in the manufacture of fluorescent lamps. The coated tube is dried and then baked to about 500–550° C. in order to remove the organic matter. When cool, much of the titanium dioxide coated on to the previously-lacquered portion of the tube falls off, and any which does not is simply removed by blowing with compressed air. The titanium dioxide coating on the other part of the tube adheres too firmly to be removed by this compressed air blow. The whole tube is now coated with fluorescent material and made into a fluorescent lamp in the same manner as with tubes which contain no reflecting surface.

Other silicone materials than that referred to may be used.

The invention can be applied to fluorescent lamps coated with different phosphors along its length, and also to incandescent lamps.

We claim:

1. In the manufacture of an electric lamp, a method of providing a light-reflecting coating over a part of the interior surface of the lamp envelope comprising the steps of applying a coating of a suitable resin to that part of the interior surface which is not to be provided with a reflecting coating, applying to the interior surface a suspension of finely-divided, white, powdered refractory reflecting material in a liquid medium which does not dissolve or react chemically with the said resin, baking the tube to remove the resin, and removing the reflecting material from that portion of the interior surface previously coated with the resin, but not from the remainder of the interior surface.



2. A method according to claim 1, wherein the removal of the reflecting material from that portion of the interior surface previously coated with the resin is effected by blowing with compressed air.

3. A method according to claim 1, wherein the resin contains a small amount of a silicone material.

4. A method according to claim 1 wherein the said liquid medium is water and wherein the said suspension is thickened to a paint-like consistency by means of a water soluble thickening agent.

5. A method according to claim 1, wherein the lamp is a fluorescent lamp, and comprising the further and subsequent step of coating the interior surface of the envelope with fluorescent material.

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