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ELECTRIC DISCHARGE LAMP

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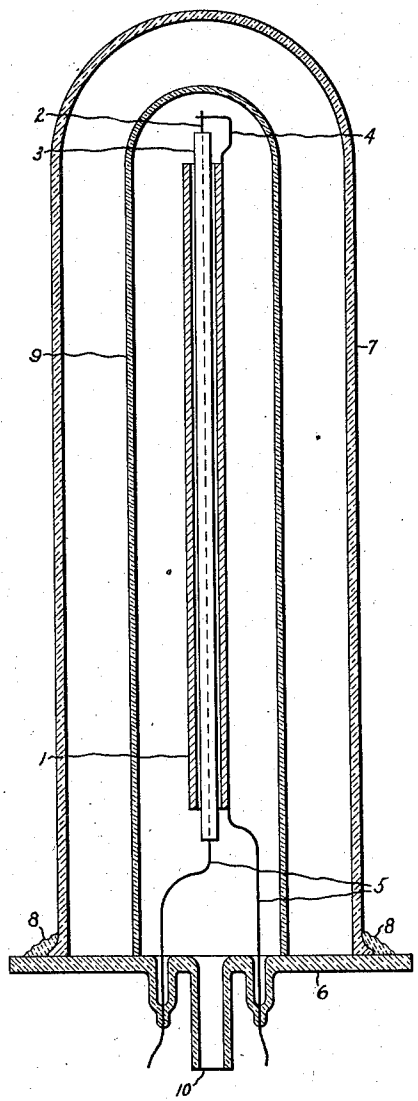

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ELECTRIC DISCHARGE LAMP

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In Great Britain May 31, 1937

1 Claim. (Cl. 91—12.2)

This invention relates to electric discharge lamps and more particularly to lamps of the cadmium or zinc type described in co-pending application Serial Number 190,842, filed February 16, 1938, and assigned to the assignee of the present application. The lamp described in the co-pending application is surrounded by a glass tube having thereon a thin coating of silver transparent in the case of cadmium to 3,260 Å and in the case of zinc to 3,078 Å radiations. This coating must be uniform in thickness (approximately 0.01 micron) so that it will reflect heat radiation strongly and also transmit the above ultra-violet radiations with little absorption.

We have observed that such a uniform film cannot be prepared by chemical deposition, which is the method commonly employed for thick films. It appears that the particles of silver deposited in this way are too large, and the film is insufficiently uniform to give the desired effects. The alternative method of vacuum evaporation from solid silver is well known, but cannot be easily applied to the coating of a large surface, such as the inside of a tube or bulb. The following effect takes place, which it is the object of the present invention to avoid.

If a wire or tube consisting of silver is mounted along the axis of a (larger) evacuated glass tube, and heated to about 900° C. by a definite power input, for example by an electric current, silver evaporates and condenses as a film on the inner surface of the glass. This film reflects back the heat radiated by the silver wire or tube, and raises its temperature, thus increasing the evaporation. The process is thus unstable; if one part of the silver is initially hotter than the rest, silver will deposit first on the glass around this hotter part, the reflected heat will raise the temperature of this part, and the evaporation will be more rapid from this part than from other parts. Since perfect uniformity of temperature in the silver vapor source cannot be attained, uniformity of the film over the whole tube or bulb is equally unobtainable.

The present invention avoids this difficulty by using, instead of solid silver as the heated source of silver vapor, a tube or wire of metal which is non-volatile at the volatilizing temperature of silver, for example nickel, in which the heating current flows. This tube or wire is previously electroplated uniformly, by known methods, with a quantity of silver just sufficient to coat the glass tube or bulb to the desired thickness. If this silver-plated nickel source is then used for the evaporation, it becomes immaterial that the film forms first on one part of the glass: for when the silver on that part of the source has been volatilized, no further evaporation can take place to that part of the glass; and the temperature can be maintained so that the silver is evaporated from the remaining parts of the source.

The accompanying drawing illustrates in a front elevational, partly sectional view one form of apparatus for carrying out the invention, suitable for preparing thin silver films on tubular vitreous jackets, for use in cadmium and zinc lamps, for example. In the drawing a nickel tube 1, plated on the outside with silver to the desired extent, is heated by a tungsten filament 2 within the tube, insulated from it by a quartz or steatite tube 3. The nickel tube itself forms the return lead from the filament, being connected to it at the top by a bridging wire 4. Power is supplied through leads 5, 5 sealed by air tight joints through the metal baseplate 6. On this rests a bell-jar 7, sealed to it by "vacuum plasticine" 8, and, within the latter, the jacket 9 to be coated with silver. The whole can be exhausted during evaporation by a pump connected to the tube 10.

What we claim as new and desire to secure by Letters Patent of the United States is:

An apparatus for producing a metal coating of uniform thickness on a hollow body comprising in combination a chamber adapted to be exhausted in which said body is mounted and a coating article mounted in said body, said article comprising a tube of insulating material, an electrical heater element in said tube, a metal tube surrounding said insulating tube, said heater element being electrically connected to said metal tube, a coating uniform on said metal tube, said coating consisting of the metal to be deposited on said hollow body, the quantity of metal in said coating in relation to the area of the surface of said hollow body to be coated being restricted to an amount such that said surface has a uniform coating of desired thickness thereon when said coating metal is all evaporated from said metal tube, the metal of said tube having a higher volatilizing temperature than the metal of said coating, a pair of current leads connected to said article, one of said leads being connected to said heater element and the other of said leads being connected to said metal tube, said leads passing through the walls of said chamber for connection with the terminals of a current source.

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