

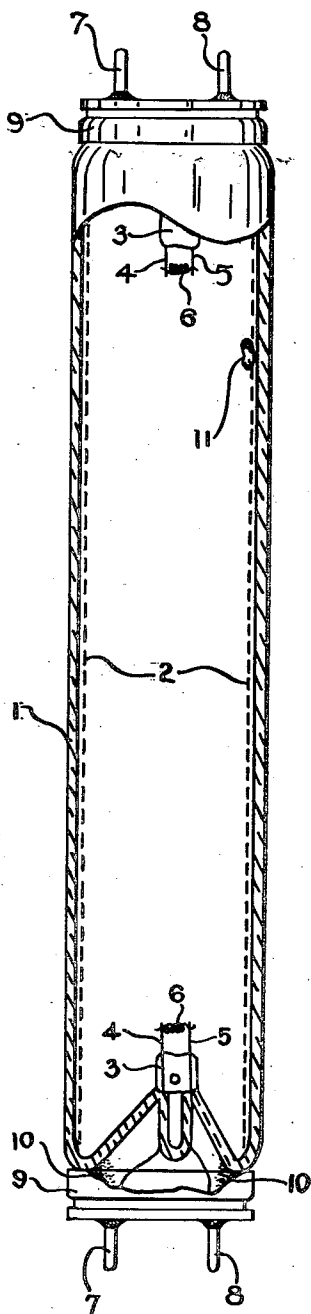
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FLUORESCENT ELECTRIC DISCHARGE LAMP

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FLUORESCENT ELECTRIC DISCHARGE
LAMP

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1 Claim. (Cl. 176—122)

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This invention relates to electric gaseous discharge lamps, particularly of the type utilizing a fluorescent material, and to the gas filling utilized in such lamps.

An object of the invention is to increase the efficiency of such lamps, and to cause their efficiency to be maintained high during the life of the lamp.

A feature of the invention is the introduction into the lamp of a gas filling containing small percentages of oxygen or nitrogen. Other features, advantages and objects of the invention will be apparent from the following specification, taken in conjunction with the accompanying drawing, in which the figure represents a lamp according to my invention.

In the drawing, the light-transmitting tubular envelope 1 of glass or the like coated on its interior surface with the fluorescent material 2, is sealed at each end by a stem 3, through which lead in wires 4 and 5 project into the interior of the bulb where they are connected to each filamentary cathode 6, which may be a coiled-coil tungsten wire coated with one or more of the alkaline earth oxides. The ends of the lead-in wires external to the glass envelope may be attached to prongs 7 and 8 of base 9, affixed to the envelope 1 by a cement 10. The interior of the bulb may contain a filling of inert gas such as one of the rare gases, at low pressure, for example, argon at 3 mm., and a drop of mercury 11 to provide mercury vapor. The lamp will ordinarily be operated at a mercury vapor pressure between 1 and 20 microns.

According to my invention, the gas filling also contains a small amount of nitrogen, or oxygen, and preferably both, in addition to the argon. The amount of oxygen is preferably about 0.1% by volume of the argon, while the nitrogen is preferably much greater, say 0.7%, but at least 0.3%.

I have found that the addition of these active gases to the inert gas may produce a lamp having, after 500 hours of life, an efficiency more than 10% greater than that of similar lamps at similar life without the active gases. The percentage gain in efficiency becomes still greater at longer life, because the active gases have the effect of reducing the drop in efficiency which normally occurs during the life of the lamp. The lamp life itself does not appear to be deleteriously affected, because lamps according to my invention have given lives well over 3500 hours.

The oxygen and nitrogen are preferably mixed into the argon in proper quantities and the

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mixture then introduced into the lamp, so that all three are introduced together as the final lamp filling, but the gases may be introduced separately if desired.

Prior to the introduction of the gases, the lamp may be evacuated and the cathodes activated in the usual manner. One method, for example, is to evacuate the lamp while it is being kept at a high temperature, say 500° C., in an oven, flushing several times with argon or other inert gas at say 3 mm. pressure, and re-evacuating after each flush to as low a pressure as 30 microns, and preferably to 8 microns prior to the admission of the final gas filling, which may be argon at a few millimeters pressure with small percentages of oxygen or nitrogen, or both. Prior to the admission of this filling the cathodes are activated by being heated in steps, with an evacuation and flushing after each step. The filament current is raised somewhat at each step, until a value about double normal is reached. The steps themselves may be about 8 seconds long.

After introduction of the active gases, the voltage necessary to start the lamp will be higher than normal. Application of sufficient starting voltage and the operation of the lamp for a few minutes will return it to its normal starting conditions.

In my tests with various quantities of oxygen and nitrogen I used spectroscopically pure argon to insure the correctness of my results.

The percentage of oxygen in the gas filling is about 0.1% for optimum results, but a range from about 0.05% to 0.6% will give good results insofar as lamp efficiency is concerned. However, amounts larger than 0.1% increase the tendency of the lamp to form dark bands at its ends.

Nitrogen does not seem to increase the latter tendency and much larger quantities can be used. However, quantities larger than 1% do not increase the efficiency greatly and do make the lamps much harder to start initially. About 0.7% has worked very well and as much as 1.5% may be used to advantage. The oxygen improves the lumen maintenance of the lamp about 3% at 500 hours life; nitrogen has an effect as great as 10% at this period.

In my invention, I have used fluorescent material such as magnesium tungstate and zinc silicate, the latter activated by manganese or beryllium, or both.

What I claim is:

A fluorescent electric discharge lamp comprising a sealed light-transmitting envelope, oxide-coated electrodes therein, a small quantity of mer-

cury therein, a gaseous filling therein consisting of argon and 0.3% to 1.5% nitrogen, and a fluorescent coating on the interior surface of said envelope and comprising at least one material of the group consisting of the fluorescent tungstates and silicates.

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