July 21, 1942. E. A. QUARRIE 2,290,208

PROCESS FOR THE MANUFACTURE OF GASEOUS DISCHARGE LAMPS

Filed Sept. 26, 1941

Fig. 1.

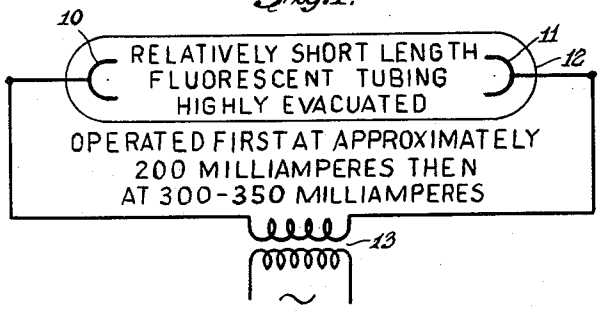


Fig. 2.

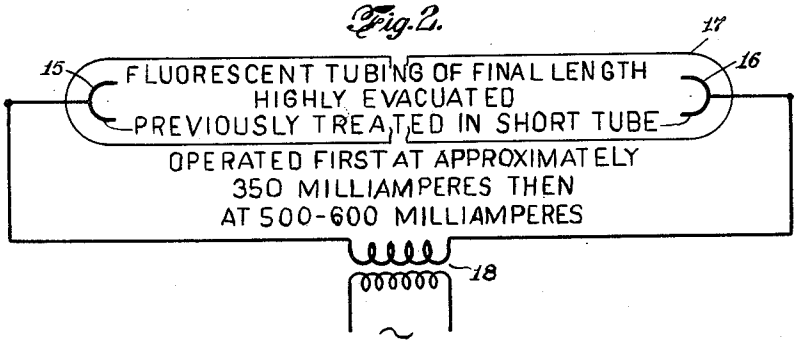
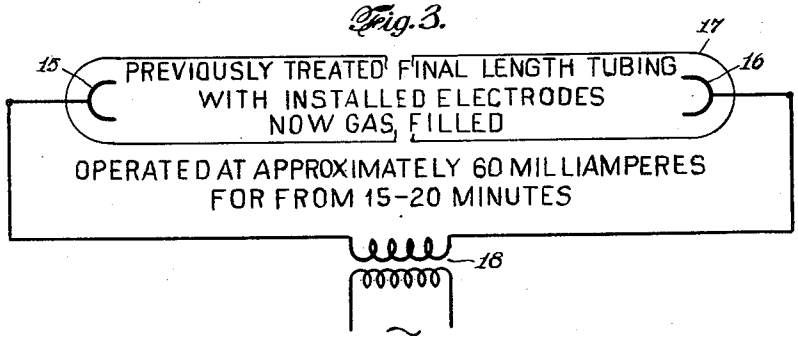


Fig. 3.



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PROCESS FOR THE MANUFACTURE OF GASEOUS DISCHARGE LAMPS

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5 Claims. (Cl. 176—7)

The invention relates to the manufacture of gaseous discharge lamps and is particularly adapted to the manufacture of the fluorescent type of luminous lamp.

In the manufacture of these lamps and particularly the cold-cathode fluorescent type, the electrodes between which the discharge occurs are installed directly in the tube or other transparent envelope or container for the gaseous medium. In the initial operation of such lamp the occluded gases of the electrode material as well as other impurities are released and the wall of the envelope, particularly the fluorescent coating thereof, is bombarded therewith. A film or deposit is thereby introduced which is more pronounced on such coating, and more especially as a result of the formation of an amalgam from the mercury or mercury-vapor contained in the envelope. This causes discoloration and darkening of the otherwise luminous portion of the tube which may extend a substantial distance along the tube from each of the electrodes, eventually travelling the entire length of the tube. The efficiency of such lamp is thereby greatly diminished and the light emission gradually reduced.

It is an object of the present invention to provide a novel process for preparing such lamps whereby a clean, clear tube or envelope is maintained so that an efficient lamp of relatively long life results.

A further object of the invention is to provide a lamp permitting of the use of higher operating current, due to lower electrode resistance, than has heretofore been found commercially practicable, as well as to eliminate "rippling" and "snaking" effects.

In carrying out the invention, the electrodes utilized in the lamp are given an initial processing or forming exteriorly thereof, as in a preparparatory tube, to remove organic and other deleterious impurities so far as possible, after which they are installed in the lamp and further "formed."

The nature of the invention, however, will best be understood when described in connection with the accompanying drawing, which illustrates more or less diagrammatically various stages in the formation of the electrodes in their application to a gaseous discharge lamp, Fig. 1 showing a relatively short length of tubing wherein the electrodes are initially processed, and Figs. 2 and 3 the electrodes installed in the final lamp wherein they are further processed, as indicated in Fig. 2, and aged as indicated in Fig. 3.

Referring to Fig. 1 of the drawing, the electrodes for use in the final lamp are indicated at 10 and 11 and as mounted in an envelope 12 which is preferably a short length of tubing evacuated to a high degree. This tubing may be clear on its inner surface or coated with a fluorescent material. In accordance with the invention, these electrodes, which are coated with the usual materials such as barium and strontium carbonates and are in all respects constructed as for use in known luminescent lighting, are located only temporarily in the particular envelope 12 for an initial processing thereof. This includes effecting an intensive electrical discharge therebetween, provided by a transformer 13, and initially maintained at approximately 200 milliamperes until the orchid color of the discharge resulting from water and other common vapors disappears. Thereupon, the current is increased to from 300 to 350 milliamperes until such time as the electrodes 10, 11 become heated to a bright cherry red color and the discharge itself attains the flickering stage. The discharge is then discontinued and the tube allowed to cool.

After the tube has cooled sufficiently, the electrodes are removed therefrom, said partly processed electrodes 15 and 16 then being indicated as located in the final envelope or tubing 17 of the desired length and constituting the lamp in its final form, the electrodes being intended for permanent installation therein. After this envelope has been highly evacuated, a discharge is again effected between the electrodes, as from the transformer 18, until the orchid color of discharge then disappears. The initial current is approximately of the order of magnitude of 350 milliamperes which is increased, after the disappearance of the orchid color, to from 500 to 600 milliamperes and until the electrodes show a cherry to bright red color with the tube being heated to a degree just sufficient to carbonize paper laid against the tube.

After discontinuing the discharge, the tube is allowed to cool and is sealed off from the source of vacuum (not shown). There is then introduced at the proper pressure the required rare gas in accordance with the particular color of the emitted light desired, as is well understood in the art. Mercury is then released into the tube in the usual manner and when the tube has been aged, it is ready for service. The aging may be effected by passing through the tube, for from fifteen to twenty minutes, a current of substantially 60 milliamperes from transformer 18, or until the mercury vapor is evenly distrib-

uted in the tube which then assumes a uniform brilliancy.

I claim:

1. In the manufacture of luminescent lamps: the steps of treating the electrodes for use in the final lamp in a preliminary tubing under high vacuum by first effecting an intensive discharge therein between the said electrodes, then increasing the intensity of the discharge, discontinuing the discharge and allowing the tube to cool, removing the electrodes from the preliminary tubing and installing the same in the final tube, operating the final tube under a high degree of vacuum, then increasing the intensity of the discharge, discontinuing the discharge and allowing the tube to cool, then sealing off the same, introducing the desired gaseous medium, and finally aging the tube.

2. In the manufacture of luminescent lamps: the steps of treating the electrodes for use in the final lamp in a preliminary tubing under high vacuum by first effecting an intensive discharge therein between the said electrodes, then increasing the intensity of the discharge, discontinuing the discharge and allowing the tube to cool, removing the electrodes from the preliminary tubing and installing the same in the final tube, operating the final tube under a high degree of vacuum, then increasing the intensity of the discharge, discontinuing the discharge and allowing the tube to cool, then sealing off the same, introducing the desired gaseous medium, releasing mercury into the tube, and finally aging the tube.

3. In the manufacture of luminescent lamps: the steps of treating the electrodes for use in the final lamp in a preliminary tubing under high vacuum by first effecting an intensive discharge therein between the said electrodes at approximately 200 milliamperes, then increasing the intensity of the discharge to from 300 to 350 milliamperes, discontinuing the discharge and allowing the tube to cool, removing the electrodes from the preliminary tubing and installing the same in the final tube, operating the final tube under a high degree of vacuum substantially at 350 milliamperes, then increasing the intensity of the discharge to from 500 to 600 milliamperes, discontinuing the discharge and allowing the tube to cool, then sealing off the same, introducing the desired gaseous medium, and finally aging the tube by passing a current of substantially 60 milliamperes therethrough.

4. In the manufacture of luminescent lamps: the steps of treating the electrodes for use in the final lamp in a preliminary tubing under high vacuum by first effecting an intensive discharge therein between the said electrodes at approximately 200 milliamperes, then increasing the intensity of the discharge to from 300 to 350 milliamperes, discontinuing the discharge and allowing the tube to cool, removing the electrodes from the preliminary tubing and installing the same in the final tube, operating the final tube under a high degree of vacuum substantially at 350 milliamperes, then increasing the intensity of the discharge to from 500 to 600 milliamperes, discontinuing the discharge and allowing the tube to cool, then sealing off the same, introducing the desired gaseous medium, releasing mercury into the tube, and finally aging the tube by passing a current of substantially 60 milliamperes therethrough.

5. In the manufacture of luminescent lamps: the steps of treating the electrodes for use in the final lamp in a preliminary tubing under high vacuum by first effecting an intensive discharge therein between the said electrodes at approximately 200 milliamperes and until the orchid color of the discharge disappears, then increasing the intensity of the discharge to from 300 to 350 milliamperes and until the electrodes are heated to a bright cherry red color and the discharge reaches a flickering stage, discontinuing the discharge and allowing the tube to cool, removing the electrodes from the preliminary tubing and installing the same in the final tube, operating the final tube under a high degree of vacuum substantially at 350 milliamperes and until the orchid color of discharge again disappears, then increasing the intensity of the discharge to from 500 to 600 milliamperes and until the electrodes show a cherry to bright red color and the tube heats to a degree just sufficient to carbonize paper, discontinuing the discharge and allowing the tube to cool, then sealing off the same, introducing the desired gaseous medium, releasing mercury into the tube, and finally aging the tube by passing a current of substantially 60 milliamperes therethrough until the mercury vapor is evenly distributed.

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