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COATING CATHODES

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Fig. 1.

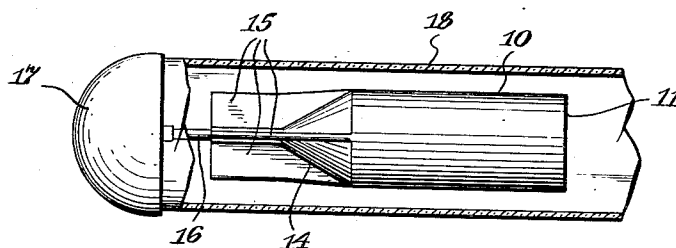


Fig. 2.

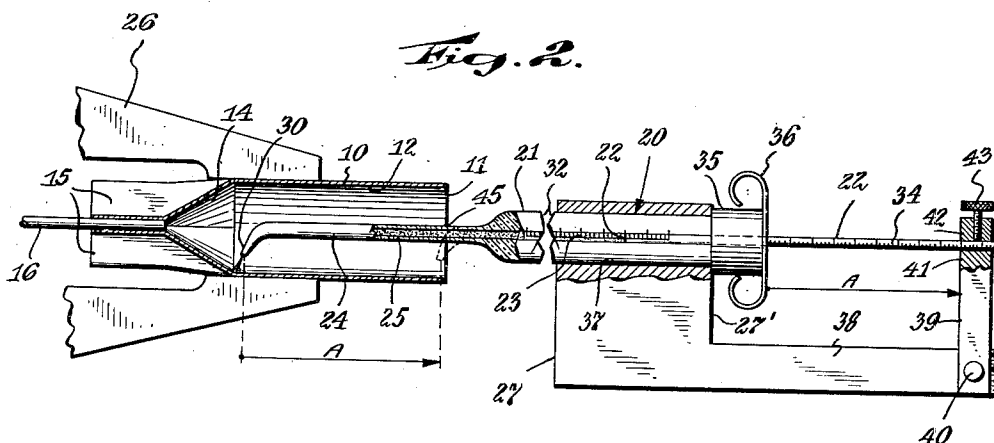
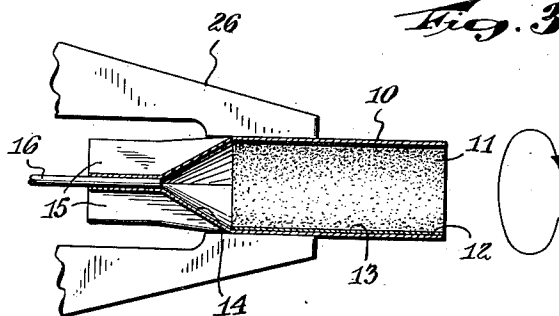


Fig. 3.



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COATING CATHODES

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4 Claims. (Cl. 117—95)

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My invention relates to electrodes and especially to the coated type of electrode.

An object of my invention is to provide an evenly coated electrode.

Another object of my invention is to provide the desired thickness of coating in the desired areas.

Another object of my invention is to provide means for evenly coating interior surfaces of cathodes.

Another object of my invention is to prevent heavy deposits of coatings.

Other objects and advantages of the invention will be apparent from the following description and drawing in which:

Fig. 1 is a view of one end of a sterilizing lamp with part of the casing broken away to disclose a type of electrode to which the invention is particularly applicable.

Fig. 2 and 3 are views, with the electrode in cross section, illustrating the preferred steps in applying the coating.

One of the difficulties with coated cathodes or electrodes alternately acting as cathode and anode is to apply an even coat and especially to evenly coat an interior surface of a cold cathode. For purposes of illustration, I have disclosed in Fig. 1 such an electrode which is used in sterilizing lamps to act alternately as a cathode and anode. This electrode is more particularly described in Pat. No. 2,029,013, issued to P. W. Blackburn, January 28, 1936, for Cathode for discharge devices, and is especially adapted to illustrate the difficulties of satisfactorily coating similar electrodes or cathodes although my invention is not limited to the particular shape illustrated.

The coating on the electrode is to make it a cathode and accordingly it will be referred to as such. The cathode illustrated comprises a cylindrical portion 10 with a round open end 11 and an interior cylindrical wall 12 illustrated in Fig. 2 which it is desired to coat with an electron emitting coating 13 illustrated in Fig. 3. The back part of the cathode, which is preferably of nickel, is pinched into a conical portion to provide integral fins 15 enclosing a conductive standard 16 secured to a conductive end cap 17 sealed to the tubular glass casing 18 of the lamp.

The preferred coating for the interior of the cathode is a combination of two or more alkaline earths and preferably barium, strontium and calcium put on in the form of carbonates in suspension with a binder such as nitrocellulose dissolved in diethyl carbonate and later reduced to the oxide as is well known. The most common ways of application are spraying, painting or dipping. In the spraying method, it is difficult to

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apply a coating of definite weight, distribution and wetness because the method allows wide variation in both the mechanical and human elements.

The painting method permits very poor control of coating weight because the weight depends upon the degree to which the brush is saturated with the coating suspension and upon the skill of the operator.

The weight and distribution of the coating applied by dipping depends upon how much coating drips from the cathode, the position in which the cathode is placed after being dipped and upon the skill of the operator.

Any of these methods may leave a too thin a coating on one portion of the cathode wall and too thick a coating at other portions of the cathode wall. In regard to the particular type of cathode illustrated, coating material will generally be deposited on the inner conical wall 14. To heat treat the electrode and reduce the carbonate coating to an oxide, a high frequency coil surrounds the cylindrical portion 10 of the electrode and heats it by induced currents. The integral fins 15 are effective in dissipating heat during operation and this action will help maintain the conical portion 14 cooler especially if it is not surrounded by the high frequency coil. The carbonate deposit on the conical portion may accordingly not be reduced or completely reduced to the oxide. A heavy deposit of coating on the cylindrical walls also may not be completely reduced to the oxide.

These sterilizing lamps operate in a gaseous medium of mercury vapor and a gas such as argon, neon or helium to give a low starting voltage requirement. After the tube is sealed off and during long operation, the unreduced carbonates on the cathode wall may give up carbon dioxide gas and this gas may seriously affect the starting characteristics of the tube. In fact the tube may not start on its original rated voltage.

Further, the evolved gas from partially or totally unreduced carbonates may react with mercury during operation and form a compound which plates the inner glass surface and reduces the ultra violet output of the lamp, reducing its effectiveness.

According to my invention, I place the alkaline earth carbonate suspension on the inner cylindrical wall only of the cathode and revolve the cathode to distribute this coating evenly on the wall by centrifugal force. In order to distribute the desired weight or thickness of coating, I preferably utilize the apparatus illustrated in Fig.

A syringe 20 is dipped into the carbonate sus-

pension and a considerable amount drawn into the barrel portion 21. The position of the plunger 22 on the scale gives the quantity in the syringe and also the difference in readings will give the amount extruded or drawn in the syringe. I prefer to construct the syringe with a long nozzle 24, longer than the cylindrical portion of the electrode. The inside diameter of the nozzle portion as illustrated at the broken away portion 25 is the size to contain the desired amount of suspension of alkaline earth compounds and binder per unit length as is desired per unit length for the inside surface. In other words a length A of the nozzle contains the exact amount of suspension desired for a length A of the inner cylindrical surface of the electrode.

Although a regular type of syringe may be used, I have devised the special type illustrated to make the application of the coating independent of the judgment of the operator. The barrel portion 21 is preferably long as indicated by the broken lines 32. This barrel portion also has an inside diameter the same as the nozzle portion and as a continuation thereof. The plunger 22 is preferably a sturdy rod with a scale 34 marked thereon. The rear portion of the barrel terminates in an enlarged ring 35 to which is secured the finger grip 36.

The barrel portion is placed in a groove 37 of a support 27 with the front face of the enlarged ring against the rear face 27' of the support. The support 27 has a rear extension 38 and on this extension 38 is an upright arm 39 adjustably clamped thereto as by the nut 40. This upright arm 39 has a shelf 41 upon which rests the extension of the plunger 22. The upright arm has a right angle extension 42 above the plunger 22 and a set screw 43 extending through this extension 42 to bind the plunger on the shelf 41 of the upright arm 39.

The upright arm is adjusted on the extension 38 the distance through which it is desired to move the plunger which in this case, is "A" shown by the arrows on the right hand side equivalent to the "A" shown on the left hand side. The plunger 22 is then bound by the set screw 43. The electrode is inserted in the jaws 26 of a chuck and the nozzle 24 is then inserted in the electrode 10 to the innermost position for depositing the material on the cylindrical surface but not on the conical portion 14. The distance for inserting the nozzle can be calculated and marked at 45 on the nozzle. The operator merely lines up this mark at 45 with the edge 11 of the electrode.

The chuck and electrode is revolved and the operator pulls back on the finger grip 36 until stopped by the upright arm 39. The nozzle tip 30 by this movement has been pulled to the front edge 11 of the electrode and has deposited exactly the suspension desired per unit length along the electrode. The centrifugal force exerted by the revolving electrode will coat the suspension evenly over the inner cylindrical walls of the electrode.

The revolution of the electrode may be kept up until the coating has sufficiently dried in position or set. The electrode may be revolved after the suspension is deposited along the bottom of the inner electrode surface if desired.

The plunger 22 is released from the set screw 43 and the syringe moved up until the ring 35 rests against the rear face 27' of the support 27. The set screw 43 then binds the plunger on the shelf 41 and the apparatus is ready for the next electrode which has been inserted in the jaws of the chuck.

The electrode which has been coated is positioned in the tube with the other elements and then the carbonate coating is reduced to an oxide by a high frequency induction coil placed about the tube where the electrode is located.

My invention deposits the right amount of coating in the right places. The application of the coating by my invention is practically fool-proof because of very little demand on the intelligence of the operator in merely inserting the nozzle into the electrode up to a mark on the nozzle, and after pulling out the nozzle, resetting the set-screw 43 on another mark on the plunger 22.

While I have disclosed the preferred method and apparatus for carrying out my invention, it is apparent that modifications may be made therein and accordingly, I desire only such limitations to be imposed thereon as is necessitated by the spirit and scope of the following claims.

I claim:

1. A coating process consisting of three simultaneous operations, namely; moving a nozzle from which coating material is ejected in proximity to a surface being coated; forcing material from the nozzle commensurate with movement of the nozzle; and spreading the material in a direction transverse to the movement of the nozzle.

2. A coating process consisting of three simultaneous operations, namely; moving a nozzle from which coating material is ejected in proximity to a surface being coated; forcing material from the nozzle commensurate with movement of the nozzle; and centrifugally spreading the material in a direction transverse to the movement of the nozzle.

3. A coating process for the interior of a tubular member consisting of three simultaneous operations, namely; moving a nozzle, from which coating material is ejected, longitudinally of and in one direction in proximity to the interior surface of said tubular member being coated; forcing coating material from the nozzle commensurate with, and controlled in amount by, movement of the nozzle; and spinning the tubular member and thereby centrifugally spreading the material in a direction transverse to the movement of the nozzle.

4. A coating process for the interior of a tubular member, comprising three simultaneous operations, namely; moving a nozzle from which coating material is ejected only as the nozzle is moved in one direction longitudinally of the tubular member, and in proximity to the interior surface of said tubular member being coated; forcing coating material from the nozzle by movement of the nozzle in the said one direction and ejecting an amount wholly controlled by distance of movement of the nozzle irrespective of rate of movement of the said nozzle with respect to the surface; and spinning the tubular member and thereby centrifugally spreading the material in a direction transverse to the movement of the nozzle.

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