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METHOD OF TREATING ELECTRODES OF NEGATIVE GLOW DEVICES

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5 Claims. (Cl. 176-14)

My invention relates to electrodes for negative glow devices such as that shown in my Patent No. 2,002,775, dated May 28, 1935, in which patent I disclose electrodes wherein there are formed vari-

- 5 ous figures or images by the employment of insulating cement as a matter of insulating certain portions of the surfaces of the electrodes in order to prevent electrical discharge in accompanying glow over that portion of the electrode. This
- 10 prior application also discloses the use of certain chemicals which are luminescent to produce various colored surfaces.

It is a purpose of this invention to provide an improved means for forming the outline of de-15 signs, figures, or the like from the electrodes.

The principal purpose of the invention is to provide means for obtaining clean cut outlines between glowing and non-glowing portions of the electrodes.

- 20 I accomplish this result by the employment of a chemical substance and blackening the same after it is applied to the surface, and, by the use of the substance and the treatment thereof, I am able to produce the advantageous results herein-25 after more fully described.
- In the drawing, Fig. 1 is a face view of an electrode embodying my invention; Fig. 2 is an enlarged section on the line 2-2 of Fig. 1; Fig. 3 is a front view of another electrode; and Fig. 4 30 is a section on the line 4-4 of Fig. 3.
- In negative glow devices of this character, the glow normally extends out or projects from the surface a short distance. This is apparently in the neighborhood of 1/40th of an inch, roughly,
- 35 although this may vary with the different constants of a particular tube as it is apparently affected by such factors as the kind of gas used, the pressure of the gas, and the composition of the electrode itself. I find that, at the edges of the
- 40 electrodes or where a portion thereof is covered with ordinary insulating cements such as are made from soapstone and the like, the glow extends over the edge onto the insulated or vacant portion a distance substantially equal to the thick-
- 45 ness of the glow on the electrode. The edge of the cement is obscured in this fashion apparently by the glow tending to spread over it. Most of the insulating cements also have a certain translucency. These factors render it difficult to obtain
- 50 outlines of sufficient sharpness to produce intricate or attractive designs upon the electrode.

I have found, however, that by the use of certain chemical compositions—such for example as some of the luminescent and phosphorescent chemicals

55 like calcium, tungsten, zinc sulphide, kunzite,

thorium nitrate, uranium nitrate, willemite, willemite (phosphorescent), zinc sulphide phosphorescent, zinc triboluminescent, also the rare earth metals or salts thereof such as barium, strontium—and preparing these substances with 5a binder in a manner which will be described, I can obtain outlines of such sharpness as to make practically any design show up in complete detail.

In preparing the chemical, I use a binder of collodion or pyroxylin with alcohol, amyl acetate, 10 and ether. The pyroxylin or collodion is first dissolved in ether and then the amyl acetate, alcohol, and chemical are added to make a solution that can be placed upon the electrode in any suitable design. 15

Preferably in using the solution I etch the design 5 in the surface of the metallic electrode 5 and then fill in with the solution as indicated at 7 and 8. The electrode 5 may be formed of substantially pure iron, nickel, copper or other suit- 20 able metal. The design may be etched in any one of a number of ways. One which I have found satisfactory is to coat the electrode with a material which is not affected by acid, form the design therein and then apply a dilute solution 25 of nitric acid. The acid should be agitated by some means as an air blast in order to prevent the gas formed by the chemical action from insulating the design from the acid. The deposits 7 and 8 in the etched surface are blackened in a 30 suitable manner. This may be accomplished in a number of different ways. For instance it may be effected by heating the electrode in the presence of a small amount of active gas, that is, a gas having some free oxygen therein. The black- 35 ening process may also be brought about by passing a current between the electrodes in a partial vacuum. Also the chemical may be blackened gradually by the aging of the tube probably due to the presence of impurities in the gas. It seems 40 likely that the chemical may be blackened by other processes which bring about the oxidization of the chemical employed or possibly it is effected by a blackening of the binder employed.

If the chemical is employed on the electrode 45 without blackening the negative glow will overlie the chemical as well as the uncoated part of the electrode but the coated portion will have a different characteristic as it may not glow so brightly or the color of the glow may be different. Howover, after the chemical has been blackened all glow of the blackened portion is prevented and the margin thereof is clean-cut and sharp.

By the use of fine lines or dots such as 9, half tone effects may be produced and solid dark ef- 55

fects may be obtained by filling in an etched portion solid. I find that with this treatment I can obtain brilliant outlines as sharp and fine as a pen and ink drawing. Apparently the luminous layer or glow does not extend over or obscure lines or

or glow does not extend over or obscure lines or images formed in this manner. The actual reason underlying this phenomenon is not clear to me at present. However, I have found this to be the fact in a number of experiments.

10 I find also that by making the layer of chemical over the main portion of the design or image relatively thick and making a thin layer at the border, the thin layer will blacken quickly while the thick body of the luminescent chemical will

- 15 not be so blackened as to destroy its distinctive color under the electrical discharge. In this manner, I can obtain a distinctive color for the image and a sharp black outline at the edge where the glow ends.
- 20 In Figs. 3 and 4 I have illustrated roughly this condition. The electrode 10 has the large body of cement 11 forming the design and it will be noted from Fig. 4 that this body is of substantial thickness but has a comparatively thin layer
- ²⁵ along the border as indicated at 12 and 13. The thin portions 12 and 13 will blacken quickly as compared with the thick portion 11 so that a non-glowing border or outline will be provided around the thicker body portion 11. I have shown
- ³⁰ at 14 a dotted portion to indicate the exposed tobacco at the end of the cigarette as these dots will produce a darkened or half tone effect to distinguish the end of the cigarette from the body 11 and from the remainder of the electrode 10.
- ³⁵ Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

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1. The method of forming designs upon the surface of electrodes of negative glow devices which consists in applying a coating of a luminescent chemical to the electrode surface as an outline of the design and blackening the coating to 5 prevent the glow from extending over the coated surface.

2. The method of forming designs upon the surface of electrodes of negative glow devices which consists in applying a coating of a lumi- 10 nescent chemical in solution with a binder to the electrode surface as an outline of the design and blackening the coating to prevent the glow from extending over the coated surface.

3. The method of forming designs upon the 15 surface of electrodes of negative glow devices which consists in applying a coating of a luminescent chemical and a binder of collodion to the electrode surface as an outline of the design and blackening the coating to prevent the glow from 20 extending over the coated surface.

4. The method of forming designs upon the surface of electrodes of negative glow devices which consists in applying a coating of a luminescent chemical and a binder of pyroxylin to the 25 electrode surface as an outline of the design and blackening the coating to prevent the glow from extending over the coated surface.

5. The method of forming negative glow devices having electrodes which consists in applying 30 to the surface of one of the electrodes as an outline of a design a coating of luminescent chemical in solution with a binder of collodion which material has the characteristic of becoming black when subjected to bombardment in the presence ³⁵ of active gas.

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