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J. D. LE VAN

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FLUORESCENT COATING

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Fig. 1.

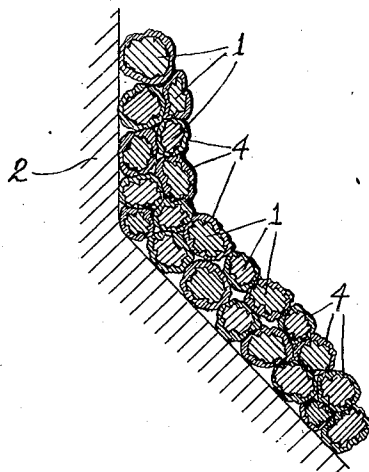
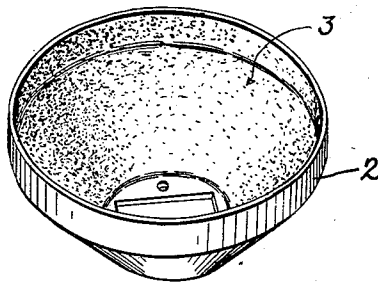


Fig. 2.

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UNITED STATES PATENT OFFICE

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FLUORESCENT COATING

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Application September 4, 1937, Serial No. 162,524

4 Claims. (Cl. 250-80)

This invention relates to fluorescent coatings for electrodes to be used in electron discharge tubes, and more particularly to such fluorescent coatings which emit light when subjected to the action of a stream of electrons.

An object of this invention is to devise such a coating which possesses a relatively high degree of electrical conductivity so that the formation of static electrical charges on such coating may be avoided.

Another object of this invention is to devise a novel method of producing such a coating.

The foregoing and other objects of my invention will be best understood from the following description of an exemplification thereof, reference being had to the accompanying drawing, wherein

Fig. 1 is a view of one form of electrode carrying my novel fluorescent coating; and

Fig. 2 is an enlarged cross-section taken through a portion of the fluorescent coating of the electrode shown in Fig. 1.

Fluorescent materials are used in space discharge tubes at the present time under a number of different conditions. One mode of producing fluorescence in such materials is to bombard the material with a stream of electrons. However, such materials ordinarily possess a relatively low degree of conductivity, and therefore when subjected to such electron bombardment, the electrons cannot be readily conducted away therefrom, and therefore a negative charge is built up on such materials. This negative charge repels subsequent electrons, and therefore it is difficult to maintain the fluorescence with any degree of accuracy or uniformity. I have found that this difficulty may be avoided by subdividing the fluorescent material into relatively small particles, and coating each particle with a material of relatively high electrical conductivity.

In one embodiment of my invention I have used a fluorescent material, such as willemite (zinc orthosilicate) sub-divided into relatively small grains, such as indicated at 1 in Fig. 2. In order to suspend these particles in a medium whereby material could be sprayed upon the surface of an electrode, such as indicated at 2, the willemite is mixed with acetone preferably in the proportion of 250 grams of willemite to 400 c. c. of acetone. In order to provide the resultant coating 3 with the requisite degree of electrical conductivity, I add about five parts of 18 second viscosity nitrocellulose to about two parts of the willemite acetone mixture. The 18 second viscosity nitrocellulose may be prepared by dis-

solving 40 second nitrocellulose in a mixture of equal parts of butyl alcohol and butyl acetate, and sufficient amount of the alcohol-acetate solution is used to reduce viscosity of the 40 second nitrocellulose to 18 seconds. I also add to the final mixture a small amount of about five per cent. of dimethyl phthalate. The dimethyl phthalate acts as a plasticizer, permits the solution to be sprayed more readily and more uniformly upon the electrode surface, and prevents the coating from peeling from the electrode during subsequent operations, such as baking. Other plasticizers may be used.

A mixture such as I have described above is first sprayed upon the surface of an electrode 2 which is preferably of some suitable metal, such as, for example, nickel. In this way the coating 3 is produced. The electrodes 2 carrying the coating 3 are then heated in a vacuum furnace at about 700° for about twenty minutes. An alternative method is to bake the electrodes in a hydrogen furnace at about 700° C. for three minutes, and then allow the electrodes to cool in a hydrogen atmosphere. The binding material is driven off and the nitrocellulose is decomposed, leaving a carbon residue. I believe that this carbon residue appears in the form of a very thin coating 4 around each grain 1. The thickness of the coating 4 is greatly exaggerated in Fig. 2. It may be that the coating around each of the grains 1 forms in effect an electrical conducting matrix in which these grains are embedded. In any event I find that when an electrode treated in this manner is utilized in an electrical space discharge tube, such as, for example, is described in my co-pending application, Serial No. 157,737, filed August 6, 1937, the coating possesses a relatively high degree of electrical conductivity, and negative charges do not build up on this coating such as is the case when the carbon is not incorporated with the fluorescent material. Despite the presence of the carbon around each of the grains 1, I find that the coating does not prevent the fluorescent action of these grains. Thus when the electrode 2 is subjected to bombardment by a stream of electrons, these electrons cause the grains 1 to fluoresce and the light of such fluorescence is emitted therefrom.

Although I have described my coating as being produced with carbon as the electrical conducting material, other electrical conducting substance may likewise be used. For example, I have found that a satisfactory result is produced when willemite is mixed with silver oxide. The

silver oxide in such a mixture can readily be broken down by the application of heat, leaving a very thin coating of silver or a silver matrix around the grains of the willemite.

- 5 This invention is not limited to the particular details of materials, processes or construction as described above as many equivalents will suggest themselves to those skilled in the art. For example, any type of material which can be
10 broken down so as to leave a carbon residue or a metallic residue can be mixed with the fluorescent material. Likewise since the coating itself possesses a relatively high degree of conductivity, it can be sprayed directly upon an insulating sur-
15 face and still be useful as an electrode. Various other modifications will readily suggest themselves.

What is claimed is:

1. A fluorescent material for a space discharge electrode comprising finely-divided particles of a fluorescent substance, said particles being coated with carbon.

2. A fluorescent material for a space discharge electrode comprising finely-divided particles of willemite, said particles being coated with carbon.

3. An electrode for a space discharge tube comprising a supporting surface having thereon a coating of a fluorescent material comprising finely-divided particles of a fluorescent substance, said particles being coated with carbon.

4. An electrode for a space discharge tube comprising a metal member having thereon a coating of a fluorescent material comprising finely-divided particles of a fluorescent substance, said particles being coated with carbon.

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