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ELECTRIC DISCHARGE DEVICE

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6 Claims. (Cl. 91—70)

My invention relates to the manufacture of electric discharge devices and more particularly to electric discharge devices comprising a container having on the inner surface thereof a coating of luminescent material, such as a fluorescent powder. Still more particularly, my invention relates to binding agents for causing the luminescent material to adhere to the surface of the container and to a method of applying such binding agents.

According to my invention, a mixture of boric and phosphoric acids is dissolved in a volatilizable solvent, preferably acetone. This material is applied to the inner surface of the container, the solvent is evaporated, and after the binder has become tacky, the luminescent powder is dusted thereon. The container is then heated to about 450° C. to fuse the binder to form a glaze containing boron phosphate.

A mixture which has given good results comprises 13.9 cc. of a saturated solution of H_3BO_3 (boric acid) in absolute CH_3OH (methyl alcohol) which is diluted to about 60 cc. with acetone. To this is added 3.23 cc. of 85 per cent H_3PO_4 syrup (phosphoric acid) having a specific gravity of 1.71, and the mixture is diluted to 100 cc. with acetone. The mixture may be filtered if necessary to remove any insoluble residue. This material is poured into the container and after the surface thereof has been thoroughly moistened, the excess material is poured back into the supply vessel. The solvent (acetone) is then evaporated either by means of a gentle stream of air or by spontaneous drying, the container being held vertically. The container is allowed to stand at room temperature until the surface of the binder possesses the proper tacky condition. Then the luminescent powder, such as cadmium or zinc silicate for example, is dusted into the container over the surface of the binder. Where the container is tubular and open at both ends, this may be done by setting the container at an angle of about thirty to sixty degrees with a clean receptacle at the lower end thereof and pouring the powder in at the top while the container is being rotated. The ends of the container may then be reversed and the operation repeated. The container may then be held vertically and jarred at the ends to remove the excess powder. The glass container is then fired at about 450° C. for approximately fifteen minutes to drive out any remaining volatilizable ingredients and to form a glaze which contains boron phosphate and which is very adherent.

The above described method may be used for applying the luminescent coating to gaseous discharge lamps of the positive column type such as shown in the United States application Serial No. 75,772, G. E. Inman, filed April 22, 1936, which contain electrodes and a starting gas such as argon and a small quantity of mercury. The luminescent material transforms invisible radiations in the lamp to visible light to complement the visible spectrum of the light emitted by the gaseous atmosphere and to supplement the intensity of the visible light.

One of the advantages of my binder over others heretofore suggested, such as a mixture of boric acid and glycerin, is that it is not necessary to employ a sponge saturated with the binder in order to apply a thin uniform coating of the binder to the container. Another advantage is that the powder adheres better and it is not necessary to employ so fine a powder. Thus, it is possible to use many fluorescent materials as they are made, whereas prior methods necessitated a laborious and costly process for obtaining certain definite particle sizes in order to obtain a reasonable degree of adherence.

Where it is permissible to use a rapid drying binder, the acetone may be omitted. Such a binder may comprise 22.5 cc. of eighty-five per cent H_3PO_4 syrup (specific gravity 1.71), 30.6 grams of H_3BO_3 crystals dissolved in 125 cc. of absolute methyl alcohol. This binder requires rapid drying with a properly directed stream of hot air.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric discharge device comprising a container having electrodes sealed therein, a coating on the inner surface of said container consisting substantially entirely of a mixture of the fused oxides of boron and phosphorous and finely divided luminescent material adherent to said coating.

2. A process for applying luminescent material to the interior of the container of an electric discharge device which comprises applying to the inner surface of said container a coating comprising a solution of boric and phosphoric acids, applying particles of luminescent material to said coating and heating said container to convert said coating to a glaze having said luminescent particles adherent thereto.

3. A process for applying luminescent material to the interior of the container of an electric discharge device which comprises applying to the inner surface of said container a coating comprising a mixture of boric and phosphoric acids

and a solvent, drying said coating to cause said solvent to be evaporated and to cause said coating to become tacky, applying particles of luminescent material to said coating and heating said container to convert said coating to a glaze having said luminescent particles adherent thereto.

4. A process for applying luminescent material to the interior of the container of an electric discharge device which comprises applying to the inner surface of said container a coating comprising a mixture of boric and phosphoric acids and acetone, drying said coating to cause said acetone to be evaporated and to cause said coating to become tacky, applying particles of luminescent material to said coating and heating said container to convert said coating to a glaze having said luminescent particles adherent thereto.

5. A process for applying luminescent material to the interior of the container of an electric discharge device which comprises applying to the inner surface of said container a coating consisting by volume of a mixture of approximately fourteen per cent of a saturated solution of boric acid in alcohol, three per cent of phosphoric acid syrup and eighty-three per cent of a solvent, drying said coating to cause said solvent to be evaporated and to cause said coating to become tacky, applying particles of luminescent material to said coating and heating said container to convert said coating to a glaze having said luminescent particles adherent thereto.

6. A process for applying luminescent material to the interior of the container of an electric discharge device which comprises applying to the inner surface of said container a coating consisting by volume of a mixture of approximately fourteen per cent of a saturated solution of boric acid in alcohol, three per cent of phosphoric acid syrup and eighty-three per cent of acetone, drying said coating to cause said acetone to be evaporated and to cause said coating to become tacky, applying particles of luminescent material to said coating and heating said container to convert said coating to a glaze having said luminescent particles adherent thereto.

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