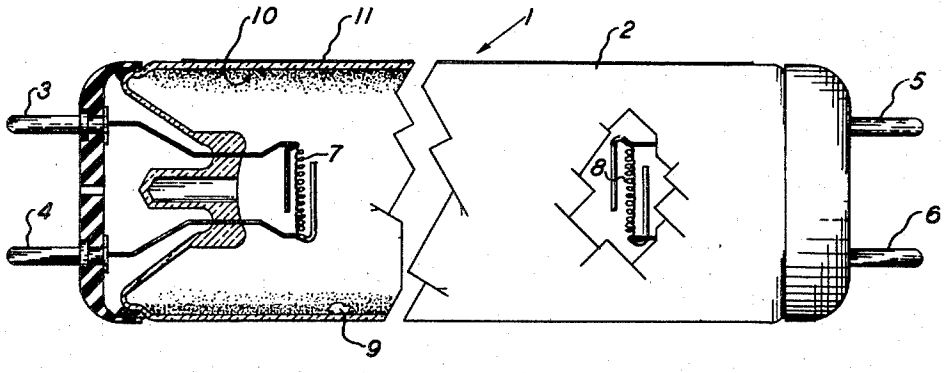
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STARTING STRIP FOR ELECTRIC DISCHARGE DEVICES

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STARTING STRIP FOR ELECTRIC DISCHARGE DEVICES

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This invention relates to electric discharge devices of the type employing ionizable mediums such as gases or vapors, and more particularly to improvements in the type of starting strip used thereon.

Heretofore starting strips were used to counteract the electrostatic effect of the wall charges on the interior of the gas discharge envelope and to produce distortion of the potential distribution or electrostatic fields between the terminals in order to facilitate starting of the discharge. In devices employing a hot and glowing filamentary electrode, the distortion of the field is due particularly to selective adsorption of certain ions or by electrons clinging to the wall of the envelope. The starting strip neutralizes and prevents the wall charge and in turn eliminates one of the causes of unsatisfactory lamp operation. These starting strips were usually thin coatings of conductive substances such as bronze or aluminum paint which frequently by rubbing or by an abrasion action wiped or wore off, thus destroying the continuity of the starting strip.

An object of my invention is to provide new and improved conductive starting strips for controlling electric discharge device operation.

Another object of my invention is to provide a new and improved composition to be used as a conductive starting strip for electric discharge devices which will adhere firmly to the glass wall of the envelope.

A further object of my invention is to provide a new and improved composition embodying a fritting agent which will adhere firmly to the glass wall of the envelope of a fluorescent lamp at temperatures below the glass fusion point.

A still further object of my invention is to provide a method of forming a conductive starting strip on a vitreous envelope of an electric discharge device.

Further features and advantages of my invention will appear from the following detailed description of species thereof.

In the drawing, Fig. 1 is a side elevation, partly in section, of a positive column discharge device 1 illustrating my invention. The device 1 shown therein comprises an elongated tubular or cylindrical envelope 2 having sealed into the ends thereof lead-in wires 3, 4 and 5, 6 electrically connected to the thermionic electrodes 7 and 8 respectively. Suitable provision may be made, not shown, for connecting these leading-in wires to a source of electrical energy for

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starting and maintaining the gaseous discharge between two electrodes and also for heating the electrodes if necessary, whereby they are brought to a glowing and emitting temperature. Electrodes 7 and 8 comprise a coil (preferably a coiled coil of wire such as tungsten coated with a material of high electron emissivity, such as an alkaline earth oxide like barium or strontium oxides or mixtures theerof). The envelope 2 contains a gaseous atmosphere such as a rare gas like kyrpton, neon, argon, or mixtures thereof or a vaporizable metal such as mercury, or a mixture of a gas and vaporizable metal. A quantity of mercury which may be in excess of that vaporized during operation of the device is indicated by a drop 9 inside the envelope 2. The device 1 may be a low pressure positive column lamp of the fluorescent type having a suitable phosphor 10 on the surface of the envelope 2, which under the influence of radiation produced by an electric discharge within the envelope, excites the phosphor to produce fluorescence. On the outside of the envelope 2 and terminating near ends thereof I provide a starting strip 11 of conductive composition and comprising an ingredient to effect adherence to the glass. More particularly, I provide a composition for use with a vitreous envelope which after application to the envelope, and after suitable heat treatment, results in a strongly adherent vitreous film containing metallic particles on the surface of the envelope, and which I have found to have a longer life and improved qualities which resist wearing, brushing, and deterioration encountered during ordinary and rough usage. This starting strip may be inside or outside of the glass receptacle and means may be provided for connecting it to one or both of the electrodes 7 and 8.

In accordance with an object of my invention, I provide a conductive composition to be used as a starting strip which will adhere firmly to the glass envelopes at temperatures well below the glass fusion point. Accordingly, I provide a composition for application to a vitreous envelope and which comprises a reducible metallic compound and a compound which serves to produce after heat treatment a closely adherent and evenly dispersed metallic layer or strip. Briefly stated, I prefer to use a reducible metallic compound of the metals in groups 1 and 8 of the periodic table such as silver oxide, platinum chloride or reducible compounds of gold and rhodium and the like, and a compound such as

lead borate which during the heat treatment and subsequent cooling adheres to the glass of the envelope holding tightly thereto and including in electrical conductive form, the reduced metallic ingredient, which is evenly distributed through the lead borate to provide an electrical conductive path, the specific resistivity of which is a function of the percentage of the reducible metallic compound used, and the ohmic resistance of the strip being determined by the specific resistivity and the dimensions of the strip.

In the mixing of the composition prior to application to the envelope and heat treatment thereof, I have found that one way in which the metallic compound may be reduced during the heat treatment is by the inclusion of a suitable reducing agent such as glycerin, citric acid, tartaric acid, polymerized formaldehyde, aluminum formate, sugar, or dextrin. A suitable diluent such as methyl alcohol may be added to vary the viscosity of the composition.

Generally speaking, I effect these desired results by means of a compound comprising ingredients which when combined together in the right proportions and applied to a glass envelope frits together and to the glass at temperatures from 500 to 550 degrees centigrade. For example, this conductive substance may be a paste containing 1050 grams of silver oxide, 600 cubic centimeters of methyl alcohol, 840 cubic centimeters of glycerin, and 450 grams of lead borate. The lead borate is used as the fritting agent. It frits to the glass envelope at temperatures below the glass fusion point and forms a porous body through which the reduced metal is dispersed. Thus a conductive and abrasive resistant path is obtained which by rubbing or abrasive action will not wipe or wear off, and by this means secure the continuity of the starting strip. Generally speaking the resistance of this starting strip is of a low ohmic value usually 25 to 100 ohms.

Application of this composition to the glass envelope 2 may be perfected either before or after the envelope is coated with phosphor and may be applied in any of the well known methods such as painting, squirting the material from a nozzle, or applying by means of a thin rubber roller. The viscosity, thickness, or stickiness of the composition may be varied to fit the type of application by means of a suitable diluent such as methyl alcohol.

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

1. In an electric discharge device of the type employing an ionizable medium, the combination comprising a vitreous envelope, a plurality of electrodes therein, and an abrasive resistant starting strip closely adherent to the vitreous envelope and comprising a layer of lead borate fritted to said envelope and containing evenly distributed metallic particles in physical contact giving to said starting strip a predetermined electrical resistance.

2. In combination, an electric discharge device of the type employing an ionizable medium and a vitreous envelope, a plurality of electrodes therein, and a starting strip comprising lead borate adherent to the vitreous envelope and containing evenly distributed particles of silver in physical contact giving to said starting strip a predetermined electrical resistance.

3. In combination, an electric discharge device of the type employing an ionizable medium and a vitreous envelope, a plurality of electrodes therein, and a starting strip comprising lead borate adherent to the vitreous envelope and containing evenly distributed particles of platinum in physical contact giving to said starting strip a predetermined electrical resistance.

4. In combination, an electric discharge device of the type employing an ionizable medium and a vitreous envelope, a plurality of electrodes therein, and a starting strip comprising lead borate adherent to the vitreous envelope and containing evenly distributed particles of rhodium in physical contact giving to said starting strip a predetermined electrical resistance.

5. The method of forming a conductive starting strip on a vitreous envelope of an electric discharge device which comprises forming a paste of reducible metallic compound, lead borate, and a reducing agent, applying said paste to the envelope, subjecting said envelope and paste to a temperature sufficient to effect reduction of said compound to particles of the corresponding metal and to frit the lead borate to the envelope in order to form a closely adherent layer thereof containing metallic particles of said compound in physical contact giving to said starting strip a predetermined electrical resistance.

6. The method of forming a conductive starting strip on a vitreous envelope of an electric discharge device which comprises forming a paste of silver oxide, lead borate, glycerin, applying said paste to the envelope, subjecting said envelope and paste to a temperature sufficient to effect reduction of said silver oxide and frit the lead borate to the envelope in order to form a closely adherent layer thereof containing metallic particles of silver in physical contact giving to said starting strip a predetermined electrical resistance.

7. The method of forming a conductive starting strip on a vitreous envelope of an electric discharge device which comprises forming a paste of platinum chloride, lead borate, applying said paste to the envelope, subjecting said envelope and paste to a temperature sufficient to effect reduction of said compound and to frit the lead borate to the envelope in order to form a closely adherent layer thereof containing metallic particles of platinum in physical contact giving to said starting strip a predetermined electrical resistance.

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