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ELECTRIC DISCHARGE VESSEL

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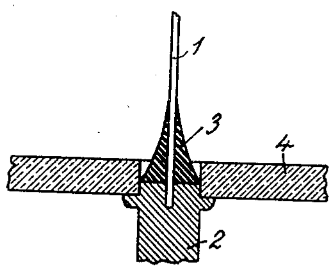

FIG. 1

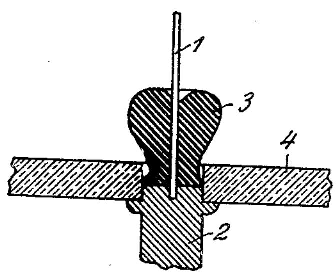

FIG. 2

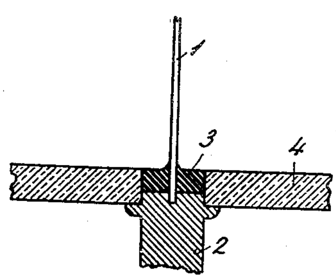

FIG. 3

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ELECTRIC DISCHARGE VESSEL

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6 Claims. (Cl. 250—27.5)

The present invention relates to electric discharge vessels, and more specifically to a method of supporting the electrode system and fixing the electrode supporting members of electric discharge vessels such as are used in small electronic discharge devices.

It is a known expedient to fix electrode supporting wires in glass bodies by squeezing the surrounding glass while in a molten condition. Various methods are also known for making vacuum seals between a ceramic substance and leading-in conductors extending therethrough. It is possible, for instance, to attach metal bodies to a ceramic material by means of certain metallic seals which may be spread out over the surfaces of the ceramic substance in the vicinity of the conductor. This will reduce the insulation and increase the capacitance values of the conductors to one another. Supporting wires so mounted must be conductively connected to terminals by soldering, welding or clamping, which requires an additional operation in the manufacturing process.

One object of the present invention is to provide a method of attaching two-part electrode leads and supporting wires to a refractory, and more particularly to a ceramic insulation member of electric discharge vessels which must have high insulation resistance and low interelectrode capacitance values. It is a further object of this invention to permit the connection of the supporting wires to the terminals which are adapted to be fixed in the insulation member by a glass seal as part of this or a prior step of fabrication.

The binding or sealing substance which is used for intimately joining the supporting wires to the terminals of the tube may, according to the invention, be also employed for rigidly fixing said supporting wires in an insulating body of ceramic material by heating said agent. This not only saves one step of the manufacturing process, but also provides a reliable conductive connection between the two parts of the leading-in conductors even if these parts have the simplest shapes. A brazed or other juncture between a supporting wire and its terminal must be effected either in an atmosphere which is free of oxygen or by the aid of reducing means. However, a metallic oxide must be formed for securing adhesion of a metallic binding agent to a ceramic substance, i. e., for rigidly interconnecting a supporting wire and a ceramic insulation member.

The softening and the melting properties of certain alloys depend upon the percentage of oxygen in the surrounding atmosphere and on the degree of temperature rise required for its softening. It has been observed that such alloys soften as a homogeneous mass expanding in a homogeneous flux. Before softening, such alloys may intumesce into finely branched masses which do not adhere to ceramic insulation bodies. When the temperature is further increased the substance will form into spherical particles and liquefy. It will now be adhesive. In order to insure adhesion between these metallic sealing substances and the ceramic insulation bodies, the adhesiveness of the substance to the ceramic material must be of a higher order than the general effective cohesion available in an atmosphere containing a low percentage of oxygen.

In a reducing atmosphere or in an atmosphere containing a low percentage of oxygen, the sealing substance may be used for intimately uniting the supporting wires with the ceramic insulation body at the same point at which these wires are connected to their terminals. This is accomplished without employing a second binding agent or adding to the first mentioned sealing substance. The same substance which has been employed for joining the supporting wire to its terminal may also be utilized for rigidly connecting the two metallic members and the insulating body of ceramic material.

The sealing may preferably be accomplished inside the ceramic member, i. e., in a bore or aperture therein. This will prevent the expansion of the sealing substance while in a fluid condition and will fix the shape thereof when it solidifies by causing it to stick to the supporting wire and to the walls of the bore or aperture.

The metallic coating of the connections heretofore described is slightly in excess of the diameter of the supporting wire. Neither the insulation resistance nor the capacitance of the wires to one another is impaired by this expedient.

The sealing operation is accomplished in such manner that the supporting wire is preliminarily joined in a reducing atmosphere by a brazing process to an extension or terminal whereupon a small quantity of oxygen is admitted for the purpose of causing the sealing substance to intumesce within the bore or aperture of the ceramic insulating body. The condition thus obtained is not yet adapted to insure adhesion between the binding or sealing agent and the ceramic substance. Additional oxygen is then introduced and the temperature is rapidly increased so as to produce a non-porous flux of the binding agent in the bore or aperture of the ceramic insulating body.

The present invention may be used with either vacuum tubes or gaseous discharge devices.

Figs. 1 to 3 schematically illustrate the various steps of the above described method.

Fig. 1 illustrates the initial stage of the connection between a supporting wire 1, and its metallic terminal 2 is effected by a sealing 3 in a reducing atmosphere. The melting point of the substance 3 is in excess of 900° C. This operation may be accomplished either within the ceramic insulation 4 or outside of it.

Fig. 2 illustrates the binding agent 3 in its intumescing condition upon the addition of a small quantity of oxygen.

Fig. 3 shows the binding agent 3 subsequent to its fluxing into the bore of the insulation 4. The edge of this aperture provides a sharply defined boundary for the binding agent so as to prevent the formation of a conductive layer or an increase of capacity on the insulating surfaces of the ceramic substance.

I claim:

1. The process of fastening a conductor to the ceramic wall of an electric discharge device and to a terminal, comprising the following steps: attaching the conductor to the terminal and passing it through an aperture in the wall with the terminal on the outside of the wall, and filling the aperture with a metallic sealing substance adhering to the walls of the aperture, the conductor and the terminal.

2. The method defined in claim 1, and in which the filling of the aperture is accomplished by heating the sealing substance in a reducing atmosphere.

3. The method defined in claim 1, and in which the filling of the aperture is accomplished by first heating the substance in a reducing atmosphere, and then adding oxygen to the atmosphere.

4. The method defined in claim 1, and in which the substance is first heated in a reducing atmosphere, and then oxygen is added to the atmosphere and the heat applied to the substance is rapidly increased.

5. In an article of the character described, a ceramic wall having an aperture, a conductor in said aperture and projecting to one side of the wall, a terminal on the other side of the wall and fastened to the conductor, and a metallic sealing substance substantially filling said aperture and flush with said one side of the wall.

6. The article defined in claim 5 and in which the substance is a metallic alloy having a melting point in excess of 900° C.

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