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PROCESS OF CONNECTING A METAL BODY
TO A VITREOUS CERAMIC BODY

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This invention relates to insulators and more particularly to a method of coating insulators with a metal to thereby facilitate the solder connection between the metal coated insulator and the cooperating metallic part.

One object of our invention is to provide in connection with a ceramic insulator a simple, inexpensive porcelain-to-metal seal, the metal being so bonded to the ceramic insulator as to form a joint therewith which is leakproof so far as air, gas or liquids are concerned.

Other objects and features of the invention will be hereinafter pointed out, the novel features being set forth in the appended claims.

In carrying out our process or method we utilize the disclosure of the co-pending application of the party Rowland, Ser. No. 204,613, filed April 27, 1938, in order to produce a mat glaze and for convenience of reference there is set forth herein a portion of the disclosure of the said co-pending application. A portion of the glaze is formed by mixing with the ceramic glaze material approximately thirty-five percent (35%) of pulverized aluminum oxide. This glaze mixture is then applied to the desired part of the insulator or other ceramic body in the usual way by spraying, brushing or dipping and upon the firing of the ceramic body there is formed in the surface of this finished glaze coating a plurality of undercut indentations or craters, of course of minute size. To this glazed surface, as in the co-pending application, we apply a metallic coating by means of a Schori metal spray gun. As disclosed in said co-pending application, it is possible by this Schori process to apply to this prepared glazed surface a coating such as copper or the like, the principal object of which is to form a conducting surface.

The present process is for an entirely different purpose, that is to form a metallic coating of appreciable thickness which is so bonded to the insulator as to firmly permanently adhere thereto. We have found that by making a mixture of approximately eighty-five percent (85%) lead, ten percent (10%) antimony and five percent (5%) tin we produce a form of type metal which has a melting point of approximately 245° C. It has, therefore, a great advantage over copper and like metals since even when it is sprayed on a ceramic body by quickly repeated passes of the metal gun it is impossible to heat the body of the insulator to a temperature higher than the melting point of this metal. Not only is this true but it is also true that the temperature of the porcelain or

ceramic body surface and metal is substantially the same so that each cools from the same point and there is no tendency to disrupt the continuity of the bond between the sprayed metal and the porcelain.

After having applied this metal coating, as above described, we now place the insulator or other ceramic object in an oven and bring the temperature thereof to approximately 160° C., which is approximately eighty-five (85) degrees below the melting point of the metal and hence does not in any way affect the surface or the bond between the ceramic member and the sprayed metal.

During the heating of the ceramic coated body we provide a solder pot containing approximately fifty percent (50%) lead and fifty percent (50%) tin and bring the temperature of this mixture to approximately 220° C., at which temperature we maintain such mixture. The ceramic object, having been heated to 160° C. is then removed from the oven and may be immersed in the solder pot in order to tin the metal coating by submerging the same in this solder solution for a period of approximately five seconds. The tinning of the coated portion of the ceramic body does not disturb the bond between such metal coating and the body, primarily because the temperature is still below the melting point of the sprayed body.

After the tinning process has been completed the ceramic body is now connected to the metal member and this may be done by first placing the hardware or metallic member to which it is wished to attach the ceramic body on the ceramic body adjacent the tin metallic coating and filling the intervening space, between the metallic body or hardware and metallic coating of the ceramic body, with solder. It is preferable that the hardware or metallic body also be tinned prior to the soldering operation but if desired a flux may be used and such prior tinning of the hardware avoided. After the solder has set the parts are slowly heated to approximately 220° C., at which time the metal in the joint between the hardware and the metallic coated ceramic body will level off and form a perfect bond which, as we have previously stated, will withstand pressure up to one hundred (100) pounds per square inch without leaking and will withstand violent changes in temperature, that is temperature cycles from boiling water to ice water without fracture or leaks.

It has been known that coatings of gold, silver and platinum can be applied to ceramic bodies to

form a metal coating thereon to which metallic parts can be soldered but so far as we are aware we are the first to perceive the possibility of applying to a ceramic body or insulator, by utilizing a mat glaze and by means of a Schori metal spray gun, an inexpensive metal which forms there-with a permanent and leak-proof bond and we have, by our invention, reduced the cost of such sealed, soldered joint from seventy-five percent (75%) to eighty-five percent (85%) and the time of applying the same to an even greater degree.

Having thus described our invention, what we claim is:

1. The process of connecting to a metal coating on a vitreous body, a metallic member, said process comprising spraying the vitreous body with an alloy including lead, antimony and tin, heating the coated body to a temperature less than the melting point of said alloy, submersing said heated body in a solder having a temperature greater than said heated body and less than the melting point of said alloy and finally bringing the metallic member adjacent said coated surface and filling the intervening space with solder.

2. The process of connecting to a metal coating on a vitreous body, a metallic member, said process comprising spraying a thin coat of alloy of lead, antimony and tin on the vitreous body, heating the coated body to a thermal temperature less than the melting point of said alloy, submersing said heated body in a molten mass comprising fifty percent lead and fifty percent tin for a relatively short time; said molten mass at the time of said submersion having a temperature less than the melting point of said alloy and greater than said heated body and finally bringing the metallic member adjacent said coated surface and filling the intervening space with solder.

3. The process of connecting to a metal coating on a vitreous body, a metallic member, said process comprising spraying a thin coat of a metal alloy on a roughened surface of a vitreous body, heating the coated body to a temperature less than the melting point of said metal alloy, submersing said heated body in a heated solder having a thermal temperature less than the melting point of said metal alloy and finally bringing said members closely adjacent the coated surface of said vitreous members and filling the intervening space with solder.

4. A process for connecting a metal body to a vitreous body comprising coating a vitreous body with a thin layer of type metal, heating the coated body to a temperature less than the melting point of said type metal, submersing said heated coated body in a solder having a thermal temperature less than the melting point of said type metal, removing said coated vitreous body from said solder, associating a metal body with said coated vitreous body and applying a molten

solder to the assembly at the juncture of said coated vitreous body and metal body.

5. A process for connecting a metal body to a vitreous body comprising spraying a type metal on a roughened surface of a vitreous body, heating the coated vitreous body to a temperature less than the melting point of said type metal, submersing said heated body in a molten solder, removing said heated body from said heated solder, associating a metal body with the coated vitreous body, applying a molten solder to the juncture of the coated vitreous body and the metal body, and finally heating the entire assembly to a temperature substantially equal to the melting point of the solder.

6. The process of connecting a metal body to a vitreous body comprising applying by means of a spray a coat of alloy composed substantially of 85% lead, 10% antimony and 5% tin to said vitreous body, heating said coated body, submersing said heated coated body in a metallic molten mass having a melting point less than said alloy, associating a metallic body with the coated surface of the vitreous body, and applying a molten metal composed of approximately 50% each of lead and tin to the joint between the metal body and the metal coating formed on said vitreous body.

7. The process of connecting a metal body to a vitreous body comprising applying a coat of alloy of lead, tin and antimony to said vitreous body, heating said coated body, submersing said heated coated body in a metallic molten mass having a melting point less than said alloy, associating said metallic body with the surface thus formed on said vitreous body, applying a molten metal having a melting point around 220 C. at the juncture of the metal body and said vitreous body, said molten metal having a melting point less than the melting point of said alloy, and subsequently heating the entire assembly to a temperature less than the melting point of said alloy so that the metal at said juncture, will level off to form a bond between the metal body and vitreous body.

8. A process of connecting a metal body to a vitreous ceramic body comprising subjecting said vitreous body to a metallic spray formed of an alloy of lead, antimony and tin to thereby cover a predetermined portion of said vitreous body with a thin coating of the said alloy, subsequently heating said coated vitreous body to a temperature less than the melting point of said alloy, submersing said heated body in a bath of solder to thereby overlay the first alloy coating with a second coating of solder, tinning a metal body, assembling said tinned metal body with the coated portion of said vitreous body, allowing said parts to cool, and then applying a solder at the juncture of said metal body and vitreous body.

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