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R. B. MANNING

2,502,970

ELECTRICAL DEVICE

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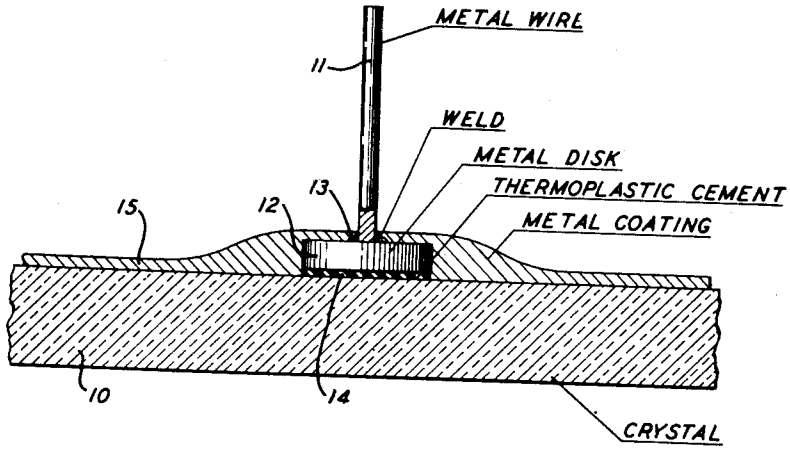

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ELECTRICAL DEVICE

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3 Claims. (Cl. 171—327)

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This invention relates to an electrical device, and more particularly to a metal coated crystal having a metal terminal wire secured thereto.

There are numberless uses in the electrical arts for a thin slab of dielectric crystalline material, commonly called a "crystal" in those arts, having a closely adherent coating of metal on one or both large faces and having a terminal wire or rod secured to be mechanically rigid with the crystal and electrically connected to a metal coating thereon. Such "crystals" have usually been made from hard and toughly durable natural mineral crystals, e. g., quartz par excellence. However, the supply of suitable natural material is insufficient to meet the demand, and crystals artificially grown from various soluble compounds which crystallize without water of crystallization and therefore are not, in general, efflorescent, are being used to supplement the materials obtainable from natural sources. Compounds such as ammonium dihydrogen phosphate, potassium dihydrogen phosphate and others are found to be satisfactory for such use. Crystalline material so derived does not have the mechanical strength nor the hardness nor the resistance to destruction by heat exhibited by crystalline silica in natural quartz. Methods and arrangements satisfactorily suitable for securing terminal wires to quartz crystals (crystal, without quotes, will hereinafter mean the slabs of the art) are often found to be impracticable for the far less rugged artificial crystals.

A prime object of the present invention is to provide a structure for the assembly of a crystal, a coating thereon, and a terminal therefor which shall be simple to make without breakage or failure and reliably durable in operation.

With the above and other objects in view the invention may be embodied in a crystal structure comprising a body of crystalline dielectric material having a smooth face thereon, a terminal base member having a corresponding face thereon, and apposed against the said face of the crystal, and a layer of thermoplastic adhesive material interposed between the apposed faces and securing the terminal base to the crystalline body, and consisting of more than 85% of a synthetic thermoplastic resin and less than 15% of a synthetic thermosetting resin.

Other objects and features of the invention will appear from the following detailed description of an illustrative embodiment thereof, taken in connection with the accompanying drawing in which the single figure is a very much enlarged view in central vertical longitudinal section of a portion of a crystal constructed in accordance with the invention.

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The illustrative embodiment of the invention herein disclosed comprises a thin, flat slab 10 of suitable crystalline material having a smooth upper face upon which rests a terminal base member 12 of suitable metal in the form of a lamella or small plate of sheet metal, here shown as a circular disk, but which may be of any desired peripheral contour so long as its under face is smooth and conforms to the upper face of the slab 10. The base 12 is mechanically secured to the slab 10 by an intercalated layer 14 of suitable thermoplastic cement, the thermoplastic character of this cement being the characterizing, crucial feature of the present invention. A terminal wire or rod 11 is secured rigidly to the base 12, e. g., by welding as indicated at 13, by soldering, or by having been made originally integral therewith. And, finally, a metal coating 15 extends over the upper surface of the slab 10 and over the exposed sides and top of the base 12.

While the invention is applicable in the case of crystals of natural quartz, it finds its use primarily when the slab 10 is of less rugged crystalline substance such as the artificially grown crystalline materials mentioned above. The coating 15 may preferably be of silver, but may be of any metal desired in particular cases. Similarly, the terminal 11 and terminal base 12 may be of any material suitable for the purpose in hand. The specific composition or character of none of these elements is material to the invention.

The case of the adhesive layer 14, however, is different. Here the nature and composition of the substance are crucially material to and characteristic of the invention. It has been found that, for satisfactory assembly of the parts as shown, the substance of the adhesive layer 14 must be a composition comprising mainly a thermosplastic synthetic resin, preferably polymerized vinyl acetate, to which has been added a small proportion of thermosetting synthetic resin, e. g., the phenol-formaldehyde condensation product familiarly known as "Bakelite." The admixture of thermosetting resin must be sufficiently small in proportion to ensure that the thermoplastic character of the composition is not destroyed, and sufficiently large to raise the softening temperature of the compound to a value practicable for the intended use of the finished device.

Copending application Serial No. 684,257, filed July 7, 1946, now U. S. Patent No. 2,468,594, by the present inventor together with another, dis-

closes and specifically claims a composition applicable to the present use. The cement therein described is broadly

I

	Parts by weight
Methyl acetate solvent	38 to 50
Vinyl acetate polymer	12 to 19
Phenol-formaldehyde resin	0.2 to 2.0
Mica flour	25 to 45

For present purposes the mica flour will, in most instances, be reduced materially or even entirely omitted. Thus, where the layer 14 is desired to be of minimum thickness, a preferred composition for the cement without any filler may be:

II

	Parts by weight
Methyl acetate solvent	38 to 50
Vinyl acetate polymer	12 to 19
Phenol-formaldehyde resin	0.2 to 2.0

For the particular case where the slab 10 has a frostily smooth surface and the disk 12 is of beryllium copper alloy, the preferred composition of the cement is one containing no filler as follows:

III

	Parts by weight
Methyl acetate solvent	About 43
Vinyl acetate polymer	About 17
Phenol-formaldehyde resin	About 1.2

The above formulae are, of course, those of the raw, liquid cement as applied. Upon being dried, i. e., as they exist in the finished crystal, those of interest here are respectively of the following compositions, calculated from those above:

	Per cent by weight
2. Vinyl acetate polymer	85 to 99
Phenol-formaldehyde resin	15 to 1
3. Vinyl acetate polymer	About 94
Phenol-formaldehyde resin	About 6

What is claimed is:

1. In an electrical crystal device having a member of crystalline material and a terminal base member of metal having mounted thereon a metal wire, the combination with the said members of adhesive material between the said members to hold the same together and consisting of 85% or more of a synthetic thermoplastic resin and a quantity of a synthetic thermosetting resin not exceeding 15%.

2. In an electrical crystal device having a member of crystalline material and a terminal base member of metal having mounted thereon a metal wire, the combination with the said members of adhesive material between the said members to hold the same together and consisting of

	Per cent
Vinyl acetate polymer resin	85 to 99
Phenol-formaldehyde resin	15 to 1

3. In an electrical crystal device having a member of crystalline material and a terminal base member of metal having mounted thereon a metal wire, the combination with the said members of adhesive material between the said members to hold the same together and consisting of

	Per cent
Vinyl acetate polymer resin	About 94
Phenol-formaldehyde resin	About 6

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