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PROCESS OF IMPROVING THE PLASTIFICATION OF NON-METALLIC ELECTRIC RESISTANCE MATERIALS

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This invention relates to a process of plastifying non-metallic electric resistance materials with the object to increase their plasticity by treating same by means of an extruding press.

The materials which are fit for the production of technically useful non-metallic resistance bodies, particularly such materials which, prior to the proper plastification process, are subjected to a pre-sintering or prc-melting procedure and which are in a crystalline state, are not to be maintained in the desired plastic condition by the binders generally used when plastification is imparted by pressure, such as water glass, sirup, or sulfite liquor. On the other hand, the methods for the production of plastic refractory masses as employed in the ceramic industry are unsatisfactory in this case because ceramic products as for instance clays, even in smallest quantities, may not be added to the resistance materials since already the presence of a small amount would entirely change their electric properties.

The following conditions are to be maintained for the plastification of electric resistance materials:

(1) Binders and sliding agents of organic type must be removable at the drying or pre-burning stage without residues.

(2) Inorganic additions, unless they will be volatilized when burning, must be of such a nature that they have no, or if any, only a favourable action upon the electric properties of the resistance mass. Their main object is to fill up the tiny spaces still present between the single granules of the primary mass so as to form a compact or dense body. Moreover, owing to their swelling capability caused by the absorption of water, they will support the organic binding and sliding agents by their tendency to agglomerate afterwards and by coating the mass grains and thus rendering same round.

(3) The amount of added organic agents should conveniently be kept small so that a too considerable porosity of the masses which have been sintered after the plastification procedure is avoided.

According to the invention, the additives employed for plastifying the masses mentioned above are divided into three kinds of which at least one of each kind must be present.

(1) Agents for insuring the cohesion during the plastification stage, i. e. agglutinants or proper binders. There may be used: lacquers, varnishes, glues, sirup, etc.

(2) Agents for rendering supple or sliding agents such as fatty substances, soaps, oils, emulsions, etc.

(3) Amorphous metal oxides of a high temperature-resistance to fill up the spaces between the single little crystals of the primary mass, which are finestly divided and may be won by precipitation. For example, certain oxides may be used for this purpose which, during the sintering procedure are incororated throughout the resistance masses, thus forming either equal or similar chemical compounds of an higher order, or reacting with the primary mass to form a solid solution without having a detrimental action on the electric properties of the treated mass.

It is a supposition for the combined use of the three kinds of additives that those employed at once should not repel each other. For example, as sliding agent there should not be added a water repelling heavy mineral oil to a water soluble agglutinant such as dextrine (British gum). Of the ingredients indicated under number 3 those substances are particularly suitable which, finestly divided, show a strong agglomerating tendency as for instance zinc oxide. Depending on the nature of the particular starting material for the resistance body the suitable inorganic additives are to be selected. Thus, for instance, iron oxide is used in resistance masses of a spinell type, having the property to turn into magnetite (ferrosoferric oxide) when burnt up to 1200° C., which itself is of a spinell type and, due to its isomorphisme, will react with the base substance forming an intimate combination (solid solution). For base substances of a zincite character zinc or cadmium oxide are to be chosen. The following may serve as an example for an entire composition of primary material and admixtures.

In order to plastify a base mass consisting of magnesium ferrite one should take as substance 1: 5% of linseed oil varnish, as substance 2: 5% of soft soap and as substance 3: 10% of finestly divided iron oxide which, if desired, has been obtained by precipitation.

When processing the thus composed mass one has to operate in the following manner: First the substances 1 and 2 are well intermixed or, if necessary i. e. if they should first repel each other, emulsified. Thereupon substance 3 is added and mixed with 1 and 2 until a thin, homogeneous paste is obtained. The base substance is then introduced therein with constant kneading until the intended quantity or the desired consistency have been obtained.

In general, the quantity of the volatile additives may be kept as small as to amount altogether at most to ten per cent, based on the weight of the whole material. This is absolutely necessary in order to yield densely sintered resistance bodies and to avoid too great a shrinkage when burning.

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