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METHOD OF APPLYING INORGANIC INSULATION TO ELECTRICAL SHEETS

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10 Claims. (Cl. 175—21)

This invention relates to a method of applying inorganic enamels to electrical sheets, this application being a division of my copending application Serial No. 543,003, filed June 8, 1931. By electrical sheets I mean steel sheets of suitable composition and physical condition which are adapted for use in electrical apparatus.

Hitherto organic enamels or varnishes have been used to coat electrical sheets for the purpose of insulating one sheet from another in electrical apparatus, thus cutting down the eddy loss. There are, however, many applications for which this type of coating is objectionable, such as in those cases where it is desired to anneal the punching after the enamel has been applied.

For producing porcelainic enamels, silicates are generally used, but these enamels, on account of the properties desired, are more complex than is preferred in an enamel for electrical sheets and these enamels are, moreover, of such a composition and fired at such temperatures as to cause the enamel to melt and flow. Enamels of this nature consequently are not suitable for electrical sheets as such enamels would cause the individual sheets to stick together when annealed in stacks. Again, these enamels are much heavier and more continuous than is necessary for the insulation of electrical sheets.

Inorganic enamels when properly made and applied have excellent electrical resistance and may be used to coat electrical sheets. When inorganic enamels are used the electrical sheet may be enameled before it is punched or cut into parts for electrical apparatus and these punchings may be subsequently annealed to produce better electrical qualities without destroying the enamel.

One of the objects of this invention is the application of an inorganic insulation to electrical sheets which will adhere to such electrical sheets and which can be uniformly deposited thereupon.

Another object is to apply an inorganic insulation which can be subjected to an anneal without detriment to the enamel.

A further object is the application of an inorganic enamel of certain composition which not only has the desired electrical properties but which acts as a protective coating for the sheets to prevent rusting of the same.

A still further object resides in the details of the present method of applying an inorganic insulating material so as to produce an even adherent coating having the desired characteristics.

Other and further objects and advantages will be understood by those skilled in this art or will be apparent or pointed out hereinafter.

I have found that very simple enamels are satisfactory for coating electrical sheets. For instance water glass may be used as the source of silicate although finely ground silica may also be used. To either of these there is added lime and another metallic oxide such as iron oxide, the proportions depending upon the properties desired in the enamel.

For example, these three constituents are used in the following proportions for certain applications:—

Water	200 cc
Lime	15 grams
Iron oxide	28 grams
Water glass	70 grams

It is understood that magnesium oxide may be substituted for the lime, or both may be used, and that silica, preferably in a finely ground condition, may be substituted for the water glass, and the iron oxide may or may not be used depending upon the properties desired in the enamel.

The sheets of material destined for electrical uses are passed singly through a bath of the liquid enamel, then through a set of rolls and through a drying oven to drive off the water. The rolls cause an even distribution of the liquid enamel on the surfaces of the sheets and remove excess enamel and may be of any suitable type. If desired, or found necessary glue or an excess of water glass may be added to the bath to make the enamel adhere more tightly to the sheet before the sheets are heated.

The drying oven is kept at a suitable temperature, for example, about 600° Fahrenheit, and the coated sheets are passed therethrough at a suitable rate such that the coating is subjected to the heat for about two minutes. The coating is finally baked on in the anneal which is carried out at about 1450° Fahrenheit. The temperature of the drying oven may vary considerably but in such cases the time of exposure thereto is suitably varied in inverse relationship thereto; that is, the hotter the oven the less the time of exposure and the cooler the oven the greater the time of exposure. In other words, the oven treatment is under conditions corresponding to about two minutes at about 600° F.

I may vary the constituents over wide limits to produce enamels having different properties, which, when baked at the proper temperature, form an insulating enamel suitable for electrical sheets. This enamel, especially when applied to

pickeled sheets, also acts as a protective coating preventing the sheets from rusting.

What I claim as new and desire to secure by Letters Patent is:

1. The method of applying an inorganic insulating material to steel sheets for use in electrical apparatus including the steps of passing the sheets through a bath of the liquid insulating material, then through a set of distributing and wiping rolls and then through a drying oven under conditions corresponding to about two minutes at about 600° F.

2. The method of applying an inorganic insulating material to steel sheets for use in electrical apparatus including the steps of passing the sheets through a bath containing a constituent selected from the group: lime, magnesium oxide; iron oxide; and a constituent selected from the group: silica, water glass; then through a drying oven under conditions corresponding to about two miuntes at about 600° F.

3. The method of applying an inorganic insulating material to steel sheets for use in electrical apparatus including the steps of passing the sheets through a bath of the liquid insulating material, then through a set of rolls and then through a drying oven to drive off the water content and finally baking the material by the subsequent annealing of the sheets.

4. The method of applying an inorganic insulating material to steel sheets for use in electrical apparatus including the steps of passing the sheets through a bath containing lime, iron oxide, and water glass, then through a set of rolls and then through a drying oven, and finally baking on the material by the subsequent annealing of the sheets.

5. The method of applying an inorganic insulating material to steel sheets for use in electrical apparatus including the steps of passing the sheets through a bath containing lime, iron oxide, and water glass, then through a set of rolls and then through a drying oven, said bath also containing a constituent selected from the group: glue, excess water glass, and finally baking on the material by the subsequent annealing of the sheets.

6. The method of applying an inorganic insulating material to steel sheets for use in electrical apparatus including the steps of passing the sheets through a bath containing a constituent selected from the group: lime, magnesium oxide; iron oxide; and a constituent selected from the group: silica, water glass; then through a drying oven; said bath also containing a constituent selected from the group: glue, excess water glass and finally baking on the material by the subsequent annealing of the sheets.

7. The method of applying an inorganic insulating material to steel sheets for use in electrical apparatus including the steps of passing the sheets through a bath of the liquid insulating material, then through a set of rolls and then through a drying oven for about two minutes at about 600° F., and finally baking on the material by the subsequent annealing of the sheets.

8. The method of applying an inorganic insulating material to steel sheets for use in electrical apparatus including the steps of passing the sheets through a bath containing a constituent selected from the group: lime, magnesium oxide; iron oxide; and a constituent selected from the group: silica, water glass; then through a drying oven under conditions corresponding to about two minutes at about 600° F., and finally baking on the material by the subsequent annealing of the sheets.

9. The method of applying an inorganic insulating material to steel sheets for use in electrical apparatus including the steps of passing the sheets through a bath containing lime, iron oxide, and water glass, then through a set of rolls and then through a drying oven for about two minutes at about 600° F., and finally baking on the material by the subsequent annealing of the sheets, the annealing being carried out at about 1450° Fahrenheit.

10. The method of applying an inorganic insulating material to steel sheets for use in electrical apparatus including the steps of passing the sheets through a bath containing a constituent selected from the group: lime, magnesium oxide; iron oxide; and a constituent selected from the group: silica, water glass; then through a drying oven under conditions corresponding to about two minutes at about 600° F., and finally baking on the material by the subsequent annealing of the sheets, the annealing being carried out at about 1450° Fahrenheit.

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