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INSULATION OF MAGNETIC POWDER FOR MASS CORES, IN PARTICULAR FOR HIGH FREQUENCY PURPOSES

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Fig. 1

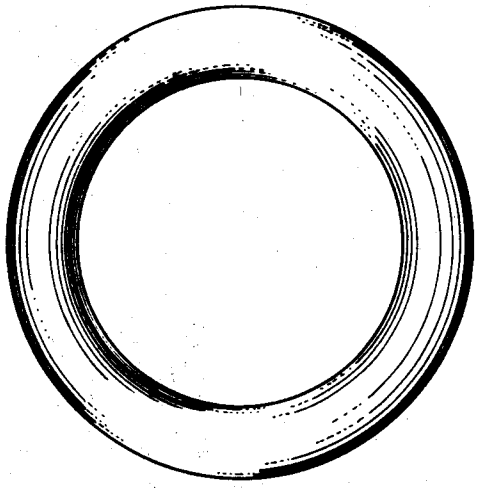


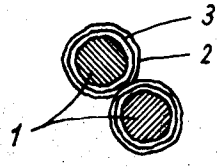
Fig. 2



Fig. 3



Fig. 4



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INSULATION OF MAGNETIC POWDER FOR MASS CORES, IN PARTICULAR FOR HIGH FREQUENCY PURPOSES

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1 Claim. (Cl. 175—21)

The present invention relates to magnetic cores especially those utilized in connection with high frequency work which cores are composed of finely divided magnetic material. In particular the invention is concerned with the substance utilized for insulating the individual particles of the magnetic material. The invention is fully described in connection with the drawing wherein Figs. 1, 2 and 3 show various forms which the cores take and Fig. 4 is an enlarged view of two of the magnetic particles showing the coating applied in accordance with the invention.

Mass cores, in particular those for high frequency purposes, require as fine a subdivision as possible of the magnetic powder and such an insulation of the individual magnetic particles from each other that the pressed magnet core possesses in particular those properties which are the most important for loading coil cores, namely, a high capacity of electrical insulation, great mechanical strength, and a high capacity of resistance with temperature variations. These properties are, in the main, dependent upon the insulating material with which each individual magnetic particle is surrounded. A whole series of such insulating substances has already been proposed, which substances fulfill certain of these required conditions.

Such an insulating substance must, furthermore, be so composed that it shows, in particular in the field of high frequency waves, only slight dielectric losses, since as is known, the dielectric losses increase with the third power of the frequency. It has already been proposed to use high quality insulating substances such as the known ceramic ones; these have, however, the disadvantage that in consequence of their brittleness, they easily break when subjected to pressure stresses, so that in this way the envelopes of the magnetic particles are destroyed on the pressing of the cores and thus the insulation is partially counteracted.

It must, furthermore, be required of an insulating substance for mass cores, in particular for high frequency purposes, that the layer round the individual magnetic particles is thin and uniform, so that the density of the magnetic particles and thus the permeability, is kept high. This condition is fulfilled by the mass cores which, as suggested, are insulated from each other by a film of oxide; oxide films are, however, bad dielectrics and consequently cause a sharp increase of the losses. Furthermore, it must be required of such insulating substances that their insulating layer has good adhesive properties with respect to the magnetic particles, and furthermore that the insulating layer besides having great elasticity is as hard and resistant as possible to mechanical stresses, that is, it must be resistant to pressure and be tough, since the individual particles must in the pressing withstand a shearing effect. In addition, the insulating substance must be capable of hardening, that is, be converted by subsequent heat treatments into a practically insoluble form so that the insulating process can be frequently repeated.

Hitherto, no insulating agents have been known by the use of which all these properties can be simultaneously attained. The majority of insulating substances have, in the case of high frequency, a considerable phase difference, so that the dielectric losses alone form an appreciable proportion of the total loss. The adhesiveness on iron is, with most insulating substances, not very high; it has sometimes been proposed to add certain products to particular insulating substances in order to increase the adhesive effect.

The object of the invention is to provide an insulating substance which, without any addition which is to assist one or the other effect, has all the above-mentioned favorable properties and is consequently adapted in particular as an insulating substance for mass cores for high frequency purposes. Such an insulating substance for magnetic powder of mass cores for high frequency purposes is, according to the invention, amber varnish.

It has been found possible to dissolve amber unmelted, and to thereby obtain amber varnishes which give very thin elastic but nevertheless pressure resisting films which adhere very firmly on iron. As is known, amber belongs to the insulating substances having very good dielectric properties. A further favorable property of amber varnishes is that they satisfactorily comply with the thermal conditions to which cores are subjected. By means of a curing process at high temperatures, the thin varnish films obtained, which coat the magnetic particles, are made practically insoluble. Amber solutions have, as compared with the use of finely powdered amber combined with a liquid medium, the advantage that they are extremely thinly liquid and ensure in addition to an extremely thin and tough film, a perfectly uniform insulating layer.

In order to improve the amber varnish in its mastic strength, the iron powder insulated with

an amber varnish and cured can for example be mixed before pressing, with a substance of higher mastic strength; such a substance is for example polystyrol, since it also shows extremely small losses with high frequency. This is shown by Fig. 4 of the drawing, wherein the outer coating **2** may comprise polystyrol and the inner coating **3** the amber varnish.

I claim:

Core material for inductance devices and the like, said core material being formed of particles of magnetic material, each of said particles being provided with two distinct relatively thin coatings of insulation material, the first coating comprising an amber varnish, the second coating comprising polystyrol.

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