

## UNITED STATES PATENT OFFICE

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## METHOD OF INSULATING BODIES

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This invention relates to electrical insulation, and particularly to the insulation of metal bodies, such as finely divided magnetic particles for use in magnetic cores for loading coils and the like.

Magnetic bodies made from finely divided particles of magnetic material assembled to form a homogeneous body by pressure or the like—in some cases with the aid of an additional binding means—, so-called “dust” cores, are being extensively used as cores for loading coils in telephone lines to improve the transmission characteristics thereof. In such cores it has been found to be necessary or desirable to insulate the magnetic particles from each other to reduce harmful eddy-current losses.

The object of the invention is to insulate metal bodies, such as magnetic particles for use in loading coil cores.

In accordance with the invention, the method consists in applying to the metal bodies or particles, a chemical combination of the desired insulation material, preferably a gaseous combination thereof, and applying heat thereto so that the insulation material is separated from its chemical combination and is attached to the metal bodies in the form of coatings. The coating thus made will adhere firmly to the metal bodies, and may be made of any desired thickness.

Metal bodies to be insulated may be of any suitable kinds, for example, in the case of magnetic dust cores for loading coils, they may comprise iron or an alloy of iron with another metal or metals in suitably finely divided form. Suitable insulation materials are boron, silicon or other elements with similar properties, and which may be easily separated from their hydrides, which are thinned in some cases with gases such as hydrogen or nitrogen. The insulation materials may be applied to the metal bodies either directly in the form of a gas or in the form of a fluid. In the latter case the fluid is changed on heating to the gaseous form.

A further insulating layer or protective layer may be produced on the coated bodies by another chemical change as by heating the coated bodies in an oxidizing atmosphere.

For example, if the coated body comprises a magnetic material such as iron coated with an insulating layer of silicon, or boron by a further application of heat an iron-silicon or iron-boron alloy of high electrical resistance may be obtained on the surfaces of the magnetic bodies. Also, for example, the boron or silicon coatings may be oxidized, as by heating in an oxidizing atmosphere to form outer insulation layers of  $B_2O_3$  or  $SiO_2$  on the magnetic particles.

In order to prevent strains being set up in the finished magnetic body when heat is applied thereto to improve its magnetic properties, due to the different coefficients of expansion of the magnetic and insulating materials, the magnetic and insulating materials should be selected so as to have substantially the same coefficients of expansion, as, for example, by using iron as the magnetic material and boron sesqui-oxide as the insulating material.

It may be advantageous also to coat or saturate the finished magnetic body with another protective layer of natural or artificial materials such as, for example, by a compound of ozokerite or the like, by well known processes.

What is claimed is:

1. The method of producing a magnetic core comprising finely divided particles of magnetic material insulated from each other, which comprises applying to the surface of each particle of said material a hydride of an insulating material, applying heat thereto to decompose the hydride, and to deposit a coating of said insulating material on said surface, applying to the coated surface a chemical which will react with the coating thereon to form an insulating oxide layer on said surface and then forming the resulting insulated magnetic particles into the desired core form.

2. A method in accordance with that of claim 1 and in which said insulating oxide layer is formed by heating the insulated magnetic material in an oxidizing atmosphere.

3. The process of making a magnetic core which consists in mixing a finely divided magnetic material and silicon hydride, apply-

ing heat to the mixture to decompose the hydride and to deposit coatings of silicon on the particles of magnetic material, heating the silicon coated particles in an oxidizing  
5 atmosphere to produce outer insulation layers of silica and forming the resulting particles into the desired core form.

4. The process of making a loading coil core which comprises mixing finely divided  
10 particles of a magnetic metal including iron with boron hydride, heating the mixture to decompose the hydride and to deposit coatings of boron on the magnetic particles, heating the boron coated particles in an oxidizing  
15 atmosphere to produce outer insulating coatings of boron oxide thereon, and then compressing the coated particles into the desired core form.

In witness whereof, I hereunto subscribe  
20 my name this 18th day of January, 1929.

RICHARD SWINNE.

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