106-84-M Cross Reference EXAMINER

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MAGNETIC MATERIAL

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5 Claims. (Cl. 175—21)

My invention relates in general to magnetic material and more specifically to an improved magnetic material for use in loading coils for telephone circuits or for use in impedance or inductance coils, and the method of producing the material and forming it into useful structures.

The main object is to produce a material having low core losses and a relatively high permeability in order to provide a highly efficient coil with a core of the smallest possible size. In order to accomplish this object it is customary to use a powdered or finely divided magnetic dust and it is necessary to, as nearly as possible, completely insulate the individual grains of the magnetic dust and provide an efficient binder to hold the dust together in as close relation as possible without rupturing the insulating envelope.

In accordance with the present embodiment the present invention contemplates the construction of magnetic cores of powdered iron particles insulated and pressed into cores in the manner hereinafter specified although metal particles of nickel-iron or any other alloy may of course be used if desired. The metal particles are first mixed with colloidal andalusite in dry form, then mixed with a binder such as sodium silicate in a solution. Heat is applied during this last mixing until the binder has dried. An oxidizer such as ammonium chromate is then added to the particles for the purpose of oxidizing any of the facets of the particles which may have been left uncoated by the andalusite in the binder and they are then pressed into cores. The cores are then heat treated to a temperature sufficient to liberate oxygen from the oxidizer to oxidize the uncoated facets of metal and the cores are ready for winding.

Following is a more detailed description of the method employed in treating the iron particles. As stated, I prefer to use a powdered iron or iron dust of sufficient fineness to pass through a screen of 300 mesh. The dust may be powdered in any of the well known methods. The iron particles are first mixed with about .5% by weight of colloidal andalusite, the two being thoroughly mixed together by tumbling dry for about twenty minutes. Andalusite is an anhydrous insoluble mineral found in nature and is the preferred insulator due to there being no change in volume due to loss of water of crystallization during heat treatment. Another material which may be used if desired is an extremely finely divided asbestos fibre. After mixing the iron with the colloidal andalusite an alkaline solution of sodium silicate is prepared and the iron is mixed with about 2.6% by weight of the solution. This mixture is then tumbled to dryness and then subjected to a temperature of approximately 150° centigrade to bake the binder so as to hold the insulator in place.

As previously stated, there may be certain surfaces or facets of the iron particles which are not completely covered or coated by the insulator and in order to insure insulation of these facets I now add about .3% by weight of an oxidizer such as ammonium chromate to the mixture. Other substances such as aluminum chlorate or sodium chlorate may be used and these materials are chosen due to their stability at mixing temperatures and to the fact that oxygen is released at slightly higher temperatures for oxidizing the uninsulated facets of the particles. The reason for choosing an oxidizer of this type is that during pressing it is possible that certain of the insulating envelopes around the particles may be pierced or punctured and it is very desirable to have an oxidizer which will not release its oxygen during mixing or pressing but only when heated to a higher temperature after pressing. The oxygen when released can follow the grain boundaries to more completely insulate each grain by oxidation at a time when no further working of the material will occur. Because ammonium chromate completely releases its oxygen content at a very definite temperature, it has the qualities which make it the preferred oxidizer for this use. In other words, it not only releases its oxygen at a definite temperature, but completely releases its whole content so as to insure that no further oxidation will occur later. This insures the production of a core which will remain stable over a period of years. The mixture of the insulated iron and the oxidizer is now again tumbled to dryness and the temperature brought to 105° to 110° centigrade in about an hour to complete drying.

The material is now ready for pressing into cores and they are so formed by pressing the material into rings at about 300 tons per square inch. After pressing, the cores are heated to a temperature above the decomposition point of the oxidizer to cause the oxidizer to release its oxygen content and oxidize the uninsulated portions of the iron surfaces. The cores are now ready for winding. Although I have described the above method in connection with certain preferred materials, it should be understood that other materials having the same qualities as those mentioned may be substituted without departing from the invention.

What I consider to be novel is set forth in the following claims.

What is claimed is:

1. The method of making magnetic structures which consists in first coating particles of a magnetic material with an insulating material, then adding to the insulated material a substance which liberates oxygen when heated to 160° C., then pressing the insulated material into cores, and heating the cores above 150° C. to cause oxygen to be liberated in said substance to oxidize any uninsulated portions of the material.

2. The method of making magnetic structures which consists in first mixing magnetic material with colloidal andalusite, adding a solution of sodium silicate as a binder, drying the mixture and then adding a solution of ammonium chromate as an oxidizer, then pressing the material into cores, and then heating the cores to a temperature sufficient to cause the oxidizer to liberate oxygen to oxidize any exposed uninsulated surfaces of the magnetic material.

3. The method of producing magnetic structures which consists in coating the particles of magnetic material with sodium silicate binder and colloidal andalusite, in heating the insulated particles to dryness, in adding a solution of ammonium chromate and heating to dryness, pressing the material into cores, then heating the pressed cores to a sufficient temperature to cause the decomposition of the ammonium chromate and consequent liberation of oxygen, to cause oxidation of any uninsulated surfaces of the magnetic particles.

4. The method of insulating powdered iron particles which consists in first mixing the particles with colloidal andalusite, then adding a solution of sodium silicate to the mixture and drying, then adding a solution of ammonium chromate to the mixture and drying, then pressing the treated material into cores and thereafter heating the cores to a temperature sufficient to decompose the ammonium chromate and cause the oxygen liberated thereby to oxidize any uninsulated surfaces of the magnetic material.

5. The method of making a magnetic structure, which consists in forming into a homogeneous mass a mixture of powdered iron, andalusite, sodium silicate, and ammonium chromate, then heating the mass to a temperature sufficient to cause the ammonium chromate to liberate oxygen to oxidize any uncoated surfaces of the magnetic material.

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