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UNITED STATES PATENT OFFICE

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MAGNET CORE

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The present invention relates to the construction of magnet cores and is particularly concerned with cores which are made from powdered material by the application of high pressure. Such cores find considerable application for loading coils of the type used on telephone lines where their special magnetic properties are particularly advantageous. It has generally been considered necessary in the manufacture of loading coils of this nature to employ magnetic material in as finely divided a state as possible in order that the particles may form a compact and substantially homogeneous mass and also so that with the insulation of individual particles there may not be a conducting path of appreciable length. A difficulty has however been encountered in preparing the magnetic material in a suitable powdered form since when the material has the most advantageous magnetic properties it also has in high degree the property of ductility and is thus reduced to powder only with great difficulty. This difficulty has been overcome to some extent by rendering the material brittle, either by subjecting it to suitable heat treatment or by the addition of a small percentage of some other material. This procedure has the disadvantage, however, that after the loading coils have been pressed it is necessary to subject them to further heat treatment to restore their magnetic properties to the maximum value, or alternatively if such heat treatment is not undertaken loss of magnetic properties of the coil will necessitate the use of a coil larger than would otherwise be necessary. Moreover the heat treatment is liable to affect adversely the mechanical properties of the pressed core.

The chief object of the present invention is the provision of a method for reducing the magnetic material to a sufficiently fine state without the necessity for first rendering it brittle. According to the invention this is accomplished in that the material is drawn out into wire of very small diameter, for instance as small as 4 mils, and is then fed through a small hole in a steel plate to a cutter which will preferably be of a rotary type by which it is cut up into very small lengths. The pieces so produced may then be annealed, coslettised, coated with insulating varnish and pressed at a pressure of 10–15 tons per square inch.

The magnetic material employed is preferably a nickel iron alloy and it may be desirable in some circumstances to add a small proportion, say up to 20%, of powdered iron which tends to fill up the interstices and thus produce a more compact core.

As an alternative to the use of the coslettising process, a somewhat similar result may be obtained by treating the chopped up particles with phosphoric acid. If hard drawn nickel-iron wire is used the acid treatment is preferably effected at about 300° F. and results in the production of a deposit of nickel and iron phosphates on each particle. The powdered iron for mixing with the nickel iron particles is also treated with phosphoric acid but without heat. The insulating varnish used as a binder preferably comprises a suitable solution of the synthetic resin known under the trade name "bakelite". Where the alternative process described above is employed it is desirable to use somewhat higher pressures for the moulding operation and this may be performed at up to 40 tons per square inch. The rings after being pressed are wound, bound with tape, dried and impregnated and the completed coils put in cases.

It is found that loading coils constructed by the above or other known processes from magnetic material prepared as above described are more satisfactory as regards their magnetic properties and after the core has been pressed to the required shape do not need any further treatment to bring these properties back to their original value.

I claim:

1. A magnet core for loading coils and the like consisting of particles comprising short lengths of nickel-iron wire which are insulated from one another by a coating of nickel and iron phosphates and consolidated by pressure.

2. A magnet core for use in loading coils and the like comprising short lengths of

nickel-iron wires treated with phosphoric acid at approximately 300° F. and subsequently subjected to high pressure.

3. A process for making magnet cores for use in loading coils and the like in which finely-drawn nickel-iron wire is cut into small lengths, annealed, treated with phosphoric acid and mixed with powdered iron which has been similarly treated with phosphoric acid after which the mixture is coated with synthetic resin varnish and then subjected to pressure in a heated mould to cause the particles to agglomerate.

4. A process as claimed in claim 3 in which the nickel-iron particles are treated with phosphoric acid at approximately 300° F. while the iron powder is treated with phosphoric acid at ordinary temperatures.

5. A magnet core comprising four parts of short lengths of nickel-iron wire mixed with one part of powdered iron, a coating of nickel-iron phosphates on said powdered iron and wires to insulate the same, and insulating material separating said phosphate coated particles and binding the same into a solid mass.

6. A process for making magnet cores which consists in annealing short lengths of nickel-iron wire, treating the same with phosphoric acid and mixing it with powdered iron, then coating the mixture with an insulating compound after which it is subjected to heat and pressure to bind the whole into a solid mass.

7. The method of making magnet cores which consists in treating short lengths of nickel-iron wire with phosphoric acid at a temperature of 300° F. while at the same time coating the particles with an insulating material and subjecting them to pressure to form the same into a solid mass.

8. The method of making magnet cores which consists in cutting finely-drawn nickel-iron wire into small lengths, annealing the wires, treating them with phosphoric acid at a temperature of 300° F., mixing the treated wires with powdered iron which has been treated with phosphoric acid, coating the mixture with a binder of insulating material, and then binding the same into a homogeneous mass under heat and pressure.

9. The method of making magnet cores which consists in treating a mixture of powdered iron and short lengths of annealed nickel-iron wire with phosphoric acid to insulate the particles from each other, then coating the particles with an insulating material, and then subjecting the mass to heat and pressure to bind the same into a solid mass.

10. A magnet core composed of short lengths of nickel-iron wire mixed with powdered iron, a coating of phosphoric acid on said wires and said powdered iron to insulate the same, and insulating material separating the phosphoric coated powder and wires.

In testimony whereof I affix my signature.

PHILIP NORTON ROSEBY.