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METAL POWDERS FOR MAGNETIC MASS CORES

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2 Claims. (Cl. 75—.5)

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This invention relates to metal powders for magnetic mass cores.

Iron powder obtained by thermal decomposition of iron carbonyl has been used since a long time for the production of magnetic mass cores, by reason of its special magnetic properties. For the said purpose, the particles of iron are coated with an insulating substance and the powder particles thus insulated are pressed into cores in moulds under high pressure. Especially when employing such mass cores for high frequencies, for example in radio technique, the eddy current losses in the magnetic mass cores should be as small as possible if a satisfactory efficiency of the coils wound on the mass cores is to be obtained. This is the better attained, apart from a sufficient fineness and suitable shape of the particles of the iron powder used, the more completely the individual powder particles are insulated from one another.

The efficiency of the insulation can be determined by measuring the electrical resistance between two points in the mass core which are a defined distance apart—the so-called cross-resistance, a small cross-resistance corresponding to a great conductivity and thus an incomplete insulation, and a high cross-resistance corresponding to a poor conductivity and therefore a more complete insulation. The attainment of the most complete insulation or the highest possible cross-resistance necessitates special additional measures in the insulation of the powder particles.

We have now found that an increase in the cross-resistance can be obtained in a simple manner by using a metal powder which has been prepared by thermal decomposition of iron carbonyl and nickel carbonyl, preferably in the presence of ammonia, and which has been subjected, before being worked up into mass cores, to no diffusion annealing.

The preparation of this iron-nickel powder is preferably effected in known manner by thermal decomposition of a mixture of iron carbonyl and nickel carbonyl vapours in the free space of a heated vessel. The individual carbonyls may be vaporised separately and the vapours then mixed together in the desired proportions, or a mixture of the carbonyls, containing the carbonyls in the desired proportions, may be vaporised. The nickel content selected may vary within wide limits. Generally a nickel content of only a few per cent is sufficient to produce the desired effect of low electrical conductivity in the mass cores; it is preferable not to go below a nickel content of about 0.5%.

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By varying the throughput of the carbonyl mixture through the decomposition chamber, the size of the particles of the iron-nickel powder formed can be influenced to a great extent. For particularly high frequencies, a particle size of only a few thousandths of a millimeter or less is especially advantageous.

In spite of the presence of the nickel carbonyl, the powder particles forming by the decomposition do not change their globular shape which is characteristic for carbonyl iron particles produced in this manner, or scarcely change that shape, although by the decomposition of nickel carbonyl alone in a free space globular particles are not formed. The said globular shape of the iron-nickel powder particles is of special value for the attainment of a good insulation of the individual particles. It is preserved because a special diffusion annealing of the iron-nickel powder, during which a deformation and recrystallisation of the individual particles might take place, is not necessary in order to obtain the desired high cross-resistance.

In order to avoid an undesirably high carbon content in the iron-nickel powder, it is preferable to add ammonia gas to the mixture of iron carbonyl and nickel carbonyl to be decomposed.

In the working up of the iron-nickel powder into mass cores, there may be used as insulating agents the resins or synthetic materials or inorganic substances such as waterglass already known for this purpose.

The mass cores prepared by pressing the insulated iron-nickel powder are directly employed for the desired purposes, for example in radio or television apparatus, without a thermal treatment such as is otherwise necessary, for example in the case of Permalloy powder.

The following example will further illustrate this invention but the invention is not limited to this example.

Example

Mixtures of iron carbonyl with different amounts of nickel carbonyl are thermally decomposed according to the conventional method in the free space of a heated vessel. Each of the resulting iron powders having different nickel contents, is insulated with 4 per cent by weight of a hardenable phenol resin and pressed into mass cores of E-shape under a pressure of 3000 kilograms per square centimetre. The mass cores are measured in a coil at a wave length of 235 metres. The efficiency values (Q) at a wave length of 235 metres and the values of the cross-

resistance, in dependency on different nickel contents, are the following:

Nickel content	Q (λ=235 m.)	Cross-resistance, ohms
0.3%	165	200
0.5%	202	800
1.1%	315	2,000
3.3%	340	3,500
3.8%	353	100,000

What we claim is:

1. A metal powder adapted for the production of magnetic mass cores and consisting essentially of iron and about 0.5% to 3.8% of nickel, said powder being prepared by thermal decomposition of iron carbonyl and nickel carbonyl in the free space of a heated vessel.

2. A metal powder adapted for the production of magnetic mass cores and consisting essentially of iron and about 3.8% of nickel, said powder being prepared by thermal decomposition of iron carbonyl and nickel carbonyl in the free space of a heated vessel.

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