

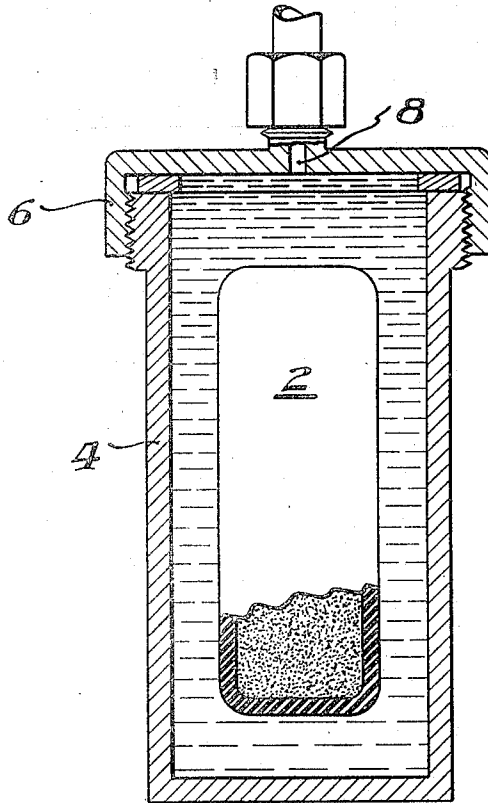
Oct. 13, 1942.

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2,298,908

POWDERED METAL

Filed Dec. 31, 1940



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POWDERED METAL

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Application December 31, 1940, Serial No. 372,435

6 Claims. (Cl. 29—155.5)

This invention relates to the treatment of so-called "powdered metal," particularly spongy paramagnetic particles, such, for example, as comminuted Swedish iron, and to the manufacture of cores and other structures from such materials.

It will be appreciated by those skilled in the art of molding coherent structures from paramagnetic particles mixed or coated with insulating materials that the more dense the individual metal particles, the smaller the stroke required in the molding operation. The smaller the molding stroke, the better the electrical characteristics of the finished product. This is so because the friction between the particles during the molding operation is lowered and, as a consequence, there is less likelihood of puncturing or otherwise damaging the insulation which must necessarily be present between the individual metallic particles in the finished structure.

Accordingly, an object of the present invention is to provide paramagnetic particles of a density greater than that obtaining in the natural or untreated but otherwise similar spongy metal particles.

A related object of the invention is to provide an improved and economical method of compressing and permanently increasing the density of the individual particles, and one which, in its practice, obviates the danger of sintering the metal.

Certain metals, in particle size, e. g., Swedish spongy iron, are ductile, not friable, and hence when subjected to a compression force of considerable intensity, may be compressed and rendered of permanently increased density. Previous attempts to increase the density of such materials by compression have not been altogether satisfactory principally because of the tendency of the particles to lose their identity and to form a coherent permanently solid mass, as if sintered. This difficulty is obviated in accordance with the invention by lubricating the metal particles prior to their compression and, when necessary or desirable, subsequently removing the lubricant.

In utilizing the invention in the production of cores and other magnetic structures for use in signaling apparatus it is preferable to start with spongy iron particles which will pass through the mesh of sieve having 300 or more openings per square inch and to thoroughly mix a batch of the particles with common motor oil or other inorganic or organic lubricant, such, for example, as graphite, grease, hydrogenated vegetable oil, etc.

Only sufficient lubricant to thoroughly coat the particles need be employed in the mix. The coated particles are then subjected to a compression force of the order of one hundred tons per square inch either in an ordinary piston or plunger type mold or in one operating on the hydraulic principle, such, for example, as the one shown in the drawing. In this latter case the batch may be enclosed in a bag 2 formed of synthetic rubber, or other strong material, which is immune to the oil and the bag placed in a tank 4 having a tightly sealed cap 6 and port 8 for the admission of the hydraulic fluid. The fluid pumped into the mold exerts its compression force equally in all directions upon the bag containing the lubricated metal particles and compresses the individual particles so that they are rendered smaller and more dense. At the indicated pressure, the reduction in bulk and in particle size will be of the order of twenty-five percent. The lubricant permits the particles to change their shape and slide one against another but prevents them from adhering together.

The contents of the bag may then be dumped into a solvent (e. g., gasoline) bath to remove the lubricant, since the presence of the lubricant may be objectionable in any substantial quantity in magnetic structures of the general character described. The washed and dried compressed particles may be molded in any desired form in accordance with the usual procedure and percentages of insulating materials.

Cores and other magnetic structures formed of comminuted metals which have been compressed and densified in accordance with the invention exhibit higher permeability and lower eddy current losses than those formed of untreated but otherwise similar metals. The increase in the factor of merit of such structures may be of the order of twenty-five per cent.

What is claimed is:

1. Method of treating comminuted spongy metal which comprises coating the spongy metal particles with a material which will prevent sintering of the particles when subjected to a compressive force, and thereafter applying to said coated particles a compressive force in substantially all directions and of an intensity sufficient to reduce the size of said particles.

2. Method in accordance with claim 1 and wherein said coating comprises a lubricating material.

3. Method of decreasing the particle size of comminuted spongy iron, said method comprising lubricating the said spongy particles and then

subjecting them to a compression force applied substantially in all directions.

4. Method in accordance with claim 3 and wherein said lubricant comprises a petroleum product.

5. Method in accordance with claim 3 and wherein said lubricated particles are subjected to a compression force of the order of one hundred tons per square inch.

6. Method of making a structure of com- 10

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minuted spongy paramagnetic spongy particles, said method comprising lubricating said particles, subjecting said lubricated particles to a compression force applied in substantially all directions and of an intensity sufficient to reduce their particle size, removing the lubricant and thereafter molding said particles together with a suitable insulating material in the form of the structure desired.

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