

Sept. 18, 1934.

K. MAIER

1,974,079

MAGNETIC BODY AND PROCESS OF MAKING SAME

Filed June 14, 1933

FIG. 1

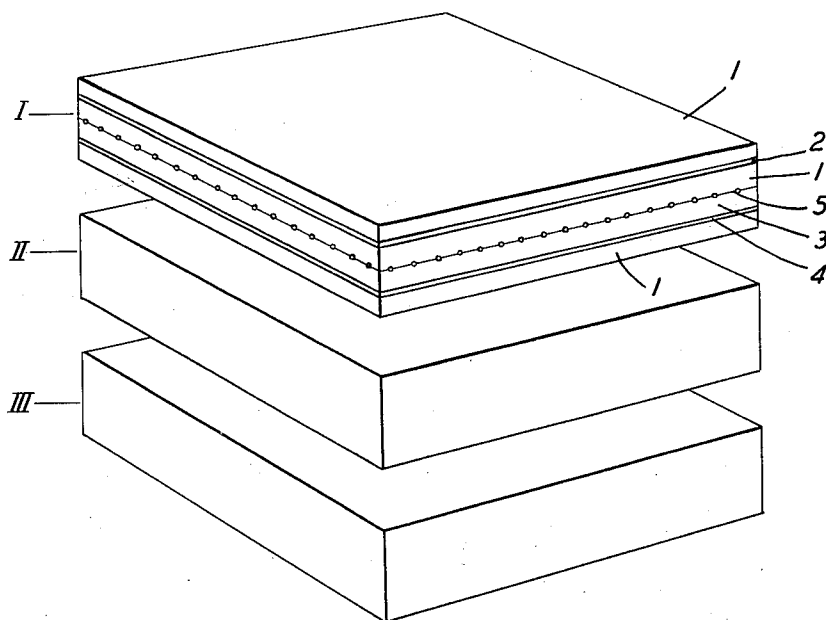


FIG. 2

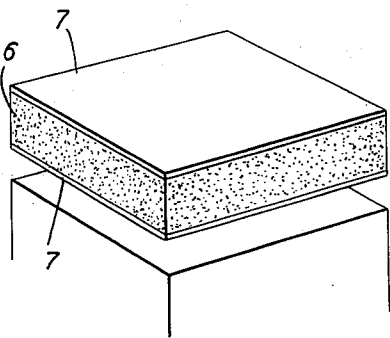
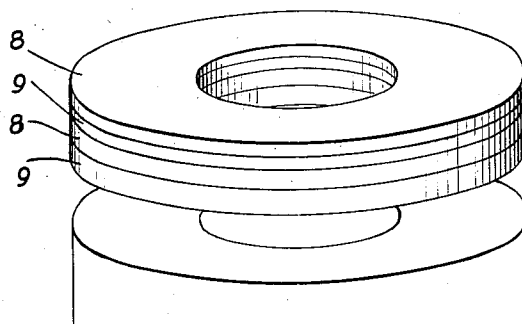


FIG. 3



INVENTOR
K. MAIER

BY *H. A. Burgess*
ATTORNEY

UNITED STATES PATENT OFFICE

1,974,079

MAGNETIC BODY AND PROCESS OF
MAKING SAME

Karl Maier, Berlin-Charlottenburg, Germany,
assignor to Siemens and Halske Aktiengesell-
schaft, Siemensstadt, near Berlin, Germany, a
company of Germany

Application June 14, 1933, Serial No. 675,695
In Germany June 25, 1932

6 Claims. (Cl. 175-21)

This invention relates to magnetic bodies and particularly to magnetic cores, sheaths, etc. for electrical transmission apparatus such as is used in communication systems, for example, loading coils, transformers and the like, and processes for making same.

An object of the invention is to produce a magnetic body having improved magnetic characteristics.

As is well known magnetic alloys of the nickel-iron group because of their desirable magnetic characteristics are preferred as magnetic material for use in magnetic cores for loading coils and transformers. These alloys are commonly made by melting together the individual metals to form an alloy which is then brought into the desired form by casting, rolling and the like. In another process used heretofore the desired alloy is formed by mixing the individual materials in powder form and subjecting the mixture to a heat treatment. The material obtained in this way, which is characterized by a granular structure, has a high stability at relatively low permeability. In most fields of the electric art, however, the requirement of high stability gives way to that of high permeability, for as is well known, when employing a material of high permeability, the size of the apparatus manufactured can be reduced and thus a saving in material obtained.

In accordance with the process of the invention a material may be obtained which is remarkable for high permeability. Furthermore, the process has the advantage that in spite of the same basic materials in the construction of the metal block from these materials the permeability can be very easily adapted to the desired object of use. In accordance with the invention these advantages are attained by building up a magnetic body comprising several layers of different magnetic materials and then subjecting the body to a heat treatment so that there is a partial alloying and sintering together of the individual layers of material. The stratification of the materials thereby takes place in such a way that the lines of force preponderantly fall in the direction of the cohering metal structure. The formation of layers of the individual materials may be carried out in several different ways. One way is to use sheets of different material which are placed on each other or to place intermediate layers of pulverized or flat structure of magnetic conducting or even non-conducting material between the individual sheets of the same or different magnetic materials. Instead of the mechanical layer formation it is also pos-

sible to apply the individual layers successively on to a carrier material by electrolytic means. A layer formation can also be carried out by means of metal comminution. For the sake of completeness it may also be mentioned that the desired layer formation can also be obtained by the pouring on of different metals.

The nature of the invention and its advantages will be clear from the following detailed description thereof when read in connection with the accompanying drawing, Figs. 1 to 3 of which illustrate different forms of magnetic bodies which may be constructed by the process of the invention.

Fig. 1 shows a layer formation in which the formation takes place by purely mechanical means by the superposition of different sheets. Such a formation is preferably suitable for apparatus of the alternating current art. The structure shown in Fig. 1 differs from the structures of the prior art which comprise superposed sheets I, II, III etc., of magnetic material of uniform composition separated by paper insulating material, in that the sheets I, II, III etc., in turn are constructed of individual layers indicated in the figure by the layers designated with the Arabic numerals 1, 2, 3, 4 and 5, and which may consist of materials of different magnetic conductivity. Layers of non-conducting material may also be included if necessary; for example, the sheets 1 may be iron plates of the same composition; the sheets 2 and 4 may be, for example, nickel plates of different compositions, and sheet 3 a plate of different composition, for example, a highly siliconized iron plate. The layer 5 represents a peculiarity insofar as the material of this layer is only distributed in lumps between the layer materials 1 and 3. This step may be employed with advantage if materials 1 and 3 alone are not sufficient to produce the desired alloy. The bundle of sheets constructed in this manner is subjected to a heat treatment to which may be added a further mechanical treatment, for example, rolling. The bundle may be subjected to mechanical processes such as rolling before the heat treatment in order to establish a closer contact of the layers.

Fig. 2 shows a further example of a layer construction. The layer designated as 6 represents the main material, on whose surfaces are produced thin coatings 7 of another material to provide additional layers. The coatings 7 may be applied by electrolytic means, by spraying finely divided metal dust on the surfaces of the layer 6 or by pouring a molten material of the desired composition on to the layer 6.

For the construction of a magnetic body, such as, a laminated disc, ring transformer, as shown in Fig. 3, thin elementary discs of the basic materials designated 8 and 9 may first be superposed to form each laminated disc. After the superposition of the individual elementary discs 8 and 9, the laminated disc so constructed is subjected, while simultaneously employing mechanical means to compress the laminated pack together, to a heat treatment in order to obtain a partial alloying of the elementary discs. Preferably, the elementary layers should be constructed by electrolytic means.

What is claimed is:

1. A magnetic body formed by superposing a plurality of sheets or plates of different magnetic materials and subjecting the whole to heat treatment to produce a partial alloying and sintering together of adjacent layers.

2. A magnetic body formed by superposing a plurality of sheets respectively comprising nickel and iron so as to produce alternate layers of nickel and iron, and subjecting the whole to heat treatment to produce partial alloying and sintering together of the nickel and iron.

3. A magnetic body formed by superposing a

plurality of sheets and pulverized particles of different magnetic materials, and subjecting the whole to heat treatment to produce partial alloying and sintering together of adjacent layers.

4. A magnetic body formed by superposing a plurality of sheets of different magnetic materials, compressing the body so formed to produce close contact between the several layers, and heat treating the whole to produce partial alloying and sintering together of adjacent layers.

5. A magnetic body formed by superposing a plurality of plates of different magnetic materials, heat treating the superposed plates to produce partial alloying and sintering together of the different magnetic materials and subjecting the resultant body to mechanical treatment to improve its magnetic and mechanical characteristics.

6. The process of producing a magnetic body which consists in superposing sheets of different magnetic materials, and subjecting the resulting product to heat treatment to cause partial alloying and sintering together of adjacent layers while subjecting it to mechanical treatment to bring the layers closer together.

KARL MAIER. 100

30 105

35 110

40 115

45 120

50 125

55 130

60 135

65 140

70 145

75 150