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EASILY MACHINABLE MAGNETIZABLE BODY HAVING A SMALL COERCIVE
FORCE AND THE METHOD OF PRODUCING THE SAME

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Fig. 1

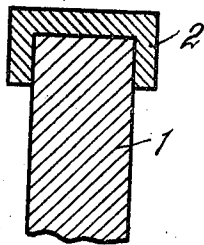
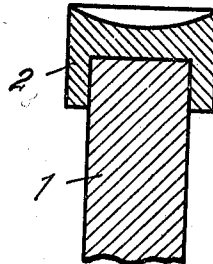


Fig. 2



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EASILY MACHINABLE MAGNETIZABLE BODY
HAVING A SMALL COERCIVE FORCE AND
THE METHOD OF PRODUCING THE SAME

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3 Claims. (Cl. 148—12)

This invention relates to easily machinable magnetizable bodies having a small coercive force and the method of producing the same.

Magnetizable alloys are known in the art which present particularly good magnetic properties and which may be employed to advantage, for instance, for coil cores of relays, headphones, loudspeakers, etc. These alloys have in some cases the disadvantage that when giving them the desired shape they are very difficult to machine owing to their hardness and brittleness. This is, for instance, the case with iron-silicon-aluminum alloys, of which especially those alloys containing 8 to 12% silicon, 4 to 8% aluminum and the remainder iron present particularly good magnetic values.

The object of the invention is to extend the field of application of these materials.

According to the invention a magnetizable body consists of a magnetically highly permeable base section of a material difficult to machine and of a highly permeable covering section of a material easy to machine, the two sections having about equal magnetic softness, i. e. equally low coercive forces, and the material of the cover section being of such composition that its magnetic properties are not impaired by cooling from elevated temperatures. By "covering section" is to be understood a complete or a partial jacket, for instance in the form of a cap, as well as the lining or covering of a single surface.

Preferably an alloy containing iron and silicon to which other substances, above all aluminum, may be added, serves as a material for the basic body. The above-mentioned alloy containing 8 to 12% silicon, 4 to 8% aluminum and the remainder iron is particularly suitable. A suitable material for the covering is, for instance, an alloy containing 50% iron and 50% nickel. Of course, any other alloy may also be employed, if it meets the requirements as to its magnetic softness and capability of being cooled.

The covering section may be produced from a cast alloy. In general, however, a sintered alloy is preferable. The alloy is first sintered at temperatures below 1000 degrees centigrade, for instance at a temperature of 900 degrees centigrade, before the alloy is given the desired shape. The shaped cover piece is then placed on the basic body, and the whole is then sintered at higher temperatures, for instance between 1200 and 1300 degrees centigrade. Upon the subsequent cooling, the covering piece shrinks so that it firmly adheres to the basic body.

The use of sintered alloys is particularly ad-

vantageous, because their shrinkage is considerably greater, in some cases as much as about ten times greater, than that of poured magnetic alloys.

The last sintering step may preferably be effected in such a manner that it forms at the same time the thermal treatment of the magnetic body required for attaining the desired magnetic properties. This simplifies the production by eliminating an otherwise necessary step.

Figs. 1 and 2 of the accompanying drawing show two different forms of magnetizable bodies according to the invention, in diagrammatic form.

In Fig. 1, 1 denotes the base section of an alloy difficult to machine and 2 a cover section in the form of a pole piece consisting of an alloy easy to machine. Both sections 1 and 2, though consisting of different alloys, have low coercive forces of similar magnitude. The cover section may be given any desired shape depending upon the purpose for which the bodies are intended. Fig. 2, for instance, shows a somewhat different cover section 4 united with a base section 3.

What is claimed is:

1. The method of producing a composite magnetic structure of low coercive force, comprising the steps of preparing a shaped base section of a highly permeable alloy of great mechanical hardness and having a low coercive force upon cooling from annealing temperatures, preparing a second section of a highly permeable and mechanically softer alloy by sintering said latter alloy at temperatures below 1000° C. and shaping said sintered section to its desired form, placing said sintered section on said first section, heating both sections together at temperatures above 1000° C., and allowing both sections to cool so as to firmly secure said second section to said base section by shrinking.

2. The method of producing a composite magnetic structure of low coercive force, comprising the steps of preparing a shaped base section of a highly permeable iron-silicon-aluminum alloy of great mechanical hardness and having a low coercive force upon a heat treatment comprising cooling from annealing temperatures, shaping a second section of a highly permeable and mechanically softer alloy of different composition and having a higher shrinkage than said first alloy when cooled from annealing temperatures, heating said two sections and allowing them to cool in union with each other so as to thereby shrink said second section onto said base section, the temperature of said heating and the rate of

the subsequent cooling being adapted to the annealing temperature and rate of cooling of said heat treatment.

3. The method of producing a composite magnetic structure of low coercive force, comprising the steps of preparing a shaped base section of a highly permeable iron-silicon-aluminum alloy containing 8 to 12% silicon and 4 to 8% aluminum and having great mechanical hardness and exhibiting a reduced coercive force upon a heat treatment comprising cooling from annealing temperatures, sintering a cover section of a mechanically softer iron-nickel alloy having an in-

creased magnetic permeability upon a similar heat treatment also comprising annealing and cooling, shaping said sintered section to its desired form, placing said sintered section on said first section, heating and cooling both sections in engagement with each other so as to thereby improve the magnetic properties of said alloys and simultaneously shrinking said cover section onto said base section, the temperature of said heating and the rate of said subsequent cooling being adapted to the annealing temperature and the rate of cooling of said heat treatments.

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