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METHOD OF MANUFACTURING PERMANENT MAGNETS

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This invention relates to a method of manufacturing permanent magnets consisting of a copper-cobalt-nickel alloy.

In the U. S. Patent 2,170,047 is described a permanent magnet consisting of alloys containing 5 to 70% cobalt, 10 to 50% nickel and the remainder substantially copper and which under circumstances may include traces up to 5% of a metal of the chromium group as well as small quantities of impurities. These alloys are machineable even in a hardened state and have excellent magnetic properties. Magnets consisting of such alloys were given their final form by casting. However, the magnets when cast to the final form present, as a rule, certain drawbacks in that the alloys consisting of constituents of different specific weights tend to segregate, which impairs the magnetic properties thereof to a considerable extent. Furthermore, when hardening particularly large pieces flaws are easily liable to be formed.

These drawbacks are removed according to the invention by sintering the pulverized constituents of the magnetic alloy described in the above patent. In this case the tendency to segregate is avoided as well as the formation of flaws. Furthermore, sintered magnets of complicated form are very economic to manufacture, such as, for instance, magnets for telephones, oscillographs and the like. Since a machining is not necessary for sintered magnets which may be manufactured directly in the desired form, any waste of material during the manufacture of the magnets is avoided. This means a great economic advantage when manufacturing magnets on a large scale, since the waste material cannot always be utilized and furthermore a saving in time is attained. Since the grain size in sintered magnets is far smaller than that of magnets obtained by casting, the sintered magnets are considerably more homogeneous, as far as the magnetic properties are concerned, than such obtained by casting. Finally, there easily occurs a slight oxidation when casting, in which case oxide traces penetrate the finished magnet body and impair the magnetic properties thereof. Also this disadvantage is removed by sintering the magnets.

The sintering is effected at temperatures of 1000 degrees centigrade and over in a neutral or reducing atmosphere or in vacuum. Under certain circumstances it is preferable to employ a preliminary alloy containing two constituents of the alloy to be produced, to pulverize these two constituents and to alloy them with the third constituent by the sintering process. In order to attain particularly high magnetic properties it is preferable to add titanium, aluminum and/or copper.

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