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PERMANENT MAGNET

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4 Claims. (Cl. 175—21)

This invention relates to magnets and has reference to magnets made from ferrous-nickel-aluminium alloys.

Steel alloys for permanent magnets containing large percentage of nickel, and lesser percentages of aluminium, together with certain other elements are already known, and it is the object of the present invention to provide magnets made from an alloy of this general type but having a certain specific constitution which, after subjection to a special heat treatment hereinafter set out, exhibit enhanced magnetic properties.

The present invention consists in its broadest aspect of a permanent magnet composed of from 30% to 35% nickel, from 10% to 15% aluminium, from 0.4% to 4% titanium and the rest iron having a carbon content of not over 0.15%, the composition being heat treated to render it permanently magnetizable by heating to a temperature between 1100 to 1300° C. and quenching in oil, and then heating to between 650 and 800° C. and cooling in air or air blast.

The preferred alloy for use in the manufacture of magnets contains, in addition to iron, about 32% nickel, 12% aluminium and 2% titanium. Carbon is bound to be present but it is desirable to keep it as low as possible and preferably the carbon content should not exceed 0.1%. It has been found, however, that a carbon content of 0.15% is permissible.

By heat treatment this alloy is made to exhibit desirable magnetic properties. The preferred heat treatment consists in heating to 1280° C. and quenching in oil and reheating to 750° C. and cooling in air blast. After such a treatment the properties of a sample of the steel having the preferred constitution were found to be:—

Remanence (B_{rem}) ---------gausses---	5,000
Maximum product (BH_{max}) of B and H_	1,000,000
Coercive force (H_c) --------gausses---	500

The heat treatment of the alloy to render it permanently magnetizable is approximately the same with all alloys within the scope of the invention.

What I claim and desire to secure by Letters Patent is:—

1. A permanent magnet of steel alloy consisting of 30 to 35% nickel, 10 to 15% aluminum, substantially .4 to 4% titanium and the rest iron, heat-treated by first being raised to a temperature of between 1100° C. and 1300° C. and quenched in oil followed by heating to substantially 675° C. to 775° C. and cooled in air, said magnet having a BH_{max} of 1,000,000 or over and a coercive force of 500 or over.

2. A permanent magnet of steel alloy consisting of substantially 32% nickel, 12% aluminum, .4 to 2.0% titanium and the rest iron of not over 0.15% carbon, heat-treated by first being raised to a temperature of between 1100° C. and 1300° C. and quenched in oil followed by heating to substantially 675° C. to 775° C. and cooled in air, said magnet having a BH_{max} of 1,000,000 or over and a coercive force of 500 or over.

3. A permanent magnet of claim 2 in which the titanium content is about .4%.

4. A permanent magnet of claim 2 in which the temperature of the first heat treatment is about 1280° C. and the temperature of the second heat treatment is about 750° C.

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