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# UNITED STATES PATENT OFFICE

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## ALUMINUM ALLOYS

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3 Claims. (Cl. 75—1)

The invention relates to aluminum base alloys containing magnesium and cobalt and to such alloys of this nature as have excellent properties at elevated temperatures.

We have discovered that aluminum base alloys, by which we mean alloys containing about 80 per cent by weight or more of aluminum, containing 1 to 15 per cent by weight of magnesium, are greatly improved in their properties at high temperatures if there is added to the alloys amounts of cobalt from about 0.2 to 3.5 per cent by weight. The alloys by reason of these additions of cobalt are considerably hardened, particularly as regards their properties at elevated temperatures, i. e., in the neighborhood of 400 to 700° Fahrenheit, and this increased hardness is effected without an appreciable decrease in elongation. Since increased hardness, without substantial decrease in elongation, is a property greatly desired at elevated temperatures, the addition of cobalt to the aluminum-magnesium alloys above mentioned increases their commercial usefulness, particularly their use as structural material in reciprocating parts operating at high temperatures. The addition of cobalt in the amounts named also increases the ease with which the aluminum base magnesium alloys are cast in permanent molds.

The aluminum base alloys containing about 1 to 6 per cent of magnesium and about 0.2 to 1 per cent of cobalt are readily placed in a wrought condition, and when alloys for working are desired, we have found it advantageous to maintain the cobalt content between 0.2 to 1 per cent since greater amounts of cobalt increase the difficulties of working without producing advantages which compensate therefor. The aluminum base alloys containing 2.0 to 15.0 per cent of magnesium are most advantageously used as casting alloys, and in such case amounts of cobalt from 0.2 to 3.5 per cent will produce the advantageous results above noted.

In these alloys the addition of 0.05 to 0.4 per cent of antimony or bismuth, or both of these metals in total amount not exceeding that named, has a pronounced effect in maintaining a high elongation in the alloys when they are subjected to elevated temperatures. Either or both of these metals added to the alloys in total amount much greater than about 0.4 per cent by weight bring about a decrease in elongation which is very disadvantageous when the alloys are to be used at elevated temperatures.

As an example of the alloys herein described may be cited an aluminum alloy containing 6 per cent of magnesium and 1.5 per cent of cobalt. This alloy after being treated for 4 hours at 700° Fahrenheit was maintained at a temperature of 600° Fahrenheit for 10 days at the end of which time, and when tested at that temperature, it had a tensile strength of 15,700 pounds per square inch and an elongation of 3.2 per cent in 2 inches. A similar alloy not containing cobalt but similarly treated and tested has a tensile strength of about 15,300 and an elongation of about 5.5 per cent in 2 inches.

The aluminum used in the manufacture of the alloys may be of the highest purity or it may contain amounts of usual impurities, and the term "aluminum" as used herein and in the claims designates the aluminum of commerce. It is an incidental property of our alloys that the presence of iron in amounts as high as 2 per cent by weight is not harmful to the high temperature properties of the alloys and, therefore, a wide choice between the various grades of commercial aluminum is possible.

We claim:

1. A metallic alloy characterized by high tensile and physical properties at elevated temperatures and consisting of 1.0 to 15.0 per cent by weight of magnesium and 0.2 to 3.5 per cent by weight of cobalt, the balance being aluminum.

2. A workable metallic alloy characterized by high tensile and physical properties at elevated temperatures and consisting of 1.0 to 6.0 per cent by weight of magnesium and 0.2 to 1.0 per cent by weight of cobalt, the balance being aluminum.

3. A metallic alloy characterized by high tensile and physical properties at elevated temperatures and consisting of 2.0 to 15.0 per cent by weight of magnesium and 0.2 to 3.5 per cent by weight of cobalt, the balance being aluminum.

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