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ALUMINUM BASE ALLOY

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This invention relates to aluminum alloys and particularly to such alloys for casting which are relatively hard and have a low coefficient of expansion.

Low expansion relatively hard aluminum alloys heretofore known have included large quantities of silicon. However, these prior art alloys have had several drawbacks and particularly as regards to their appearance and poor color. For pistons for internal combustion engines, for instance, a very low coefficient of expansion alloy is necessary for most efficient operation. For electric flat irons, for instance, a very hard alloy is desirable in order that it will not smudge or mark articles on which it is used.

According to this invention, I have provided an aluminum alloy, the material constituents of which are aluminum, copper, zinc, and tin, together with the usual impurities. This alloy is more hard and more silvery colored than the above described silicon-aluminum alloys, and is therefore more suited for the construction of electric flat irons and other articles where hardness and a good color are desirable. This alloy also has a lower coefficient of expansion than heretofore known aluminum alloys, making it particularly desirable for pistons for internal combustion engines, and is generally desirable for casting.

The alloy according to this invention has not only the characteristics of being hard, having a good color, and having a low coefficient of expansion, but also it has a low casting shrinkage, is readily machinable, is relatively non-corrodible, and will not lose its color on being heated in the open air. Its use is thus not solely limited to electric flat irons and pistons, but may be used wherever an alloy having the above characteristics is desirable.

In its preferred form, my new alloy comprises about 60 percent aluminum, about 24 percent copper, about 12 percent zinc, and about 4 percent tin with or without small quantities of iron, silicon, nickel, manganese, magnesium, chromium, molybdenum, etc., as impurities. This composition may be varied within relatively wide limits without departing from the invention. It has a pattern maker's shrinkage of about 5/64" per foot, a coefficient of expansion of about .00002 per degree centigrade between 0 degrees centigrade and 300 degrees centigrade, and hardness of about 40 to 50 Shore or about 300 Brinell, a melting point of about 1,000 degrees Fahrenheit, and a specific gravity of about 3.65. These properties are obtainable without the addition of magnesium or silicon and without heat treatment.

Nickel in proportions up to 5 percent may be substituted in the alloy for as much copper without particularly changing its characteristics except that at higher temperatures the alloy containing nickel is somewhat stronger. The substitution of up to about one percent of molybdenum or chromium for a like percentage of copper may be made with the same beneficial results arising upon the substitution of nickel. However, proportions greater than one percent of molybdenum or chromium cause brittleness and should be avoided.

As has been stated herein above, the alloy according to this invention is extremely hard. However, an alloy of aluminum which is less hard than the preferred extremely hard form of the invention but is hard enough to be non-smudging and is also relatively non-corrodible and of good color is often desirable such as in building hardware. Extreme hardness is undesirable for such uses for the reason that breakage in rough handling is likely to occur. The hardness in the alloy is due to the copper. Thus by adding less copper softer varieties of the alloy may be provided. I have found it advantageous to reduce the zinc content proportionately with that of the copper so that the proportion between copper and zinc is always about as two to one. An example of an alloy such as above described having reduced hardness is one comprised of 68 percent aluminum, 20 percent copper, 10 percent zinc, and 2 percent tin.

While it is desirable that the percentage of impurities be maintained as low as possible, it is particularly desirable that iron and silicon be reduced to a practical minimum and should be considered only as undesirable impurities.

While it is true that the composition according to this invention may be varied within relatively wide limits, aluminum alloys having 15 percent copper are more or less commonplace, that is, without particularly constituting good qualities, and those having 30 percent copper are too brittle to serve any useful purpose. Accordingly, the percentage of copper in the alloy according to my invention lies within these limits. In its broadest form the alloy comprises between 15 and 30 percent copper, 5 to 15 percent zinc, 1 to 5 percent tin, and the balance principally aluminum. A preferred alloy having the most desirable characteristics comprises 20 to 25 percent copper, 10 to 12 percent zinc, 2 to 5 percent tin, and 60 to 68 percent aluminum.

Heat treatment such as quenching and aging

are not effective in the alloys according to this invention, but a normalizing or annealing is in some cases desirable, for the annealing of this alloy will lower its hardness for example from 40 to 30 Shore.

Having thus described my invention, what I desire to secure by Letters Patent and claim is:

1. An alloy of aluminum containing between 15 and 30 percent copper, 5 to 15 percent zinc, 1 to 5 percent tin, and the balance aluminum except for impurities, the alloy being characterized by relatively great hardness and low casting shrinkage.

2. An alloy of aluminum containing between 15 and 30% copper, 5 to 15% zinc, 1 to 5% tin, the balance being of aluminum except for impurities.

3. An alloy of aluminum containing in the order of 60% aluminum, in the order of 24% copper, in the order of 12% zinc, and in the order of 4% tin.

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