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ALLOY

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The invention relates to aluminum base alloys. It relates particularly to alloys of this nature containing substantial amounts of copper and magnesium. The alloys within the scope of my invention also contain silicon and iron in smaller, but effective, amounts.

Aluminum base alloy castings are now frequently used in the manufacture of washing machine parts. The part of a washing machine, for instance, known in the trade as a "dolly" or "agitator" is customarily made from an aluminum base alloy. In order to serve its function in producing a turbulent motion in the washing solution it should be made of an alloy of as low a specific gravity as possible, consistent with sufficient strength to serve its purpose. Since it is periodically immersed in a washing solution, usually alkaline, it should be of high corrosion resistance, and especially resistant to the attacks of alkaline solutions. A washing machine part is cited merely as an example, it being understood, of course, that there are numerous applications of aluminum base alloys wherein corrosion resistance in the presence of alkaline reagents is a distinct advantage. Of importance, likewise, from the commercial standpoint is the question of pleasing appearance of an object sold for domestic use.

A prime object of the invention, then, is the development of an alloy of low specific gravity, high corrosion resistance, and good casting qualities.

I have discovered that aluminum base alloys containing from about 4 per cent to about 10 per cent of copper, from about 2 per cent to about 6 per cent of magnesium, from about 0.5 per cent to about 2.0 per cent of iron, and from about 0.5 per cent to about 3 per cent of silicon are characterized by excellent corrosion-resistant characteristics in the presence of mild alkalis. Furthermore, they can be cast in thin sections in permanent molds without misruns, cold shuts, or other indicia of unfavorable casting characteristics. For lightness, strength, and possibility of rapid and exact duplication the permanent mold method of casting is ideal for objects such as washing machine agitators, but although an alloy of copper, magnesium, and iron within the above disclosed range is excellent from many viewpoints, it was only by raising the range of silicon above the ordinary impurity content that the casting of the alloy in permanent molds was rendered possible in the case of articles of thin cross section. I have found that by thus increasing the silicon content between about 0.5 per cent and 3.0 per cent I secure an excellent compromise on strength and casting properties. The copper should be present in amount from about 4 per cent to about 10 per cent and the magnesium from about 2 per cent to about 6 per cent. Iron usually occurs as an impurity in aluminum base alloys, averaging generally less than 1 per cent. An iron content between about 0.5 per cent and 2.0 per cent has a favorable effect on hardness, strength, and casting properties of the alloys herein described.

As a test of the practical performance of this alloy under actual conditions a chill cast specimen was immersed in a strongly alkaline solution in a washing machine and remained therein while the machine completed a total run of 160 hours. Similar samples of other alloys were also subjected to the same test, including alloys heretofore customarily used for making washing machine agitators. Fresh solution at or near the boiling point was substituted about every 40 hours. In these tests an amount of sodium carbonate was added which is roughly five times more concentrated than ever used in home washing processes, and this in combination with a 160-hour test is probably the equivalent of more than a year's ordinary use.

At the expiration of these tests the alloys of the type claimed herein were still white and clean whereas other alloys were corroded to varying extents, and all of them were fairly seriously discolored.

As disclosed in a copending application of Maurice W. Daugherty and myself, filed concurrently herewith, chemical methods are available whereby the surface of cast articles of this alloy may be considerably improved in appearance. The alloy itself as it comes from the mold has a characteristic bluish tint which does not have any particular effect on its physical properties although it seems to affect its appearance and, therefore, sales appeal. Briefly, the treatment consists in immersing the cast article in a chemical bath having a hydrogen ion concentration greater than 10^{-6} gram-ions per liter. It is unnecessary in the present specification to go into the matter further since a preferred result may be secured by dipping the article for a few seconds in a 10 per cent (by volume) solution of nitric acid at room temperature. There are, of course, many commercial applications wherein a bluish surface tint is entirely unobjectionable and a dipping process is unnecessary.

As a preferred composition within the alloy range disclosed hereinabove I suggest an alumi-

num base alloy containing about 6 per cent of copper, about 4 per cent of magnesium, about 1 per cent of iron, and about 2 per cent of silicon, the balance being commercial aluminum.

The alloys disclosed and claimed herein may be compounded by any of the methods known in the art, either by adding the alloying elements to the aluminum in the pure form or by means of rich alloys or hardeners. The alloys may also be made up by using as a base certain aluminum alloys already compounded and by calculated additions bringing the composition to the desired figure.

The term "aluminum base alloy" as used herein and in the appended claims embraces the usual impurities found in aluminum ingot of commercial grade or absorbed in the course of the usual handling operations incident to ordinary melting practice.

I claim:

1. An aluminum base alloy containing from about 4 per cent to about 10 per cent of copper, from about 2 per cent to about 6 per cent of magnesium, from about 0.5 per cent to about 2.0 per cent of iron, and from about 0.5 per cent to about 3.0 per cent of silicon, the balance of the alloy being substantially all aluminum.

2. An aluminum base alloy containing about 6 per cent of copper, about 4 per cent of magnesium, about 2 per cent of silicon, and about 1 per cent of iron, the balance being substantially all aluminum.

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