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MAGNESIUM ALLOY

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3 Claims. (Cl. 75—168)

Our invention relates to magnesium alloys and to a process of making same.

It is an object of our invention to provide a process by which higher resistance to corrosion, and better machinability, are imparted to magnesium alloys.

To this end, we make an addition of sodium plus potassium, or of sodium alone, or of potassium alone, to a magnesium alloy of any suitable composition.

If sodium plus potassium are added, the total content of both constituents is 1 to 5%.

Sodium alone is added at the rate of 2 to 5%, and potassium alone at the rate of 1 to 5%.

By the term "magnesium alloy" used throughout the following specification is generally understood a magnesium-base alloy containing at least 50% of magnesium, but we are not limited to this, or any other, percentage of magnesium.

The other constituents of the alloys according to our invention—with the obvious exception of the additions of sodium plus potassium, or sodium or potassium—and their percentages may be as desired.

Our invention may be adapted, by way of example, to the magnesium alloys known by the registered trade name of "Electron" metal which, in addition to a magnesium base, contain zinc, aluminium, or copper in varying proportions, according to the purpose for which the alloy is intended. Such an alloy, with a base of magnesium, may for example contain 0.2 to 0.5% of aluminium, and 0.1 to 0.3% of zinc; or 6 to 6.5% of aluminium, and 1% zinc.

It has already been proposed to increase the resistance to corrosion of magnesium alloys of the "Electron" metal type, or of a similar kind, by adding small quantities of certain metals, such for example as manganese. In this way, the two "Electron" metal alloys recited above, are prepared with an addition of 0.5 to 1% of manganese, and 0.2 to 0.5% of manganese, respectively.

Although such addition of manganese produces an appreciable increase in the corrosion resistance of the alloys, the increase is not sufficient for many purposes and requirements, and so some fields of application remained closed to magnesium alloys for which they would be excellently adapted in respect of their properties.

Another drawback of the known magnesium alloys is that they produce curly chips when machined on automatic, or other machine tools which coil about the tools and interfere with the machining of the alloys, particularly on automatic machine tools.

Surprisingly, it has been found that by adding sodium plus potassium, or sodium or potassium, as described, a resistance to corrosion is imparted to the magnesium alloys which is far superior to that attained heretofore. Besides, the novel alloys produce short, spurting chips when machined on automatic or other machine tools. The additions do not in any way deteriorate the mechanical properties of the alloys.

The percentages of the several additions have already been stated. It should be noted that an addition of the sodium at the rate of less than 2%, and potassium at the rate of less than 1%, has been found not to exhibit the desired effect. Preferably, the content of sodium plus potassium is 2%, and the percentages of the individual constituents in the addition may be equal, i. e., 1% of sodium and 1% of potassium, or they may be different. The percentage of sodium alone is preferably about 3, and that of potassium is preferably about 5.

It will thus be understood that the alloys embodying our invention include a magnesium base, any desired usual additions, see supra, and an addition of sodium plus potassium at the total rate of 1 to 5%, preferably 2%, or 2 to 5%, preferably 3%, of sodium, or 1 to 5%, preferably 2%, of potassium.

It has already been proposed to add up to 10% of lithium to magnesium alloys but this did not produce increased corrosion resistance.

When submitted to a short-time corrosion test in the salt spray apparatus, magnesium alloys of the "Electron" metal type exhibit efflorescence on the surface already after a short time, and after four hours extensive destruction takes place. Under similar conditions, and after four hours, the same alloy, but with an addition of 3% of sodium, developed a thin protective film at the surface which apparently protects the alloy from further corrosion, but otherwise no alteration of the surface was to be observed.

A comparison of the corrosion in a magnesium alloy of the usual type, and one with an addition according to the invention, was made as follows: Alloy I was the usual alloy, with 8.5% of aluminium, 0.2% of manganese, and 0.5% of zinc, rest magnesium. Alloy II was prepared by adding 2% of sodium to alloy I. The two alloys were tested in a solution of 3% of sodium chloride, 1% of hydrogen peroxide, and 0.01 cubic centimetres of hydrochloric acid in 100 cubic centimetres of

solution. The amounts of hydrogen, in cubic centimetres, evolved were as follows:

After hours	Alloy I	Alloy II
½	12	0.3
1	22	0.4
1½	49	0.7

We have found that our method produces an increase in the corrosion resistance and better machinability of all magnesium alloys we have tested.

The following examples of magnesium-base alloys embodying our invention are given:

	Percentage of—				
	Aluminium	Manganese	Zinc	Sodium	Potassium
1	8.5	0.2	0.5	2	
2	8.5	0.2	0.5	1	1
3	8.5	0.2	0.5		1.5
4	8.5	0.2	0.5	4	
5	8.5	0.2	0.5	2	0.5
6	6.5	0.5		2	
7	6.5	0.5		1	1
8	6.5	0.5			1.5
9	6.5	0.5		4	
10	6.5	0.5		2	1.5
11	6.5	0.5		0.5	1.5
12	11	0.3	1	2	
13	11	0.3	1	1	1
14	11	0.3	1		1.5
15	11	0.3	1	4	
16	11	0.3	1	2	0.5
17	11	0.3	1	0.5	1.5

The remainder of these alloys consists substantially all of magnesium, that is, magnesium having the usual impurities and/or containing minor amounts of the customary additions above mentioned.

We claim:

1. A magnesium base alloy containing 2 to 5% of sodium, from traces up to about 11% of aluminum, the remainder substantially all of magnesium besides small amounts of customary additions and impurities.

2. A magnesium base alloy containing 1 to 5% of potassium, from traces up to about 11% of aluminum, the remainder consisting of magnesium besides small amounts of customary auxiliaries and impurities.

3. A magnesium base alloy containing from traces up to 11% aluminum and an addition of metal selected from the group consisting of sodium and potassium, the individual amounts of sodium and potassium being 2 to 5% and 1 to 5% respectively and the total amount of said addition being up to 5%, the remainder being substantially all magnesium besides small amounts of customary auxiliaries and impurities, said alloy being characterized by increased corrosion resistance due to said addition.

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