

UNITED STATES PATENT OFFICE

2,188,239

MAGNESIUM ALLOY

Fritz Christen, Zurich-Altstetten, Switzerland

No Drawing. Application April 3, 1939, Serial No. 265,819. In Switzerland December 30, 1937

5 Claims. (Cl. 75-168)

The magnesium alloys hitherto known do not exhibit a sufficient resistance to corrosion and have not a sufficient hardness, particularly if such alloys are employed for producing elements which are subjected to varying working temperatures.

A further disadvantage resides in that although by altering the additives it is certainly possible to obtain an increasing tensile strength, the malleability is reduced.

The object of the present invention is to provide an improved magnesium alloy having an increased hardness and mechanical strength and capable of being worked by forging, rolling or like operations.

The alloy according to the present invention is produced with the aid of the pre-alloy according to application No. 194,221, of which the present application is a continuation in part. This pre-alloy has the following composition:

	Percent
(1) Aluminum	33-40
(2) Zinc	23.5-16.5
(3) Copper	17.5-14.5
(4) Manganese	3-6
(5) Nickel	1-3
(6) Cobalt	6-4
(7) Chromium	0.5-0.9
(8) Molybdenum	0.5-0.1
(9) Magnesium (constant)	15

and from 4-12% of this pre-alloy is taken and formed into a final alloy with magnesium forming the remainder. The alloy thus has a composition falling within the range between:

	Percent
(1) Aluminum	1.32-1.6
(2) Zinc	0.94-0.66
(3) Copper	0.70-0.58
(4) Manganese	0.12-0.24
(5) Nickel	0.04-0.12
(6) Cobalt	0.24-0.16
(7) Chromium	0.02-0.036
(8) Molybdenum	0.02-0.004
(9) Magnesium	96.6

on the one hand and,

	Percent
(1) Aluminum	3.96-4.8
(2) Zinc	2.82-1.98
(3) Copper	2.1-1.74
(4) Manganese	0.36-0.72
(5) Nickel	0.12-0.36
(6) Cobalt	0.72-0.48
(7) Chromium	0.06-0.108
(8) Molybdenum	0.06-0.012
(9) Magnesium	89.8

on the other hand.

For producing an alloy within the foregoing range which has favourable properties for forging and exhibits a high tensile strength with small ductility, the composition may be as follows:

	Percent
(1) Aluminum	1.5
(2) Zinc	1
(3) Copper	1
(4) Manganese	0.5
(5) Nickel	0.25
(6) Cobalt	0.24
(7) Chromium	0.05
(8) Molybdenum	0.01
(9) Magnesium	95.45

An alloy which is equally favourable from the point of view of forging but which has a lower tensile strength and a very high ductility can be obtained by selecting the following composition:

	Percent
(1) Aluminum	4
(2) Zinc	1.5
(3) Copper	1.25
(4) Manganese	0.25
(5) Nickel	0.15
(6) Cobalt	0.16
(7) Chromium	0.02
(8) Molybdenum	0.02
(9) Magnesium	91.65

In all cases the alloys are produced in the following way. First of all an alloy as prescribed in application No. 194,221 is produced with the requisite quantities of aluminum, zinc, copper, manganese, nickel, cobalt, chromium, and molybdenum, and the appropriate amount of magnesium as specified in the said application. Pigs of this pre-alloy are placed in the furnace and are covered with a covering salt of known composition which comprises magnesium chloride. When the material has liquefied, pig magnesium is added to the requisite amount and a fresh covering of salt is applied. After a temperature of about 950° C. has been reached heating is discontinued and the liquid metal which is somewhat superheated is thoroughly stirred and is covered again. After the temperature has dropped to about 800° C. the slag is removed and the alloy is cast in moulds of the desired dimensions at about 700° C.

I claim:

1. As an article of new manufacture, a magnesium alloy having a composition falling within the range between:

	Per cent
(1) Aluminium	1.32-1.6
(2) Zinc	0.94-0.66
(3) Copper	0.70-0.58
(4) Manganese	0.12-0.24
(5) Nickel	0.04-0.12
(6) Cobalt	0.24-0.16
(7) Chromium	0.02-0.036
(8) Molybdenum	0.02-0.004
(9) Magnesium	96.6

2. An article of new manufacture, an alloy consisting of:

	Per cent
(1) Aluminium.....	4
5 (2) Zinc.....	1.5
(3) Copper.....	1.25
(4) Manganese.....	0.25
(5) Nickel.....	0.15
(6) Cobalt.....	0.16
10 (7) Chromium.....	0.02
(8) Molybdenum.....	0.02
(9) Magnesium.....	91.65

3. As an article of new manufacture, an alloy consisting of:

	Per cent
(1) Aluminium.....	1.5
(2) Zinc.....	1
(3) Copper.....	1
20 (4) Manganese.....	0.5
(5) Nickel.....	0.25
(6) Cobalt.....	0.24
(7) Chromium.....	0.05
(8) Molybdenum.....	0.01
25 (9) Magnesium.....	95.45

4. A magnesium alloy consisting of magnesium and

	Per cent
(1) Aluminium.....	1.32 -4.8
(2) Zinc.....	0.66 -2.82
(3) Copper.....	0.58 -2.1
(4) Manganese.....	0.12 -0.72
(5) Nickel.....	0.04 -0.36
(6) Cobalt.....	0.16 -0.72
(7) Chromium.....	0.02 -0.108
(8) Molybdenum.....	0.004-0.06

5. A magnesium alloy having a composition of

	Per cent
(1) Aluminium.....	3.96-4.8
(2) Zinc.....	2.82-1.98
(3) Copper.....	2.1 -1.74
(4) Manganese.....	0.36-0.72
(5) Nickel.....	0.12-0.36
(6) Cobalt.....	0.72-0.48
(7) Chromium.....	0.06-0.108
(8) Molybdenum.....	0.06-0.012
(9) Magnesium.....	89.8

FRITZ CHRISTEN. 25