

UNITED STATES PATENT OFFICE

2,073,515

ALLOY

Edward F. Fischer, Cleveland, Ohio, assignor, by
mesne assignments, to Magnesium Develop-
ment Corporation, a corporation of Delaware

No Drawing. Application February 6, 1934,
Serial No. 709,969

4 Claims. (Cl. 75-168)

This invention relates to magnesium base alloys and it is particularly concerned with alloys of magnesium and certain alkaline earth metals.

Commercially pure magnesium has been used in a very limited way as a structural material because of its relatively low strength. On the other hand the extreme light weight of the metal commends it for use where weight is a paramount consideration. It is an object of my invention to provide an alloy which utilizes the lightness of weight of magnesium and combines it with sufficient strength to produce a satisfactory structural material. It is also an object of my invention to provide an alloy that not only has the requisite strength but does not readily disintegrate under corrosive conditions. A further object is to produce an alloy of simple composition that can be easily compounded under commercial foundry conditions.

My invention is predicated on the discovery that calcium, barium and/or strontium can be added to magnesium to form a moderately strong and useful alloy. These elements for the purposes of my invention, constitute a single class of substances wherein any one member of the class may be substituted for another member. Contrary to what would have been expected I have found that from about 0.5 to 4.5 per cent of these alkaline earth metals improve the structural quality of magnesium without deleterious effect on fabricating properties. Binary alloys of magnesium with these metals cast well without excessive oxidation and can be extruded in a satisfactory manner but they are not well adapted to hot working such as hammer forging. Such alloys possess a greater strength than the pure metal magnesium while at the same time retaining substantially the ductility of the unalloyed metal.

A binary alloy of magnesium and 1 per cent calcium, for example, that was made up, had a tensile strength of about 29,600 pounds per square inch and an elongation of about 8 per cent in the as-extruded condition. An increase in calcium to 4 per cent produced a corresponding increase in tensile strength which amounted to about 34,500 pounds per square inch with an elongation of approximately 5.5 per cent. The addition of barium and strontium produces simi-

lar increases in tensile strength. For example, in the extruded condition a binary alloy of magnesium and 1 per cent barium had a tensile strength of about 33,800 pounds per square inch and an elongation of 6.2 per cent. A similar alloy containing 1 per cent of strontium had a tensile strength of about 31,600 pounds per square inch and an elongation of 10.7 per cent in two inches. An alloy containing 4 per cent barium had still higher tensile strength, namely, 37,000 pounds per square inch. Commercially pure magnesium under similar conditions has a tensile strength of about 27,000 pounds per square inch and an elongation of about 5.5 per cent.

For most purposes I prefer to use from about 1 to 4 per cent of the alkaline earth metals. I may, however, use more than one of the metals in combination with magnesium. In such cases the total amount of added elements should not exceed about 4.5 per cent although preferably less than 4 per cent should be employed. The same limitations apply to the minimum amounts that have been stated hereinabove, namely that in no case should a total of less than 0.5 per cent be used, and preferably not less than 1 per cent.

The alloys may be made in the usual manner that magnesium base alloys are compounded, the alloy ingredients being preferably added in metallic form or as a "rich" alloy.

The term "magnesium" as used herein and in the appended claims refers to the commercially pure metal that contains the usual impurities.

I claim:

1. A magnesium base alloy composed of magnesium and about 1 per cent calcium.

2. A magnesium base alloy containing alloying metal in an amount ranging from about 1.0 per cent to 4.0 per cent, said alloying metal being selected from the alkaline earth elements calcium, barium and strontium, the balance being magnesium.

3. A magnesium base alloy composed of magnesium and about 4 per cent calcium.

4. A magnesium base alloy composed of magnesium and about 1 per cent barium.

EDWARD F. FISCHER.