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MAGNESIUM ALLOY

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2 Claims. (Cl. 75—168)

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The subject matter of this patent may be used by or for the Government for governmental purposes without the payment of any royalties.

The invention relates to magnesium base alloys. It more particularly concerns an improved quaternary magnesium base alloy containing lithium, zinc, and cadmium and exhibiting a high yield strength especially under compression loads.

The invention is based upon the discovery that by alloying together 6 to 12 per cent of lithium, 16 to 25 per cent of zinc, and 1 to 20 per cent of cadmium, the balance being essentially magnesium, a unique alloy results which exhibits exceptionally high strength values and other useful properties. These properties render the alloy suitable for many structural uses in the arts. Preferred proportions in which to alloy the aforesaid metals are: lithium 7 to 10 per cent, zinc 16 to 20 per cent, cadmium 10 to 20 per cent, the balance being magnesium.

The following tabulated data are illustrative of the compression yield strength (defined as the load at which the stress strain curve deviates 0.2 per cent from the modulus line) of some representative examples of the alloy.

Table

Nominal Composition in Per Cent by weight, Balance Magnesium			Compression Yield Strength in Lbs./Sq. In.
Li	Zn	Cd	
7	16	1	49,000
7	16	5	57,000
7	16	10	70,000
7	16	15	85,000
7	20	20	85,000
7	25	5	88,000
10	20	20	84,000

In preparing the samples for the foregoing strength tests the metals, in the usual commercial grades of purity, were melted together in the requisite proportions in a conventional steel melting pot, taking due precautions to prevent atmospheric attack on the molten metal, as by the use of flux. A suitable flux is one composed of 3 parts of lithium chloride and one part of lithium fluoride dehydrated by heating to about 1600° F. before use. The flux is applied in the molten state. It is preferable first to melt the magnesium, using about one part of flux for 10 parts of metal for protection from atmospheric attack. After the magnesium has melted the zinc and cadmium are added preferably at a temperature of about 1300° to 1400° F. Thereafter the lithium is added while the temperature of the melt is about 1250° F. To prevent the lithium from floating during alloying, it may be held in the molten metal by an inverted ladle.

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After preparing a batch of each of the various compositions indicated, portions of the melt were cast into cylindrical ingots in a metal mold. After casting, the ingots were scalped and extruded hot (450° F.) from a 3 inch inside diameter container into strip 1/16" x 3/4" at the rate of 5 feet per minute and the extruded strip was cut into test specimens. Before making the compression strength tests, average values of which appear in the table, the specimens were subjected to a heat treatment by heating the specimens at 700° F. for 30 minutes, followed by quenching in water at room temperature (except the last composition in the table which was quenched in oil).

We claim:

1. A magnesium base alloy composed of 6 to 12 per cent of lithium, 16 to 25 per cent of zinc, 1 to 20 per cent of cadmium, the balance being essentially magnesium.

2. A magnesium base alloy composed of 7 to 10 per cent of lithium, 16 to 20 per cent of zinc, 10 to 20 per cent of cadmium, the balance being magnesium.

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