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LIGHT METAL ALLOY PARTS

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4 Claims. (Cl. 75—142)

My invention relates to an aluminum alloy which is malleable and slowly age-hardenable at room temperature.

It is clearly known to use, for instance, for aircraft purposes, rivets of an alloy comprising 3.7 to 4.7% Cu; 0.6 to 1.0% Mg; 0.3 to 0.7% Si; 0.2 to 0.4% Mn and consisting for the rest of aluminum and to heat treat said rivets so as to improve certain of their physical properties. By this heat treatment, which usually comprises heating the material to a temperature of the order of 500° C. and rapidly cooling down the same to room temperature, the rivets are at first rendered soft and can be cold worked during a predetermined period of time of two to four hours, while after said period they become hard and unworkable. In many instances, the hardening process even proceeds so rapidly that rivets worked before expiration of the said period of workability crack and have to be replaced.

My invention relates to a malleable and age-hardenable aluminum alloy with the property that the increase of hardness does not begin earlier than four hours after the quenching during storage at room temperature (about 20° C). In order to attain this property my alloy contains as compared with the known malleable and age-hardenable aluminum alloys 1.8 to 3.0% copper and 1.5 to 2.5% magnesium. The alloy also contains 0.3 to 1.2% manganese whereby the strength properties of the material are favorably influenced. In view of the strength and also the hardening period, it is advantageous if the total of the contents of copper and magnesium remains within certain limits, about between 3.3% and 4.8%.

Pure aluminum and also commercial aluminum with the normal traces of impurities are suitable for making the alloy. I have had good experience with silicon-containing aluminum which contains about 0.1 to 1.2% Si. However, in this case, a useful material is only obtainable if the other impurities, more particularly iron, titanium and zinc amount to less than 1%. All percentages are percentages by weight.

The heat treatment of my alloy is the usual treatment for alloys of this type. The material is heated to about 500° C. and quenched in the usual manner at room temperature. The material is then relatively soft and as compared with the hitherto known materials of this type, it does not show an increase of hardness earlier than four hours after the quenching during storage at room temperature.

This slow increase of hardness makes it possible to cold work light metal parts and more particularly rivets yet one day after the quenching without any detrimental effects like surface rents or breaking up of the deformed material. The possibility of working the material during a much longer period of time than hitherto possible is a very important advantage for riveting light metal plates.

An aluminum alloy in which the amount of copper falls within the limits so stated, and which possesses this quality of slow hardening comprises 1.8 to 3% Cu and 1.5 to 2.5% Mg. An alloy like this water-quenched in usual manner from 500° C. shows no amount of hardness during nearly half a day. This slow increase of hardness makes it possible to cold work light metal parts and more particularly rivets yet one day after the quenching without any detrimental effects like surface rents or breaking up of the deformed material. The possibility of working the material during a much longer period of time than hitherto possible is a very important advantage for riveting light metal plates.

For example, an alloy containing 2.1% Cu; 2.1% Mg; 0.79% Si; 0.55% Mn; 0.45% Fe has after heating it to a temperature of 500° C. and following water-quenching a Brinell hardness of 61 kgs. per sq. mm. During storage at room temperature this hardness practically remains unchanged for a period of 8 hours, and then the hardening begins. After a time of 24 hours the hardness has reached 75 kgs. per sq. mm. and the material is yet workable. Rivets of this material may be worked within 24 hours after quenching. The hardening is practically finished after two weeks and the shearing strength of the rivets after this time is 24 to 25 kgs. per sq. mm.

It is clear that the hardness and the shearing strength may be changed by varying the content of copper and magnesium within the above stated limits.

I have found that it is possible to cold work a material of this kind during a time of 1 to 6 days after the heat treatment without any detrimental effects of the kind above referred to. On the other hand, after a period of about 14 days, the material assumes physical properties substantially equivalent to those of the improvable light metal alloys as formerly used for the said purpose. For example, the final shearing strength of a rivet of my novel type amounts to 21 to 27 kg. mm^2.

It will be understood that in many instances, my novel product offers very important advantages over the existing alloys, as it permits the

working of the heat treated material during a much longer period of time than hitherto possible. Especially, it is now rendered possible to use improved light metal products where it was so far impossible or very difficult to use such products due to the short time available for the working. This applies, for instance, for mass production articles. Also, parts which are subjected to an extended cold working process in several steps, as for instance, arched edge coverings for the ends of airplane wings, can be worked without repeated heat treatment between the single working steps as hitherto required, whereby the manufacturing process is substantially simplified and the costs reduced.

I claim:

1. A malleable and age-hardenable aluminum alloy, comprising substantially 1.8 to 3.0% Cu, 1.5 to 2.5% Mg, 0.3 to 1.2% Mn, the balance aluminum with traces of impurities having the property that the increase of hardness does not begin earlier than four hours after the quenching during storage at room temperature.

2. A malleable aluminum alloy age-hardenable at room temperature (about 20° C.), comprising 1.8 to 3.0% Cu, 1.5 to 2.5% Mg, 0.3 to 1.2% Mn, the balance aluminum with traces of impurities, the total content of Cu and Mg amounting to 3.3 to 4.8%.

3. A malleable and age-hardenable aluminum alloy consisting of 1.8 to 3.0% copper, 1.5 to 2.5% magnesium, 0.3 to 1.2% manganese and the balance substantially all aluminum, said alloy beginning to harden at least four hours after quenching while being maintained at about 20° C.

4. An alloy as claimed in claim 3, wherein the total amount of copper and magnesium is from 3.3 to 4.8% of the whole.

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