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COPPER BERYLLIUM ALLOY

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3 Claims. (Cl. 148—32)

Our invention relates to copper-beryllium alloys.

The known copper-beryllium alloys, with or without the addition of other metals, owe their technical importance to their capability of being tempered, to the fact that they are capable of being improved by a special heat treatment, and to their physical characteristics, such as, hardness and strength. In these alloys, however, the rate of elongation is unsatisfactory in as much as it is low. A further defect consists in that the improved physical qualities are not retained at high temperatures and such alloys can only be used below a temperature limit of 200° to 300° C. if their best qualities are to be retained.

According to the present invention in order to remove these defects, manganese is added to the copper-beryllium alloy in the proportion of from about 0.5 to 25 per cent the beryllium content being from about 0.5 to 20 per cent. The copper content may be at least 50 per cent. The resultant alloy can be rolled and improved in quality in a similar manner to a beryllium-copper alloy without manganese, but in the improved condition, however it shows a greater tendency of maintaining its original properties, especially its hardness and coefficient of expansion, when heated.

The improvement in quality of the new alloy is effected by heating to 500° to 800° C. chilling and annealing at 250° to 500° C. for a long time.

On account of the fact that the new alloy is not so readily affected by heat as the known alloys, the second treatment is preferably carried out at higher temperatures than in the case of alloys without manganese.

A further advantage of the new alloy in the improved state consists in the comparatively high elongation of 9–10 per cent.

Various metals may be added to the new beryllium-copper-manganese alloy in order to modify the characteristics. The following quantatitive additions have been found advantageous.

	Per cent
Ti	0–10
Cr	0– 5
Fe	0–10
Ni	0–40
Co	0–10
Si	0–25
Mg	0– 2
Li	0–0.5
Zn	0–20
Cd	0– 5
Al	0– 8
Sn	0–10
P	0–0.5

These alloys may also be successfully heat treated according to the new process for improving the quality.

In the claims, where the expressions "remainder being substantially copper" and "balance principally copper" are employed, we intend to include in the compositions called for any of the metals listed above in the proportions recited; these proportions being insufficient to substantially alter the characteristic properties of the alloys. These alloys, in comparison with the corresponding copper-beryllium alloys free from manganese, are capable of being rolled and heated with less change in characteristics, such as hardness and thermal expansion, and have greater elongation.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:

1. As a new composition of matter, a heat-hardened alloy comprising about 0.5 to 20 per cent beryllium, about 0.5 to 25 per cent manganese, with a balance principally copper; said alloy having been hardened by a process comprising heating said alloy to a temperature varying from about 500° to 800° C., followed by chilling and heat-hardening at temperatures ranging from about 250° to 500° C. for a prolonged period.

2. An alloy consisting substantially of copper, beryllium and manganese containing from about 0.5 to 20 per cent beryllium to produce hardness and stength, said alloy being given greater extensibility and greater resistance to change in its characteristics of hardness and thermal expansion upon heating and rolling by containing from about 0.5 to 25 per cent manganese.

3. An alloy comprising from about 0.5 to 25 per cent of manganese, about 0.5 to 20 per cent of beryllium, with a remainder substantially copper; said alloy being given great hardness and strength by the presence of the said beryllium.

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