Patented Feb. 18, 1941 2,231,940

# UNITED STATES PATENT OFFICE

2,231,940

## ALLOY

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No Drawing. Application December 28, 1939, Serial No. 311,284

4 Claims. (Cl. 75—154)

The present invention relates to an alloy composition and the method of forming the alloy and more particularly concerns a cuprous alloy.

Yet more particularly, the invention contemplates the provision of a cuprous alloy containing additions of tin, aluminum, and silicon so associated as to provide a product having improved properties as to wear, fatigue, and corrosion resistance.

An almost infinite number of combinations of elements is possible in the case of copper alloys and the resulting products are known to vary widely in character. I have discovered within a fairly limited range of composition the specific combination of alloy elements which, when combined in a homogeneous alloy, are characterized by certain improved properties.

It is, accordingly, an important object of the present invention to provide such a product which is especially suited to uses wherein it may be subjected to excessive wear and fatigue, which product is at the same time highly corrosion resistant and possesses a desirable surface appearance.

Yet further objects of the present invention contemplate the provision of an alloy having desirable special properties as enumerated above, while additionally being characterized by further desirable properties including high tensile strength, satisfactory hardness and resistance to deformation, good resistance to impact, and capable of being readily and satisfactorily worked and machined.

In accordance with the preferred embodiment of the present invention, I melt together the following components:

| | Percent |
|---|---|
| Copper | 91.0 |
| Aluminum | 4.1 |
| Tin | 4.3 |
| Silicon | .6 |

The alloying may take place in any convenient pot or crucible and may be suitably made up of the following commercially available materials in the following proportions:

| | Parts |
|---|---|
| Copper | 84 |
| Aluminum (containing 5% silicon) | 4 |
| Tin | 4 |
| Silicon copper (50—50) | ¾ |

While various melting practices are suitable, it is preferred to first melt the copper at a temperature, for example, of 2000° F. The aluminum is then gradually well mixed with the molten copper and the tin added, while constantly stirring. The silicon copper is added as a final step and the material heated to a suitable temperature for casting, after which it is poured into a mold.

The temperature at which the melt may be poured may vary in accordance with the size and character of the casting to be made, varying between a maximum of probably 2200° F. and a lower temperature determined by the form and mass of the casting. It is undesirable to maintain excessive temperatures or conditions favorable to excessive loss of alloying elements.

I prefer to employ high purity metals in making the melt and endeavor to keep the oxidation as low as possible.

It has been found that the foregoing cast product possesses improved structural properties rendering it particularly suitable for employment in the manufacture of structural elements normally subjected to extremely severe conditions of wear, friction, and the like, such, for example, as brake shoes, trolley wheels, and bearing units. That is to say, the product is characterized by an improved resistance to wear, abrasion, and the like, and maintain clean and satisfactory bearing and contact surfaces in spite of the severest conditions. It is important further to note that the product is extremely resistant to corrosion by commercial chemical materials, as well as atmospheric conditions and accordingly is of improved utility in connection with parts normally operating under or subjected to corrosive chemical influences and, particularly, parts and elements of devices subjected to wear and abrasive influences under such conditions. Attention is further directed to the fact that the final product possesses a pleasing golden color which is highly permanent in view of the abnormal tarnish resistance of the material.

It is important additionally to note that the structural properties of the castings, as well as their machining ability and mechanical workability are within a preferred range, rendering the product useful in substantially all situations where its wear resistance becomes a highly significant advantage.

It is thought that the alloy produced in accordance with the foregoing process possesses a composition substantially as follows:

| | Percent |
|---|---|
| Copper | 91.0 |
| Aluminum | 3.32 |
| Tin | 4.3 |
| Silicon | .5 |

The proportions of ingredients added to the melting pot can be varied somewhat. Thus, the percentage of copper may be varied within a range from 86 to 96 per cent, although the most superior wearing properties characteristic of the present invention are only realized to the fullest extent in a range between 88 and 92 per cent of copper. Similarly, the tin addition may vary between 4.25 and 5.5 per cent, and the aluminum addition likewise. It is to be noted in particular that the addition of an excess of aluminum over that recited as the preferred quantity creates excessive hardness, rendering the material excessively hard for the present purpose, while at the same time interfering with the mechanical working properties and with the homogeneity of the final alloy. In the present preferred range of aluminum, the product possesses the hardness and corrosive resistance of the desired character while still remaining uniformly homogeneous. I have observed that the silicon addition improves the product even in very small percentages of the order of .2 per cent and accordingly prefer to add the silicon in a range of about .1 per cent to .75 per cent. The silicon performs the additional function of facilitating the homogeneous admixture of the aluminum.

Thus it will be noted above that I prefer to employ an aluminum containing 5 per cent silicon for facilitating the alloy formation and, accordingly, while the addition of this ingredient occurs at a range of 4.25 to 5.5 per cent, it will be seen that the corresponding addition of aluminum occurs at a range of 4.0 to 5.2 per cent. While the analysis of the final casting may vary somewhat from the foregoing in view of the preferential loss of ingredients under certain conditions of melting technique, it will be appreciated that in general only the aluminum and silicon are so characterized. It will be seen, therefore, that the aluminum and silicon may be expected to occur in the final casting in percentages slightly less than those added. In my experience, however, I have found that in general the final product will possess an analysis running from 88 to 92 per cent of copper, 3.3 to 5.5 per cent of aluminum, 4.25 to 5.5 per cent of tin, and .1 to .75 per cent of silicon.

The invention is hereby claimed as follows:

1. An alloy composed of approximately 86 to 96 per cent copper, 3.3 to 5.2 per cent aluminum, 4.25 to 5.5 per cent tin, and .1 to .75 per cent silicon.

2. An alloy composed of approximately 88 to 92 per cent copper, 3.3 to 5.2 per cent aluminum, 4.25 to 5.5 per cent tin, and .1 to .75 per cent silicon.

3. An alloy composed of about 91 per cent copper, about 3.3 per cent aluminum, about 4.3 per cent tin, and a proportion of silicon equal to less than .6 per cent.

4. An alloy composed of copper equal to about 88 to 92 per cent, aluminum equal to about 3.3 to 5.2 per cent, tin equal to about 4.25 to 5.5 per cent, and an appreciable amount of silicon less than .75 per cent.

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