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HOT WORKABLE BRONZE

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4 Claims. (Cl. 75—154)

This invention relates to copper-tin alloys, and more particularly to a phosphor bronze or other deoxidized copper-tin alloy, and has for an object to produce such an alloy which is hot workable.

The so called phosphor bronzes are alloys of copper and tin deoxidized with phosphorus before pouring or casting the molten metal into suitable molds. In order to make sure the metal is properly deoxidized there is usually sufficient of the deoxidizer used so that there is a small surplus and a small amount of the deoxidizer remains in the resulting alloy.

Silicon bronzes are copper-tin alloys deoxidized with silicon before pouring or casting the metal in suitable molds.

Other deoxidizers are also used for deoxidizing the bronzes or copper-tin alloys, but phosphorus is the usual deoxidizer for the tin bronzes.

The present invention or discovery is applicable to all the tin-bronzes within the ranges noted herein whether they are deoxidized with phosphorus, silicon or the other suitable deoxidizers.

All of these bronzes may be cold rolled up to about 12% tin content. These bronzes as a rule also may be hot rolled or worked up to about 2% tin content, but the hot rolling, or hot working, becomes rapidly impossible as the tin content is increased over 2%.

It has been found that the addition of 0.1% to 5% of manganese to these tin bronzes with a tin content of from 2% to 20% greatly improves the hot working characteristics as described in the copending application of Daniel R. Hull, Serial No. 108,615 filed of even date herewith, but I have found that the hot rolling characteristics are still further improved by the addition of a suitable amount of iron. I have also found that the addition of the proper amount of iron alone to these tin bronzes with a tin content of from 2% to 20% greatly improves the hot working characteristics, but that the effect is much better where both the iron and the manganese are used. Thus a tin bronze that could not be hot rolled at all can be easily hot rolled with the proper addition of iron, and even more so with additions of both iron and manganese.

This effect is secured in these copper-tin alloys with a tin content of from 2% to 20% and balance principally copper, the content of iron being from 0.25% to about 5%, and of manganese from 0.1% to about 5%, depending on the amount of tin. The amount of the deoxidizer, such for example as phosphorus, silicon, etc., may be up to about 1% of the finished alloy, that is from 0 to about 1%.

It will be appreciated a large number of specific alloys may be made within the ranges of elements noted, but an example of an alloy that hot rolls very nicely has approximately the following proportions; tin 5%, iron 0.5%, manganese 0.5%, phosphorus 0.1% and balance copper.

The iron and manganese contents, or the iron content when used without the manganese, may be varied so that these alloys ranging from 2% to 20% tin may be readily hot rolled or otherwise hot worked. The preferred amount of manganese is from 0.5% to 2%, and of iron from 0.5% to 2% as these amounts give the desired effect, and it is preferred not to use more of these elements than is necessary. However, as indicated above the content of each of these elements may be as high as 5% if desired.

Having thus set forth the nature of my invention, what I claim is:

1. An alloy which is characterized by being hot workable comprising from 2% to 20% tin, 0.25% to 5% iron, 0.1% to 5% manganese, 0.01% to 1% phosphorus and balance copper.

2. A copper-tin alloy of about 5% tin content containing approximately 0.5% iron, 0.5% manganese, 0.1% phosphorus and balance copper, said alloy being characterized by being hot workable.

3. A copper-tin alloy of from 2% to 20% tin content containing 0.5% to 2% iron, 0.5% to 2% manganese, 0.01% to 1% phosphorus and balance copper, and which is characterized by being hot workable.

4. A deoxidized copper base alloy which is characterized by being hot workable composed of 2 percent to 20 percent tin, 0.25 percent to 5 percent iron, 0.1 percent to 5 percent manganese, 0.01 percent to 1 percent of the deoxidizer, and balance copper.

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