Patented Mar. 30, 1937

2,075,014

UNITED STATES PATENT OFFICE

2,075,014

COPPER SILICON ALLOYS

William H. Bassett, Cheshire, Conn., assignor to The American Brass Company, Waterbury, Conn., a corporation of Connecticut

No Drawing. Application November 25, 1933, Serial No. 699,710

5 Claims. (Cl. 75—160)

This invention relates to copper base alloys containing silicon and manganese and has for its chief object to improve certain characteristics of such alloys and particularly their machinability or free cutting properties. The free cutting properties of these copper base alloys containing silicon and manganese are secured with little or no depreciation of their physical properties by the addition of lead in relatively small amounts.

A number of copper base alloys containing silicon have gone into quite extensive use it being found that the addition of silicon up to certain amounts to copper produced alloys which were highly resistant to the chemical action of certain acids and other corrosive liquids. It was, however, found that the addition of silicon rendered the alloy hard and very brittle and difficult or practically impossible to work, and other elements such as manganese were added to overcome these difficulties and improve other properties of the alloy, such as strength, toughness, etc. and still retain the resistance to corrosion. It was found that for practical purposes the range of silicon was up to approximately 6.5 percent, and my invention therefore relates to copper base alloys containing from approximately 0.1 percent to approximately 6.5 percent silicon, and manganese from 0.01% to 3%.

It has been known to improve the machining qualities of copper or brass by the addition of lead, but it has been generally considered and also the literature would indicate that in alloys containing silicon lead would be thrown out of the mixture by the silicon. This was also indicated where there has been a mixture of leaded scrap with copper silicon alloys. In other words it was generally supposed that with silicon present the lead would settle to the bottom of the crucible or furnace due to its high density. I have found, however, that with small amounts of lead in copper base alloys containing silicon and manganese in the amounts above noted the lead is dispersed as fine particles throughout the mass, greatly improving its machinability or free cutting qualities. I have found that this effect is secured with amounts of lead from approximately 0.1 percent to approximately 0.45 percent, the preferred range being from approximately 0.25 percent to approximately 0.4 percent.

Thus for example it has been known to add manganese from approximately 0.01 percent to approximately 3 percent to copper silicon alloys containing from 0.1 percent to 6.5 percent silicon to toughen and strengthen the alloys and improve their workability and give the required strength and other physical properties without injury to the corrosive resisting properties. Difficulty, however, was experienced in machining these alloys as among other things the chips were tough and came off in long continuous spirals tending to clog the tools, and the tools would not stand up and cutting speed was relatively low. I have found, however, that by the addition of the above named quantities of lead to these alloys they were rendered much more free cutting, and the chips instead of coming off in long continuous spirals broke up into short lengths easily clearing the tool, and in short converted the alloys into free turning alloys with little or no depreciation of their physical properties, such as strength, toughness, workability, and resistance to corrosion. Thus these alloys would be composed of from approximately 0.1 percent to 6.5 percent silicon, approximately 0.01 percent to 3 percent manganese, approximately 0.1 percent to 0.45 percent lead, and the remainder substantially copper. The preferred range of lead, however, is from approximately 0.25 percent to 0.4 percent. A specific alloy which has been used extensively is composed of approximately 95.6 percent copper, 3 percent silicon, 1 percent manganese, and 0.4 percent lead.

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

1. A copper base alloy which is workable and characterized by free cutting properties and resistance to corrosion comprising approximately 0.1% to 6.5% silicon, 0.01% to 3% manganese, 0.1% to 0.45% lead and balance copper.

2. A copper base alloy which is workable and characterized by free cutting properties and resistance to corrosion comprising approximately 0.1% to 6.5% silicon, 0.01% to 3% manganese, 0.25% to 0.4% lead, and balance copper.

3. A copper base alloy which is workable and characterized by free cutting properties and resistance to corrosion comprising approximately 95.6% copper, 3% silicon, 1% manganese and 0.4% lead.

4. A wrought metal article composed of a copper base alloy characterized by free cutting properties and resistance to corrosion and comprising approximately 0.1% to 6.5% silicon, 0.01% to 3% manganese, 0.1% to 0.45% lead, and balance copper.

5. A wrought metal article composed of a copper base alloy characterized by free cutting properties and resistance to corrosion and comprising approximately 0.1% to 6.5% silicon, 0.01% to 3% manganese, 0.25% to 0.4% lead, and balance copper.

WILLIAM H. BASSETT.