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WELDING ROD ALLOYS

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My invention relates to welding rod alloys, and will be best understood from the following description of several examples of alloys compounded according to the invention.

Although, for many reasons, brass has desirable properties when employed for welding rods, brass alloys as heretofore compounded commonly result in a weld metal which is porous and deficient in strength, probably due to the fuming of the zinc contained in the brass, which fuming in itself is objectionable due to its harmful effects on the operator. Further, such prior alloys commonly result in a poor bond, and in a weld metal that is deficient in hardness for many uses.

Applicant has found that fuming in brass welding rods can be eliminated by the use of iron and nickel in proper proportions to the copper and zinc contents, and that, at the same time, an extremely dense and sufficiently hard weld metal can be produced and a strong bond secured, so strong a bond in fact that when steel plates are welded, and subjected to tension, the break ordinarily will occur in the plates and not at the weld.

In compounding the alloy according to applicant's invention, it is desirable that the proportions of constituents are such that a structural condition of the alloy is secured which will result in a low melting point and high strength. In general, this structural condition will be secured when the proportions of constituents are such that a combination of an alpha and beta structure is present, and in this connection it has been found that if the copper content is increased to a point where the beta phase disappears there is great difficulty in obtaining a proper bond between the alloy and steel or iron.

In general, sufficient hardness will be secured when the alloy contains from 1 to 2% iron, resulting in a dense hard surface allowing the metal to be employed for building up worn parts which are to be subsequently machined. Under favorable conditions sufficient hardness may be secured with the iron content as low as 0.25% of the alloy.

Apparently the strength of the bond is largely influenced by the presence of nickel, in the absence of substantial amounts of which metal a poor bond is secured. Under ordinary conditions, satisfactory results will be secured with a nickel content of about 2% of the alloy, although, under favorable conditions, as small an amount as 0.25% may be satisfactory.

In general, all the hereinbefore mentioned desirable results will be secured when the iron is between 0.25 and 3% of the alloy, and the nickel between 0.25 and 5% of the alloy, provided the copper content is within the correct range, which range will be secured, with the mentioned ranges of iron and nickel, when the sum of the copper, iron and nickel is from 50 to 65% of the alloy, the balance in each case being zinc.

To insure against any deleterious effects of impurities, such as oxides, or sulphur which tends to combine with the nickel, small amounts of manganese may be incorporated for deoxidizing the other metals and for taking up the sulphur. Preferably the amount of manganese will not exceed 1%, it being understood of course that where impurities are not present no manganese need be employed. Preferably also the alloy is free from aluminum which seems to decrease the facility with which the weld may be formed.

The general formula of the alloy as above described is iron approximately 0.25 to 3%, nickel approximately 0.25 to 5%, the sum of the copper, iron and nickel approximately 50 to 65%, manganese optional, depending upon the presence of impurities, in amounts up to 1%, with the balance substantially all zinc, it being understood of course that other metals may be incorporated for imparting special characteristics where they do not eliminate the desirable properties hereinbefore pointed out. All alloys made according to this general formula therefore consist essentially of copper, iron, nickel and zinc in the ranges of proportions stated even though the alloy contains impurities which may be harmless or contains manganese to eliminate any possible effect of harmful impurities, and so long as the impurities, manganese, or other metals which may be present do not destroy the characteristic properties of the pure copper-iron-nickel-zinc alloy. An excellent alloy for welding having all around properties of density, strength, hardness, and absence of fuming, consists of approximately copper 57%, iron 1 to 2% (say 1.5%), nickel 2%, manganese 0.2%, zinc the balance.

In accordance with the above it will be understood that wide deviations may be made from the embodiments of the invention herein described without departing from the spirit of the invention.

I claim:

1. Alloys useful for welding rods consisting of copper, iron, nickel, and zinc in approximately the following ranges of proportions: copper 42 to 64.5%, iron 0.25 to 3%, nickel 0.25 to 5%, zinc the balance, but in all instances the sum of the copper, iron and nickel being from 50 to 65%.

2. The alloys according to claim 1 containing substantial amounts up to 1% of manganese.

3. Alloys useful for welding rods consisting of copper, iron, nickel, and zinc in approximately the following ranges of proportions: copper 43 to 63.8%, iron 1 to 2%, nickel 0.25 to 5%, zinc the balance, but in all instances the sum of the copper, iron and nickel being from 50 to 65%.

4. The alloys according to claim 3 containing substantial amounts up to 1% of manganese.

5. Alloys useful for welding rods consisting of copper, iron, nickel, and zinc in approximately the following proportions: copper 57%, iron 1 to 2%, nickel 2%, zinc the balance.

6. The alloys according to claim 5 containing substantial amounts up to 1% of manganese.

7. Alloys useful for welding rods consisting of copper, iron, nickel, and zinc in approximately the following proportions: copper 57%, iron 1.5%, nickel 2%, zinc the balance.

8. Alloys useful for welding rods consisting of copper, iron, nickel, manganese, and zinc in approximately the following proportions: copper 57%, iron 1.5%, nickel 2%, manganese 0.2%, zinc the balance.

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