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COPPER BASE ALLOYS

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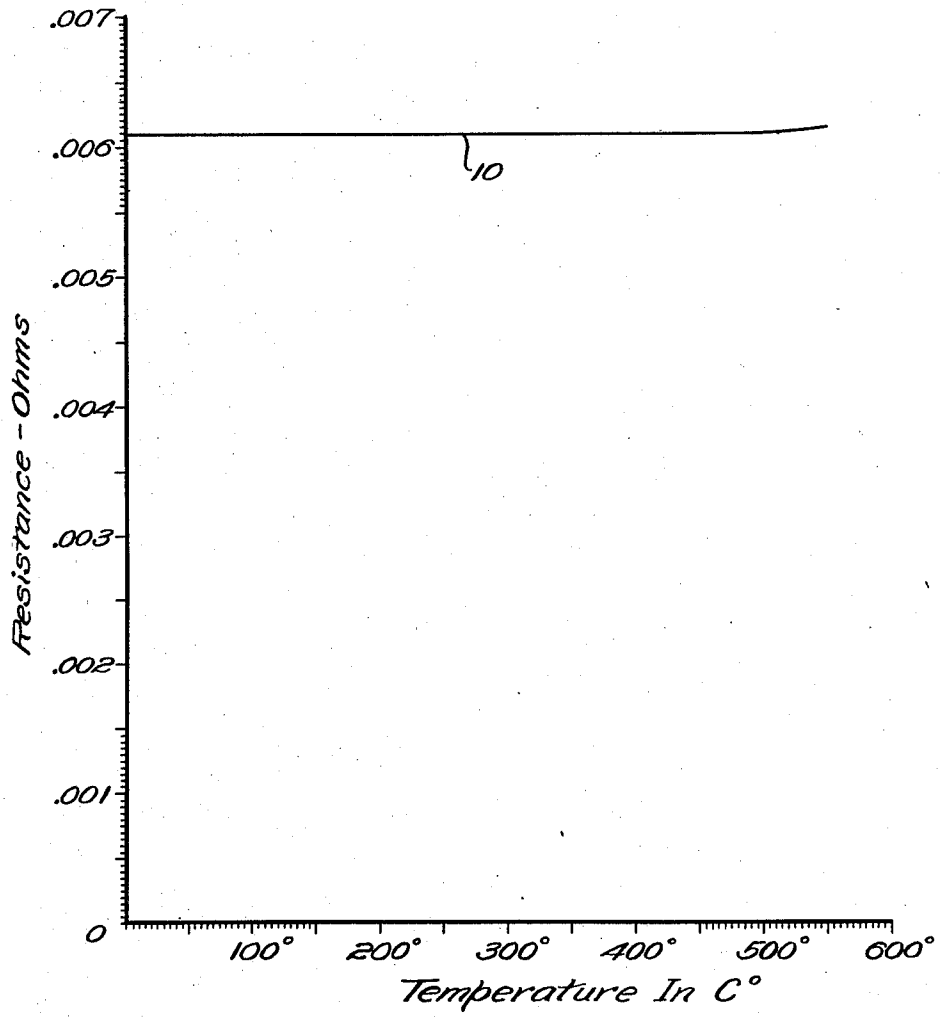

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COPPER BASE ALLOYS

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3 Claims. (Cl. 75—157.5)

This invention relates to alloys and in particular to copper base alloys.

In industry, a casting alloy composed of 55% copper and 45% nickel has been extensively employed as the interpole shunt grid material for electric locomotives. The design of the interpole grids has been based on the use of this particular alloy, the specific resistance of which is about twenty-eight times of that of pure copper. This copper-nickel alloy is particularly suited for such applications having a very low temperature coefficient of resistance of .000157 over the temperature range of 25° C. to 550° C. However, because nickel is no longer available for general use, it has become necessary to utilize nickel-free alloys as the grid material.

The existing alloys have one or more disadvantages in that they do not have a sufficiently low temperature coefficient of resistance or where the temperature coefficient is low then the specific resistance of the alloy varies so far from that of the 55% copper 45% nickel alloy that it cannot be employed without redesigning the present pattern equipment. In particular, the change in the specific resistance is objectionable for grids made from such alloys will not have the same surface area and cross-sectional strength as the copper-nickel grids thereby necessitating considerable change in space and ventilation requirements of the grid.

It is an object of this invention to produce a copper base alloy having a very low temperature coefficient of resistance and a predetermined specific resistance.

Other objects of this invention will become apparent from the following description when taken in conjunction with the accompanying drawing, the single figure of which is a graph, the curve of which illustrates the resistance of the alloy of this invention over a temperature range of 0° C. to 550° C.

The alloy of this invention comprises by weight from 74% to 75% copper, from 10% to 11% manganese, from 3.5% to 4.5% iron, from 10 to 11.5% zinc, and from .5% to 1.0% aluminum. Alloys having the elements within the foregoing range can be readily duplicated by usual metallurgical practices and have a specific resistance of substantially twenty-eight times that of pure copper. The alloy can be readily formed into resistor grids and has sufficient strength and toughness for withstanding the shock and vibration to which it is submitted when employed in service such as grids for electric locomotives.

In particular, the alloy composed of 74.27% copper, 10.43% manganese, 3.71% iron, 10.96% zinc and .63% aluminum is satisfactory for such applications. When tested, it is found that this preferred alloy has a temperature coefficient of resistance between 0.° C. and 550° C. of .000032 and a specific resistance of about twenty-eight times that of pure copper.

Referring to the single curve 10 of the drawing, there is illustrated the variation in the resistance of the specific alloy identified hereinbefore when subjected to temperatures between 0.° C. and 550° C., it being noted that the resistance is maintained substantially constant over the entire range. This compares favorably with the resistance of the known copper-nickel alloys employed heretofore, the present alloy, however, being more consistent in its value of resistance than the 55% copper 45% nickel alloy referred to hereinbefore.

While it is appreciated that it is hard to duplicate the specific composition of the preferred alloy identified hereinbefore to the hundredth percentage of each alloying element, it is preferred to maintain the composition as close to the given composition as possible in order to maintain its specific resistance at substantially that of the prior copper-nickel alloy. However, all the alloys within the range given hereinbefore are satisfactory for the purpose of this invention, being readily cast to shape and having good strength and being capable of being welded when formed into grids.

Although this invention has been described with reference to a particular embodiment thereof, it is, of course, not to be limited thereto except in so far as is necessitated by the scope of the appended claims.

We claim as our invention:

1. An alloy consisting of 10% to 11% by weight of manganese, 3.5% to 4.5% by weight of iron, 10% to 11.5% by weight of zinc, .5% to 1.0% by weight of aluminum, and the balance copper.

2. An alloy consisting of, about 74.27% by weight of copper, about 10.43% by weight of manganese, about 3.71% by weight of iron, about 10.96% by weight of zinc, and about .63% by weight of aluminum.

3. An alloy consisting of, about 10.43% by weight of manganese, about 3.7% by weight of iron, about 10.96% by weight of zinc, about .63% by weight of aluminum, and the balance copper, the alloy being characterized by having a specific ohmic resistance substantially twenty-eight times that of copper and a temperature coefficient of resistance of about .000032 over a temperature range of 0° C. to 550° C.

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