Patented Oct. 27, 1936 2,058,857

UNITED STATES PATENT OFFICE

2,058,857

SILVER BASE ALLOY

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No Drawing. Application June 30, 1936, Serial No. 88,115

8 Claims. (Cl. 75—173)

This invention relates to alloys and more particularly to alloys suitable for electrical contacts and the like.

An object of the invention is to produce an improved silver base alloy.

Another object is to provide an improved alloy for contacts.

A further object is to produce an improved electrical contact.

Other objects of the invention will be apparent from the following description taken in connection with the appended claims.

The present invention comprises the combination of elements, methods of manufacture, and the product thereof brought out and exemplified in the disclosure hereinafter set forth, the scope of the invention being indicated in the appended claims.

While a preferred embodiment of the invention is described herein, it is contemplated that considerable variation may be made in the method of procedure and the combination of elements without departing from the spirit of the invention.

According to the present invention an improved alloy is contemplated having the following ingredients present in substantially the ranges of proportions given below:

	Percent
Palladium or platinum	1 to 5
Cadmium or zinc	5 to 20
Silver	balance

The percentages are given by weight.

For the most desirable performance in electrical contacts cadmium is generally to be preferred to zinc. The specific proportions which have been found most suitable are as follows:

	Percent
Palladium or platinum	3
Cadmium	10
Silver	balance

The alloy is made according to well-known alloying methods either by melting all three ingredients together or by first alloying the refractory metal with the molten silver and then adding the cadmium or zinc to the melt in elemental form or as a cadmium-silver or zinc-silver alloy.

After alloying the material may be readily worked into suitable sheet rod or wire form and cut or headed into contacts. This alloy is also well adapted to the fabrication of steel-backed contacts wherein a disc of the contact alloy metal is placed against the face of a steel backing member, such as a rivet or disc, and the assembly heated to fuse the silver alloy to the backing.

The alloy has a melting point considerably higher than that of silver and hence the resulting contacts are much less susceptible to sticking or welding together due to over-heating from excessive currents or inductive discharges through the mating contacts.

The surfaces of the contacts are also notably free from metal transfer or build-up as well as pitting.

The contacts made from the present alloy are suitable for use with A. C. or D. C. and may be operated in pairs of the same composition or with a mating contact of entirely different composition such as a tungsten contact. Contacts of the above preferred composition have been operated with great success on high frequency electromagnetic vibrator-interrupters where the requirements are very exacting and tungsten contacts are usually required. These contacts have also been found suitable for use in voltage regulators, relays and circuit breakers and shows a definite improvement over fine silver and coin silver.

The best method of determining the value of contacts is by the comparative operation under controlled conditions of the contacts under consideration with contacts of the prior art. Extensive comparison tests have been made on the contacts of an alloy of the present invention containing 87% silver, 10% cadmium and 3% palladium and contacts of fine silver (at least 99% silver), coin silver (90% silver, 10% copper) and a binary alloy of 80% silver and 20% cadmium.

The various contact materials were tested on Cutler-Hammer relays using one pair of contacts 0.187 diameter one of which was flat faced and the other having approximately a 1" radius. The contacts were riveted on phosphor bronze reeds with the maximum opening about ¼". The frequency of operation was 1.4 seconds on, 1.4 seconds off, making 1285 operations per hour. The load was resistive at a power factor of 100%. Tests were run at both 2 and 10 ounces total contact pressure. The test period consisted of 72 hours of operation or in excess of 92,000 operations.

The following are some of the results obtained:

Sticking.—The 80—20 alloy, fine and coin silver contacts all stuck before the completion of the test period of 72 hours whereas the contact alloy of the present invention was still operating at the end of the test. Sticking occurred with the comparison alloys after the following number of operations:

Material	Number of operations
80—20 alloy	56,540
Fine silver	1,285
Coin silver	69,390

Metal transfer and pitting.—Fine silver showed the greatest tendency toward pitting and transfer, followed in order by the 80—20 alloy and the

alloy of the present invention. Coin silver was not compared in this regard.

Oxidation.—The alloy of the present invention showed slightly less oxidation than the 80—20 alloy, fine silver or coin silver.

Contact wear.—Contact wear is closely related to pitting and transfer. Therefore the comparison materials showed a tendency toward greater wear than the alloy of the present invention.

Contact resistance.—The change in contact resistance during operation is in general an indication of the operating characteristics of the contact material. An increasing contact resistance with length of operation indicates the formation of a high resistance oxide or a pitting or wearing of the contact face. Increased resistance causes an increased tendency toward overheating and contact sticking.

The initial resistance of contacts made of the alloy of the present invention was lower than that of the 80—20 alloy and of coin silver. Fine silver generally has a lower initial resistance than all the others and remains constant on low current operation. However, its contact resistance increases very greatly with heavy loads frequently resulting in sticking.

The 80—20 alloy showed a greater increase in resistance during operation than any others. Coin silver showed a decrease. The alloy of the present invention was generally more constant with all current loads and with light and heavy contact pressures.

It is contemplated that alloys containing normal amounts of impurities are within the scope of the present invention.

While the present invention, as to its objects and advantages, has been described herein as carried out in specific embodiments thereof, it is not desired to be limited thereby but it is intended to cover the invention broadly within the spirit and scope of the appended claims.

What is claimed is:

1. An alloy composed of an element selected from the group consisting of palladium and platinum 1 to 5%, an element chosen from the group consisting of cadmium and zinc 5 to 20% and the remainder silver.

2. An alloy composed of an element selected from the group consisting of palladium and platinum 1 to 5%, a cadmium 5 to 20% and the remainder silver.

3. An alloy composed of an element selected from the group consisting of palladium and platinum about 3%, cadmium about 10%, and the remainder silver.

4. An electrical contact member formed of an alloy composed of an element selected from the group consisting of palladium and platinum 1 to 5%, an element chosen from the group consisting of cadmium and zinc 5 to 20% and the remainder silver.

5. An electrical contact member formed of an alloy composed of an element selected from the group consisting of palladium and platinum 1 to 5%, cadmium 5 to 20% and the remainder silver.

6. An electrical contact member formed of an alloy composed of an element selected from the group consisting of palladium and platinum about 3%, cadmium about 10%, and the remainder silver.

7. An alloy containing about 1 to 5% of an element selected from the group consisting of palladium and platinum, about 5 to 20% of an element selected from the group consisting of cadmium and zinc and the remainder substantially all silver, said alloy being characterized by a higher melting point than silver, less tendency toward oxidation than fine or coin silver, higher wear resistance than fine or coin silver, and greater constancy of operation in electric current control than fine silver, coin silver or a binary alloy of silver and cadmium.

8. An electrical contact member formed of an alloy containing about 1 to 5% of an element selected from the group consisting of palladium and platinum, about 5 to 20% of an element selected from the group consisting of cadmium and zinc and the remainder substantially all silver, said alloy being characterized by a higher melting point than silver, less tendency toward oxidation than fine or coin silver, higher wear resistance than fine or coin silver and greater constancy of operation in electric current control than fine silver, coin silver or a binary alloy of silver and cadmium.

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