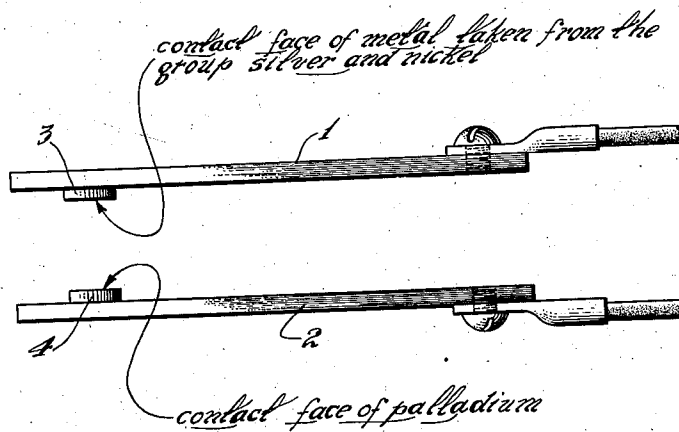


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ELECTRICAL CONTACT ELEMENT
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ELECTRICAL CONTACT ELEMENT

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This invention relates to electrical contact elements suitable for use in the making and breaking of electric current.

Electrical contacts are usually manufactured of platinum, alloys of platinum, tungsten or silver. Electrical contact systems of cooperating contacts of silver, for instance fine silver, have found the widest use, as such silver contacts are relatively cheap and have excellent current carrying capacity, excellent heat conductivity, and good resistance to oxidation. Such electrical contacts of silver are subject, however, to the disadvantage that they tend to stick together, particularly when heavy electric currents are employed, whereby the useful application as well as the life of such contacts is relatively limited.

It is one object of this invention to provide an electrical contact system wherein the generally favorable properties of silver contacts are retained, but wherein at the same time the disadvantage of sticking is decreased or substantially eliminated. It is another object of this invention to provide such electrical contact system which shall have wide application and long useful life and which shall be capable of employment even with heavy electric currents.

I have found that the aforesaid objects of my invention can be attained by providing an electrical contact system wherein one electrical contact comprises silver or nickel, and the cooperating electrical contact comprises palladium or has at least a contact face of palladium.

The invention is illustrated in the single figure of the drawing representing a side view of an electrical contact system comprising contact holders 1 and 2 provided with electrical contacts 3 and 4. In the embodiment shown in the drawing contact 3 has a contact face of metal taken from the group silver and nickel and the contact 4 has a contact face of palladium.

The pairing in an electrical contact system of a contact of silver or nickel with a contact of palladium results in an electrical contact system of long life, wherein sticking of the contacts is substantially eliminated. The system of the invention may be employed, therefore, not only with relatively low electric currents, i. e. currents of not more than 15 volts and 15 amperes, but also with relatively heavy electric currents where contact systems of cooperating contacts of silver cannot usually be employed without resulting difficulties involving sticking.

The nature and advantages of my invention are illustrated by a few representative examples.

With an electric current of 15 volts D. C. and 30 amp. and after 100,000 cycles of continuous makes and breaks of the electric current an electrical contact system composed of a palladium cathode contact and a fine silver anode contact showed substantial absence of sticking and disclosed even wear of both contacts. In this system the voltage drop increased from 15 millivolts to 30 millivolts, the palladium contact showed a loss of 0.0022 gram, and the fine silver contact showed a gain of 0.001 gram. In a like experiment, an electrical contact system of palladium cathode contact and nickel anode contact likewise showed substantial absence of sticking and disclosed even wear of both contacts. In this system the voltage drop increased from 90 millivolts to 190 millivolts, the palladium contact showed a loss of 0.0092 gram, and the nickel contact showed a loss of 0.0043 gram. As distinguished from such contact systems according to the invention, a system wherein both cooperating contacts comprised fine silver showed under like operating conditions a definite tendency to stick, and disclosed the formation of craters. In this system the voltage drop increased from 3.5 millivolts to 8 millivolts, the contact cathode showed a gain of 0.0192 gram and the anode contact a loss of 0.0228 gram. A system wherein both contacts comprised palladium showed under like operating conditions a slight tendency to stick, with the voltage drop increasing from 64 millivolts to 360 millivolts. In this system the cathode contact showed a loss of 0.0028 gram and the anode contact showed a gain of 0.0010 gram.

It will be apparent from the above illustrations that the electrical contact system of palladium against silver has longer life than the system silver against silver in that in the system according to this invention the voltage drop remains low and the amount of metal transfer from one contact to the other is extremely small. It is surprising that the system palladium against silver is even more favorable than the system palladium against palladium, in which connection it will be noted that such all-palladium system loses weight slightly more rapidly, has a larger metal transfer, and higher voltage drop than the system of the invention. The system silver against silver has, of course, the lowest voltage drop but in use becomes considerably deformed and sticks occasionally, wherefor its useful life is shorter than that of the system palladium against silver of the invention. The system of palladium against nickel is particularly suited for cases where the melting point of silver is too low and the low

voltage drop of the system palladium against silver is not necessarily required. Experiments with electrical contact systems embodying one contact of silver and another contact of a metal of the platinum group other than palladium have disclosed the superiority of the system of the invention embodying one contact of palladium; for instance, a system comprising an anode contact of silver and a cathode contact of an alloy of 75% platinum and 25% iridium showed under like operating conditions an increase in the voltage drop from 24 millivolts to 210 millivolts; a loss of 0.0028 gram for the platinum contact, and of 0.0024 gram for the silver contact.

The electrical contact system according to the invention is useful not only in D. C. operations, but also in A. C. operations where such system of the invention, likewise, displays less tendency to stick and exhibits a longer useful life than the system silver against silver.

The terms "silver," "palladium" and "nickel" as herein used shall include not only pure metals but also such other compositions wherein such metals predominate, although it will be understood that contacts of the pure metals are to be generally preferred. The determining factor in the electrical contact system according to the invention is the requirement that the contact faces, i. e. the contacting surfaces, consist of silver, palladium, and nickel, respectively, and it will be understood, therefore, that it is not necessary that

the contacts consist in their entirety of such metals.

What I claim is:

1. Electrical contact system for making and breaking electric current, comprising a pair of cooperating electrical contacts positioned opposite each other wherein one such electrical contact has a contact face of metal taken from the group silver and nickel, and the other electrical contact has a contact face of palladium.
2. Electrical contact system for making and breaking electric current, comprising a pair of cooperating electrical contacts positioned opposite each other wherein one such electrical contact has a contact face of silver and the other electrical contact has a contact face of palladium.
3. Electrical contact system for making and breaking electric current, comprising a pair of cooperating electrical contacts positioned opposite each other wherein the anode contact has a contact face of silver and the cathode contact has a contact face of palladium.
4. Electrical contact system for making and breaking electric current, comprising a pair of cooperating electrical contacts positioned opposite each other wherein one such electrical contact has a contact face of fine silver and the other electrical contact has a contact face of pure palladium.

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