July 15, 1930. C. F. CARPENTER 1,770,839

ELECTRIC CONTACT

Filed Nov. 1, 1926

Fig. 1.

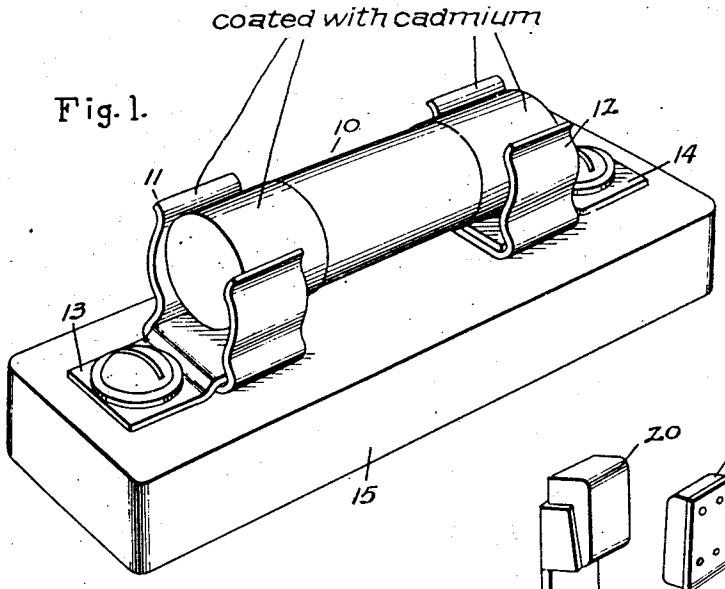
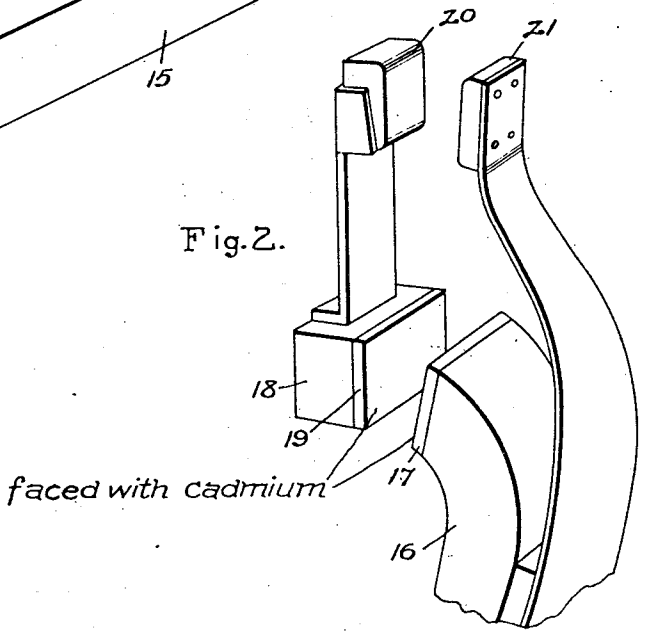


Fig. 2.



Inventor:

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Patented July 15, 1930 1,770,839

UNITED STATES PATENT OFFICE

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ELECTRIC CONTACT

Application filed November 1, 1926. Serial No. 145,442.

This invention relates to electric contacts, and it is particularly concerned with the contact resistance inherently existing at the junctions of conductors that are included in an electric circuit. Thus, when two conductors of copper or other metal are mechanically held in contact to permit electric current to flow therebetween, there is a restrictive resistance to the current flow at the joint. This is due primarily to the fact that the actual contact is made only at one or more small points and the current is therefore forced to flow across these small restricted connections.

Since the contact resistance between most all metallic conductors is increased as the contact surface of the conductor becomes oxidized, undesirable localized heating is likely to develop at the contact between the conductors, particularly with the conductors in circuits carrying currents of any appreciable magnitude. This is particularly true of copper conductors, as the copper oxide is a very poor conductor. Since copper is the metal principally used for the current carrying parts of electrical devices for the reason that it has the lowest ohmic resistance of any of the cheap metals, considerable difficulty due to the localized heating at the contacts of copper conductors has been experienced in most all types of electrical apparatus. Thus, for example, when an ordinary type of fuse mounted in fuse clips is included in an electric circuit, the contact resistance between the copper end ferrules and the copper fuse clips may produce a heating effect which materially affects the normal rating of the fuse, particularly after the fuse has been in service sufficiently long for the contact surfaces of the end ferrules and the fuse clips to become thoroughly oxidized. Likewise, with an ordinary switch having contacts of copper that have become oxidized, such localized heating at the contacts may develop that the switch is incapable of satisfactorily carrying the normal load current for which it was designed.

My present invention provides improvements whereby the contact resistance of electric conductors, particularly at the contacts of fuses, switches, or the like, may be limited so that overheating does not result even during long continued service under conditions which would normally cause oxidization and deterioration of the contacts.

This is accomplished in accordance with the present invention by providing the conductors with a contact surface of cadmium. I have found that copper contacts provided with a coating or facing of cadmium at the contact surfaces are capable of long continued service without developing any appreciable restrictive resistance at the contacts and, therefore, without any increased heating effect at the contacts over long periods of service while carrying full load current through the contacts.

Fig. 1 of the accompanying drawing shows an ordinary type of fuse mounted in fuse clips with both the end ferrules of the fuse and the fuse clips provided with a coating of cadmium, as illustrating one way in which the invention may be carried into effect.

Fig. 2 shows the main current carrying contact of a double break circuit interrupter provided with a facing plate of cadmium in accordance with the invention.

In Fig. 1 the fuse 10 is of the usual type provided with the copper or brass end ferrules 11 and 12 which are arranged to be received in the copper or brass fuse clips 13 and 14 mounted upon the base 15. The ferrules 11 and 12, as well as the fuse clips 13 and 14, are then provided with a substantial coating of cadmium, preferably by electrolytic deposition of the cadmium thereupon.

As there are various well-known methods of producing a satisfactory electrolytic deposition of the cadmium upon a foundation metal such as copper, brass, or other low resistance conducting material, it will be understood that the particular method employed is not of the essence of the present invention, and hence no further description thereof is deemed necessary.

I have found that the cadmium coating, such as described above, is particularly advantageous in reducing the contact resistance where the electric conductors are held in contact with only a light pressure, and are not

subjected to any appreciable wear, as in the case of the fuse mounted in the fuse clips illustrated in the drawing.

Where a contact is required to withstand considerable wear or abrasion, as in the circuit interrupter shown in Fig. 2, or various other electrical devices, the contact member may be either formed entirely of cadmium or may be provided simply with a facing of cadmium, as illustrated in Fig. 2. In this arrangement the main current carrying contact 16 of the circuit interrupter is provided with a relatively thin facing plate 17 formed of cadmium. Likewise, the stationary contact 18 also may be provided with a thin facing plate 19 of cadmium. The cadmium facing plates 17 and 19 may be secured to the respective contacts 16 and 18 in any suitable manner, although preferably the facing plates are sweated or soldered to the contact member.

As the arc occurring upon the opening of the circuit interrupter shown in Fig. 2 is restricted entirely to the auxiliary arcing contacts 20 and 21 which are maintained closed until after the separation of the main current-carrying contacts 16 and 18 in the usual manner, the cadmium facings of the main current-carrying contacts are not subjected to the pitting, burning, or other destructive action of the arcs. Due to the fact that the contact resistance between the cadmium facings 17 and 19 remains at a substantially constant value throughout a long period of service, there is no tendency for the main current-carrying contacts 16 and 18 to become overheated due to localized heating at the junction therebetween. Consequently, the interrupter provided with contacts embodying the present invention is capable of continued service at full load curent over long periods.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. An electrical contact formed of copper and provided with a coating or facing of cadmium on the contact surface thereof for maintaining the contact resistance of the contact substantially constant.

2. An electrical contact having a cadmium contact surface for preventing increase in the contact resistance of the contact.

3. An electrical device provided with relatively movable contacts having cooperating contact surfaces of cadmium for preventing increase in the contact resistance between the contacts.

4. A fuse having a coating of cadmium electrically deposited on its contacts.

5. In combination, a pair of electrical conducting members having cooperating contact surfaces thereon, each of said members comprising a low resistance foundation metal with a contacting surface of cadmium.

In witness whereof, I have hereunto set my hand this 29th day of Octotber, 1926.

CHARLES F. CARPENTER.