April 22, 1947. B. E. SPIRO 2,419,469

MANUFACTURING METHOD FOR ELECTRICAL CONTACTS

Filed April 24, 1943

Fig. 1.

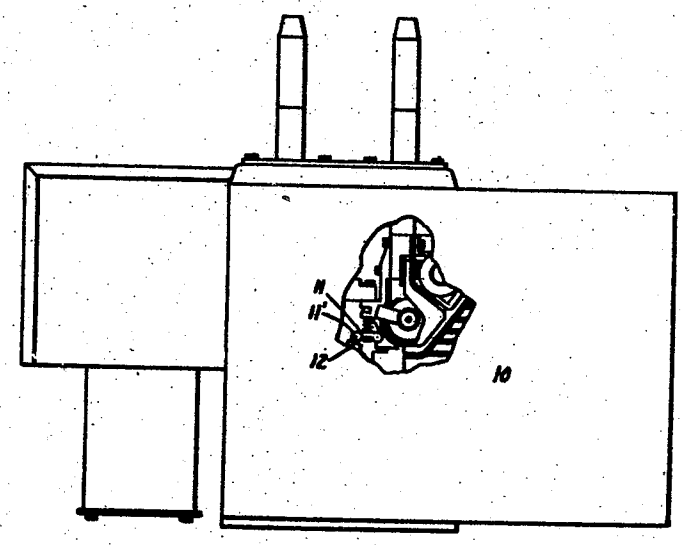


Fig. 2.

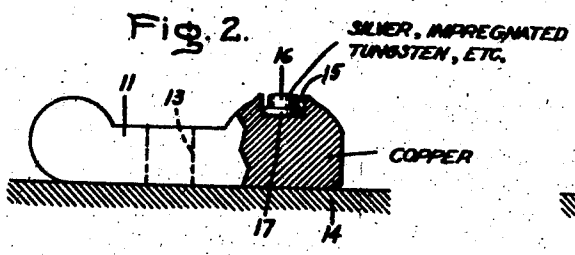


Fig. 3.

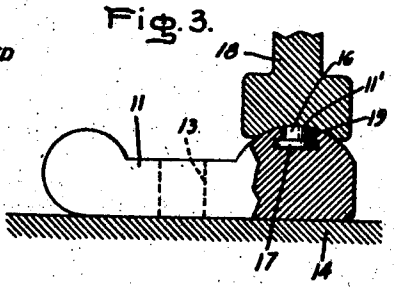


Fig. 4.

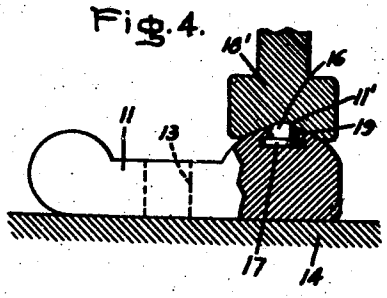
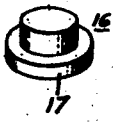


Fig. 5.



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MANUFACTURING METHOD FOR ELECTRICAL CONTACTS

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3 Claims. (Cl. 29—155.55)

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My invention relates to an electrical contact for electrical apparatus such as switching means or the like, and more particularly to the method of producing an improved contact surface therefor.

In recent years the contacts of switches, relays, and the like, have often included a surface formed of a material different from the main conducting parts of the electrical apparatus. For example, the current carrying contacts of electric switches such as circuit breakers or relays are often provided with contact surfaces formed of a material the oxide of which does not substantially interfere with electrical current conduction. The conducting parts of switches are usually made from copper, but since copper oxide substantially interferes with electrical current conduction, it has become good practice to provide the contacting surfaces of such conducting parts with a coating of silver or the like the oxide of which is both physically and chemically unstable so as not to substantially interfere with electric current conduction.

Again, contacts whose contact surfaces are subject to arcing in electric circuit breakers are often provided with a local contact surface which is capable of withstanding extreme heat without deleterious effects therefrom such as pitting or burning. For this type of duty it is advantageous to provide a contact surface formed of a sintered and impregnated tungsten material of the type such as is disclosed, for example, in U. S. Patent 1,552,184 and which is sold under the trade-mark Elkonite. This and other comparable arc-resisting materials are well known in the electrical art. My invention is particularly concerned with a new and improved method of constructing contacts of the above-mentioned type in which a contact surface is formed of a material different from the material from which the main body of the contact element is constructed.

It is an object of my invention, therefore, to provide a new and improved manufacturing method for applying a contact surface at the engaging part of a current conducting member for electrical apparatus.

It is another object of my invention to provide a new and improved method of producing a contacting surface of the engaging part of a current conducting member for electrical apparatus, the contacting surface being of silver and the conducting member being of copper.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty

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which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this application.

For a better understanding of my invention, reference may be had to the accompanying drawing in which Fig. 1 is a diagrammatic representation of an electrical apparatus employing a contact produced in accordance with the teaching of my invention, Figs. 2 and 3 represent stages during the process of constructing the contact surface of my invention. Fig. 4 is similar to Fig. 3 representing a modified step in the construction of the contact surface of my invention, and Fig. 5 is a perspective view of a flanged plug used in producing the new and improved contact surface of my invention.

Although my invention may be applied generally in connection with the contact surfaces of electric switches and relays, I have chosen to specifically illustrate my invention in connection with the current carrying contact of an electric circuit breaker.

Referring now to Fig. 1 of the drawing, I have shown a circuit breaker 10 of the well-known drop-down type for use in a grounded metal enclosure or cubicle not shown, wherein disconnection from an external electric circuit is effected merely by bodily lowering of the circuit breaker. Circuit breaker 10 includes a movable contact structure including a pair of relatively movable current carrying contacts 11 and 12. My invention is concerned with the current carrying contact 11 and particularly the method of producing the same. Contact 11 is really a contact finger shown in enlarged view in Figs. 2, 3 and 4. Contact fingers similar in shape to contact finger 11 of Fig. 1 have been used extensively in switch-gear of the type disclosed as, for example, in United States Letters Patent 2,293,513, granted August 18, 1943, upon an application of Leonard J. Linde and assigned to the same assignee as the present application.

Various means of constructing these contact fingers have been employed and the contacting surface generally indicated at 11' in Fig. 1, has comprised a piece of silver, for example, which has been bonded to the conducting members as by welding, soldering or by the cementation processes disclosed and claimed in United States Letters Patent 2,094,482 and 2,094,483, granted September 28, 1937, upon applications of William J. Weder and assigned to the same assignee as the present application. After many thousands of current interrupting operations, we have found that contacts constructed in accordance with my

invention, show considerably less mechanical wear than contacts constructed in accordance with the teachings of the prior art.

The contact finger 11 usually constructed of an electric conducting material such as copper, is first formed by a stamping or extruding operation so that long strips of material having a cross section of the general form shown by the contact fingers of Figs. 2, 3, and 4 are produced. The contact fingers are then cut off from these copper strips and a suitable opening such as 13 is drilled therethrough so that the contact finger may be fastened into position on the electric circuit breaker 10. Next, with the contact finger supported on a suitable base 14, a generally circular recess 15 is formed in contact finger 11 by a simple punch press operation which simultaneously shapes the end of contact finger adjacent recess 15, so as to assume the form indicated in Fig. 2. The contact finger 11 is then plated with silver or the like so that the interior of recess 15 is also plated. Next a flanged plug 16 of a material the oxide of which does not substantially interfere with current conduction is inserted in the circular recess 15 with the flange 17 at the bottom of the recess as indicated in Fig. 2. The flanged plug 16, best shown in Fig. 5, may be silver if, for example, a current carrying contact is to be produced, or may be of the already identified heat-resistant material Elkonite if an arcing contact is to be produced. Flanged plug 16 is generally in the form of a button having an integral enlargement 17 and as mentioned above is positioned in the recess 15 with said enlargement 17 at the bottom of the recess.

The completed contact surface 11' is obtained as indicated in Fig. 3, by means of a cold upsetting punch press operation with a smooth radius tool such as is indicated at 18, whereby a hard planished surface 11' is obtained which produces a very satisfactory contact. The silver plating in the recess 15 and the silver flanged plug 16 unite into a silver-to-silver bond so as to form a good current carrying contact. Furthermore, the edges of the recess are clinched over as indicated at 19 to engage the enlargement or flange 17 of the button or flanged plug 16, thereby holding the flanged plug as if it were an integral part of the contact finger 11.

The tool 18 of Fig. 3 provides a uniformly rounded contact surface which is very suitable for a current carrying contact. In the event that it is desired to produce an arcing contact having a contact tip such as Elkonite, it might be desired to have the contact tip of the arcing material extend above the surface of the material from which contact finger 11 is constructed. Such an arrangement is disclosed in Fig. 4 in which the upsetting tool 18' is shaped so as to permit the surface 11' to extend above the surrounding portions of the contact finger 11 to provide an arcing tip. If a contacting surface is constructed such as is illustrated in Fig. 4, the contacting material projecting above the surface of the contact finger is available for filing or dressing in the event it becomes pitted or otherwise damaged, and which dressing operation is not possible with the construction illustrated in Fig. 3 without affecting the surrounding silver-plated portion of the contact finger 11.

From the above discussion, it will be obvious that a new and improved contact construction is provided which is much simpler to manufacture, in that it permits of a considerable saving of labor and, in addition, requires a smaller percentage of the silver or other material for the contact surface than is required by the prior art arrangements. Also the cold upsetting operation does not produce any annealing of the contact material so that better wearing qualities are obtained.

While I have disclosed certain specific methods of carrying out the contact producing process of my invention, it should be understood that my invention is not limited to the specific details and methods of construction thereof herein illustrated, and I intend in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

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

1. The method of producing a contact surface from a material whose oxide does not substantially interfere with current conduction on a switching member which comprises, forming a circular recess in said member, plating said member with silver, placing a button having an integral enlargement at one end into said recess with said enlargement at the bottom of said recess and with the other end of said button substantially flush with the edges of said circular recess, and bonding said button to said member by clinching the edges of said recess over said enlargement by a cold upsetting operation so that said other end of said button forms the contacting portion of said contact surface.

2. The method of producing a contact surface of silver on a switching member of copper which comprises, forming a circular recess in said member, plating said member including said recess with silver, placing a silver button having an integral enlargement at one end into said recess with said enlargement at the bottom of said recess and with the other end of said button substantially flush with the edges of said recess, and bonding said button to said member by clinching the edges of said recess over said enlargement by a cold upsetting operation while simultaneously producing a silver-to-silver bond between said button and the plated surface of said recess.

3. The method of producing a silver contact surface on a copper switching member which comprises forming a circular recess in said member, plating said member with silver, placing a flanged plug of silver in said recess with the flange thereof at the bottom of said recess and the unflanged end thereof substantially flush with the edges of said circular recess, and bonding said flanged plug to said member by clinching the edges of said recess over said flange by a cold upsetting operation.

BENJAMIN E. SPIRO.

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