April 29, 1958 H. FELTS ET AL 2,832,127

METHOD OF MAKING ELECTRICAL CONTACTS

Filed Nov. 29, 1955

Fig. 1.

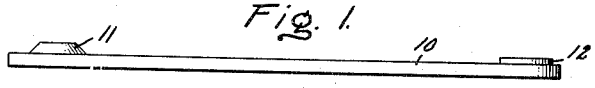


Fig. 2.

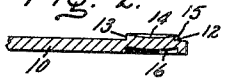


Fig. 3.

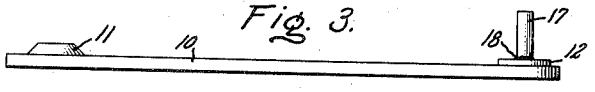


Fig. 4.

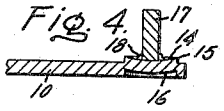


Fig. 5.

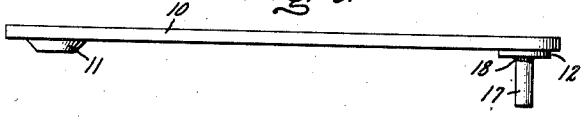


Fig. 6.

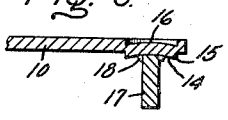


Fig. 7.

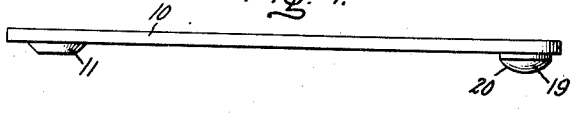


Fig. 8.

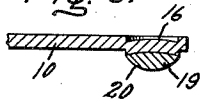


Fig. 9.

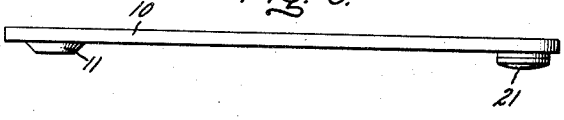
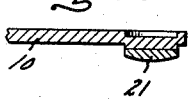


Fig. 10.



Inventors:
Herman Felts,
Frederick W. Riddington,
by Laurence R. Kempton
Their Attorney.

United States Patent Office 2,832,127
Patented Apr. 29, 1958

2,832,127

METHOD OF MAKING ELECTRICAL CONTACTS

Herman Felts, Upland, and Frederick W. Riddington, Ontario, Calif., assignors to General Electric Company, a corporation of New York

Application November 29, 1955, Serial No. 549,699

7 Claims. (Cl. 29—155.55)

This invention relates to electrical contacts and methods of manufacturing the same.

Some electrical contact assemblies in the past have been made by forming an annular groove or moat in the supporting member around a cavity or indentation which defines the contact area. After conducting material suitable for an electrical contact was placed within the confines of the moat, the supporting member including the conducting material was heated with the supporting member so positioned that the contact area with its conducting material was on the upper side thereof. It has been found, however, that conducting material, when melted, had a tendency to flatten out and flow over the edges of the moat from the contact area. This resulted in coating the supporting member beyond the confines of the moat and either involved the use of an excess amount of conducting material or resulted in an insufficient amount of conducting material being left within the contact area. In addition, such melting has frequently been accomplished in a reducing atmosphere. During the heating process, the supporting member became chemically clean throughout its entire surface, thereby increasing the tendency of the conducting material to wet the entire surface of the supporting member instead of being confined to the contact area. This tendency has been further increased because of the normal practice of heating the entire supporting member in a reducing atmosphere so that the temperature is the same throughout the member. In accordance with this invention the contact assembly is formed, positioned and heated in such a manner as to overcome the aforementioned problems encountered with prior art structures.

Accordingly, it is an object of this invention to provide an improved and simplified method of making electric contacts.

Another object of the invention is to provide a method to more easily confine conducting material to the appropriate area of the electrical contact.

A further object is to provide an electrical contact with an improved contact face.

Further objects and advantages will become apparent as the following description proceeds and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In carrying out the objects of this invention in one form thereof, a quantity of conducting material suitable for an electrical contact, silver for example, is fused or otherwise bonded to a supporting member composed of electrical conducting material. The supporting member is formed to include a raised dam within the confines of which the conducting material, preferably in rod form, is positioned, by welding or other suitable bonding arrangement. The assembly is heated with the conducting material preferably in a depending position so that the melted silver tends to assume a drop formation and the tendency to flow beyond the confines of the raised dam is minimized. Heating is preferably supplied by an induction heater to more effectively localize the heating to the end of the supporting member which contains the dam.

For a better understanding of the invention, reference may be had to the accompanying drawings in which:

Fig. 1 is a side view of a backing or supporting member for use in forming the contact assembly;

Fig. 2 is a sectional elevation view of a portion of the structure shown in Fig. 1;

Fig. 3 is a side view of the supporting member and conducting material in the form of a rod in an upright position preparatory to the heat treating step.

Fig. 4 is a sectional elevation view of a portion of the structure shown in Fig. 3;

Fig. 5 is a side view of the supporting member in an upside-down position with the conducting material in the form of a rod bonded to said member preparatory to heating the assembly;

Fig. 6 is a sectional elevation view of a portion of the structure shown in Fig. 5;

Fig. 7 is a side view of the contact assembly after the heating operation has been performed;

Fig. 8 is a sectional elevation view of a portion of the structure shown in Fig. 7;

Fig. 9 is a side view of the assembly after a coining operation has been performed; and

Fig. 10 is a sectional elevation view of a portion of the structure shown in Fig. 9.

Referring to Fig. 1, a metallic backing or supporting member of suitable electrically-conducting material, such as any of a number of metals commonly employed for the purpose, is indicated at 10 in an upright position. At the end of said member is stamped a raised conical-shaped terminal 11 with a hole therethrough. The other end of the member is formed by a suitable stamping operation to provide on the upper face of the supporting member a raised circular portion or dam 12 with a concave surface facing upwardly. Illustrated more clearly in Fig. 2, this dam consists of a raised circular side 13 and a concave indentation or area 14 with a sharp circular edge 15. A corresponding convex indented portion 16 is formed on the opposite or lower face of the support member.

The conducting material, such as silver, 17, preferably in rod form, is placed against the concave or cavity area 14. The silver is then bonded in any suitable manner, as by welding, to the cavity area within the dam as indicated at 18 in Figs. 4 and 6. Although silver is preferably employed as the conducting material, it will be apparent that any other suitable conducting material may be used within the scope of this invention. The above-mentioned operation may be performed while the supporting member is in an upright position as shown in Figs. 3 and 4 or the supporting member may be inverted to the upside-down position shown in Figs. 5 and 6 before the welding operation is performed.

The assembly is then placed in the upside-down position in a suitable reducing atmosphere, such as hydrogen, and is heated until the silver becomes fluid, flowing and fusing itself to the support dam area.

During the heating operation, while the assembly is in the upside-down position, the fluid silver assumes a generally globular shape similar to the formation of a drop due to the cohesion of the silver and its adhesion to the supporting member. This is illustrated in Figs. 7 and 8. By taking a drop-like form, the silver assumes a convex or rounded face 20 and tends to remain within the dam confines. The sharp edge 15 of the dam aids in confining the silver to that area. In addition, the heat is applied preferably to the end of the supporting member which contains the dam and the silver to be melted. It has been found that by concentrating the heat substan-

tially in the vicinity of the dam area, the temperature of the remaining assembly is lower and less critical. The tendency of the silver to wet the entire supporting member is minimized and the silver is thereby more easily confined to the dam area. This insures a sufficient amount of silver for a satisfactory finished contact. An induction heating means is desirable to concentrate the heat substantially to the dam vicinity, although any heating means which is capable of localizing heat and controlling temperature may be used. Upon cessation of the application of heat the fluid silver adhering to the dam area cools to form a solid mass having a convex contact surface confined within the dam boundaries.

Thus, it becomes apparent that by positioning the assembly in an upside-down manner during the heating operation, the silver tends to remain within the dam confines, leaving enough silver for a suitable contact, manufacturing methods become less critical, and the contact face tends to assume a more suitable shape.

After the contact assembly has sufficiently cooled and the contact has solidified, in some instances the contact may be suitable for use as a contact face without any further treatment. However, the contact face may be worked into different finished forms by various methods. For example, the contact surface may be polished into a smooth finished face. Alternatively, as illustrated in Figs. 9 and 10, the contact may be coined into a button shape. The contact thereby produced has a circular face with a curvature 21 of less convex contour or shape than the contact surface shown in Figs. 7 and 8.

While a specific embodiment of this invention has been shown and described, it will be understood, of course, that the invention is not limited to the particular methods and constructions shown and described, and the appended claims are intended to cover all modifications within the spirit and scope of the invention.

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

1. The method of forming an electric contact which comprises forming a concave dam with a sharp edged periphery of said dam projecting above one face of a contact support member composed of a metal wettable by molten silver, securing a slug of silver to the area upon said dam, turning said support member to an upside-down position, and melting said material while said member is in said upside-down position to form an electric contact.

2. The method of forming an electric contact which comprises forming a concave area in a contact supporting member of a metal wettable by molten silver with a sharp edged periphery of said area projecting above the plane of one surface of said supporting member, securing a slug of silver to said area, inverting said member to an upside-down position, and melting said silver whereby said silver forms an electric contact.

3. The method of forming an electric contact which

comprises forming a concave area in a contact supporting member of a metal wettable by molten silver with a sharp peripheral edge of said area projecting above the plane of one surface of said supporting member, applying a quantity of silver to said area, inverting said member to an upside-down position, and melting said silver in a reducing atmosphere whereby said silver forms an electric contact.

4. The method of forming an electric contact which comprises forming a circular concave area with sharp peripheral edges projecting upwardly from a contact supporting member of a metal wettable by molten silver, welding a slug of silver to said concave area while said member is in an upright position, inverting said member to an upside-down position, melting said silver while the member is in said inverted position, allowing said assembly to cool, and working the contact face into a less convex shape.

5. The method of forming an electric contact which comprises projecting a raised, circular concave area with a sharp peripheral edge with respect to the surface of a contact supporting member of a metal wettable by molten silver, welding a slug of silver to said concave area while said member is in an upright position, inverting said member to an upside-down position, melting said silver in a reducing atmosphere while the member is in said inverted position, and coining said silver into a button form after said contact has solidified.

6. The method of forming an electric contact which comprises forming a circular concave area with a sharp peripheral edge of said area projecting upwardly from a contact supporting member of a metal wettable by molten silver, applying a slug of silver to said concave area while said member is in an upright position, inverting said member to an upside-down position, and heating said member localized to the vicinity of the dam area and in a reducing atmosphere whereby said silver is melted while the member is in said inverted position.

7. The method of forming an electric contact which comprises forming a circular concave area with a sharp peripheral edge of said area projecting upwardly from a contact supporting member of a metal wettable by molten silver, welding a slug of silver to said concave area while said member is in an upright position, inverting said member to an upside-down position, and locally and inductively heating said member in a reducing atmosphere substantially in the vicinity of the dam area whereby said silver is melted while the member is in said inverted position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,137,617	Imes et al.	Nov. 22, 1938
2,301,915	Harrington	Nov. 17, 1942
2,319,610	Lake	May 18, 1943