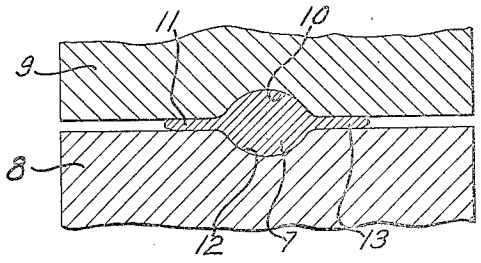
May 9, 1933. A. H. ADAMS 1,907,930

PROCESS OF MANUFACTURING ELECTRICAL CONTACT MEMBERS

Filed Nov. 24, 1930

Fig. 1.



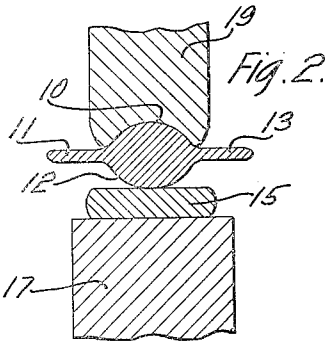


Fig. 2.

Fig. 3.

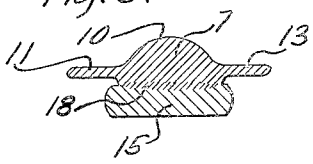
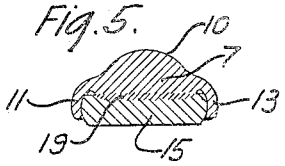


Fig. 5.



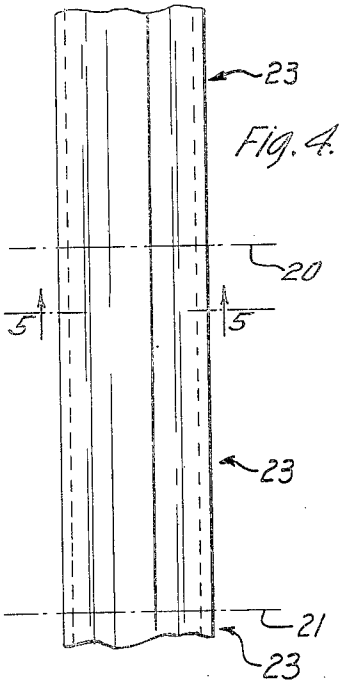
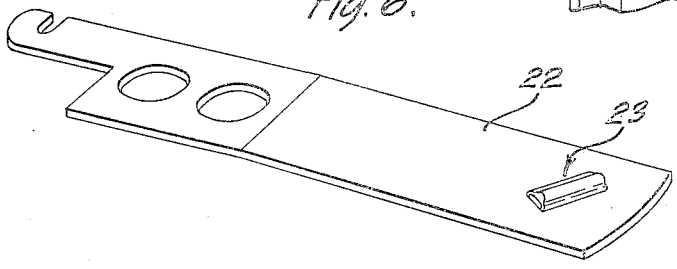


Fig. 4.

Fig. 6.



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UNITED STATES PATENT OFFICE

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PROCESS OF MANUFACTURING ELECTRICAL CONTACT MEMBERS

Application filed November 24, 1930. Serial No. 497,755.

This invention relates to a process of manufacturing electrical contact members, and more particularly to a process of manufacturing bimetallic electrical contact elements.

It is the object of the present invention to provide a process of manufacturing bimetallic, electrical contact elements, utilizing a minimum quantity of contact metal while providing a substantial effective contact surface.

In accordance with one embodiment, the invention contemplates forming a substantially rectangular ribbon of base metal, forming a strip of contact metal to a substantially elliptical cross-sectional shape with laterally extending portions at the smaller ends of the ellipse, and welding the contact metal to the base metal. After the strip of contact metal and the ribbon of base metal have been shaped as described hereinbefore and welded together, the laterally extending portions of the contact metal are bent out of their normal plane to surround partially the adjacent edges of the base metal, thereby to provide a greater area protected by contact metal when the contact elements are mounted upon contact springs of electrical apparatus. A composite strip of base and contact metal formed as hereinbefore described may be cut to predetermined lengths and welded to contact springs and angularly disposed with respect to each other.

A better understanding of the invention may be had by referring to the following detailed description of one embodiment thereof when considered in conjunction with the accompanying drawing, wherein

Fig. 1 is a cross-sectional view through a forming apparatus in which the wire of contact metal is positioned and formed to the shape shown;

Fig. 2 is a sectional view through a strip of contact metal and ribbon of base metal and a pair of welding electrodes showing the relative position of the electrodes and the base and contact metal before the welding operation takes place;

Fig. 3 is a cross-sectional view of a composite bimetallic strip composed of a ribbon of base metal and strip of contact metal after the welding operation;

Fig. 4 is a plan view showing a composite bimetallic strip after the laterally extending portions of the contact metal have been formed out of their normal plane;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4 in the direction of the arrows, and

Fig. 6 is a perspective view of a contact spring with the composite bimetallic contact element welded thereto.

Referring now to the drawing wherein like reference characters designate the same parts throughout the several views, the numeral 7 indicates a wire of contact metal such as platinum, palladium, alloys of platinum and gold or palladium and gold or similar metals of the composition commonly used in electrical contact elements which has been deformed from a regular cylindrical wire by means of cooperating swage blocks 8 and 9 to the shape shown wherein portions of the metal of the wire have been swaged outwardly at diametrically opposite points to form laterally extending projections 11 and 13 and upper and lower rounded surfaces 10 and 12, respectively. After a wire of contact metal has been so formed a strip or ribbon of base metal 15 of nickel silver or pure nickel of a substantially rectangular cross-section with rounded edges is combined with the contact metal in the manner shown in Fig. 2 with the rounded lower surface 12 of the contact metal making a line contact with the base metal and welding electrodes 17 and 19 are applied to the lower, flat surface of the base metal 15 and the upper, rounded surface 10 of the wire 7 of contact metal and a welding current is applied to the electrodes in any well known manner. As is usual in welding operations, pressure is exerted upon the contact and base metals while the welding current is being applied to cause them to join together by fusion thereof in the manner shown in Fig. 3.

It has been found that because of the difference in fusing temperatures of contact metal such as platinum or palladium and alloys thereof and base metal such as nickel

silver, pure nickel or other metals having a high resistance to corrosion, that if a line contact is provided between the two metals, as shown in Fig. 2, the welding current in passing from the wire 7 of platinum or similar metal to the strip 15 of nickel silver or similar metal will be concentrated and will encounter the greatest resistance at the line of contact and the metals will fuse simultaneously providing a very satisfactory weld with an alloy of the two metals being formed in the area indicated by the numeral 18, Fig. 3. This substantially simultaneous fusing of the contact and base metals is due to the fact that the base metal being large in cross-sectional area will not heat as rapidly as the contact metal, which at the line where the welding action takes place and where the concentration of the welding current occurs is relatively small in cross-sectional area, thereby causing the base and contact metals along the line of contact therebetween tc reach their melting temperatures at approximately the same time, thus providing an intimate mixture and alloying of the metals and a strong welded union between them.

After a ribbon of base metal and a wire of contact metal have been welded together to form a continuous strip of the shape shown in cross-section in Fig. 3, the laterally extending projections 11 and 13 of contact metal are formed by suitable forming-members to the shape shown in cross-section in Fig. 5, whereupon the composite strip so formed may be cut to predetermined lengths along the lines 20 and 21 (Fig. 4) to form composite bimetallic contact elements 23. The laterally extending projections 11 and 13 thus form an apron over the base metal to provide a greater area covered with contact metal thereby preventing the deposition of oxides of the base metal on the contact metal which would otherwise be caused by arcing between the base and contact metal of cooperating contact elements.

Contact elements 23 formed in accordance with the steps outlined hereinbefore may then be secured by welding to springs 22 for use in electromagnetic relays or like apparatus. It will be noted that the contact element 23 as shown in Fig. 6, is angularly disposed upon the flat surface of the contact spring 22. Another contact element 23 fixed diagonally to a spring (not shown) will provide a cooperating contacting surface for use in conjunction with the contact element and spring shown in Fig. 6, the contact elements being angularly disposed with respect to each other, a cross contact being thus provided.

Although this invention has been described as utilizing a specific form of ribbon or base metal and wire of contact metal, it will be understood that various modifications and adaptations of the method outlined in detail hereinbefore may be made without departing from the scope of the invention, which is to be limited only by the scope of the appended claims.

What is claimed is:

1. The process of manufacturing bimetallic contact elements which includes forming a base metal to predetermined dimensions, forming a contact metal to a predetermined irregular formation, combining the base metal and contact metal, welding the contact metal to the base metal to form a composite member, and forming the contact metal over the base metal to protect the base metal.

2. The process of manufacturing bimetallic contact elements which includes forming a ribbon of base metal of predetermined dimensions, pressing a wire of contact metal to form horizontally extending projections upon diametrically opposite portions thereof, combining the ribbon of base metal and the wire of contact metal with the projections of the wire of contact metal parallel to the widest surface of the base metal, welding the base metal and wire of contact metal while maintained in that relative position, and thereafter forming the composite strip into its final shape.

3. The process of manufacturing bimetallic contact elements which includes forming a ribbon of base metal of predetermined dimensions, pressing a wire of contact metal to form horizontally extending projections upon diametrically opposite portions thereof, combining the ribbon of base metal and the wire of contact metal with the projections of the contact metal parallel to the widest surface of the base metal, welding the base metal and the wire of contact metal while maintained in that relative position, and forming the projections of contact metal out of their normal horizontal plane to surround partially the vertical portions of the base metal.

4. The process of manufacturing bimetallic contact elements which includes forming a ribbon of base metal of predetermined dimensions, pressing a wire of contact metal to form horizontally extending projections upon diametrically opposite portions thereof, combining the ribbon of base metal and the wire of contact metal with the projections of the contact metal parallel to the widest surface of the base metal, welding the base metal and the wire of contact metal while maintained in that relative position, and forming the projections of contact metal out of their normal horizontal plane to surround partially the vertical portions of the base metal while retaining the rounded upper surface of the contact metal.

5. The process of manufacturing bimetallic contact elements which includes forming a ribbon of base metal of predetermined dimensions, forming contact metal to a predetermined irregular formation, combining the

base metal and contact metal, welding the contact metal to the base metal, forming the composite strip into its final shape, and welding the composite strip in its final shape to a contact spring.

6. The process of manufacturing bimetallic contact elements which includes forming a ribbon of base metal of substantially rectangular cross-section, forming a wire of contact metal to an approximately elliptical cross-sectional shape with projecting portions at the smaller ends of the ellipse, welding the contact metal to the base metal with the projecting portions of the contact metal parallel to the flat surface of the base metal, and forming the projecting portions of the contact metal to surround partially the base metal.

7. The process of manufacturing bimetallic contact elements which includes forming a ribbon of base metal of substantially rectangular cross-section, forming a wire of contact metal to an approximately elliptical cross-sectional shape with projecting portions at the smaller ends of the ellipse, welding the contact metal to the base metal with the projecting portions of the contact metal parallel to the flat surface of the base metal, forming the projecting portions of the contact metal to surround partially the base metal, cutting the composite base and contact metal strip into predetermined lengths, and welding the composite strip to contact springs.

8. The process of manufacturing bimetallic contact elements which includes forming a base metal of substantially rectangular cross-sectional shape, forming outwardly extending ridges on a wire of contact metal, combining the base metal and the contact metal, welding the contact metal to the base metal, and forming the ridges of the contact metal over the base metal.

9. The process of forming bi-metallic contact elements for contact arms which comprises forming a base member and a contact member, providing one of said members with a convex surface to make a line contact with the other to localize an electric current, applying an electric current to the parts to weld them together into a composite member, forming one of the members over the other member to enclose a portion thereof, and welding the composite member to a contact arm.

In witness whereof, I hereunto subscribe my name this 18th day of November, A. D. 1930.

ARTHUR H. ADAMS.