May 9, 1933. E. PUGH 1,907,932

PROCESS OF MANUFACTURING ELECTRICAL CONTACT MEMBERS

Filed Nov. 24, 1930

Fig. 1.

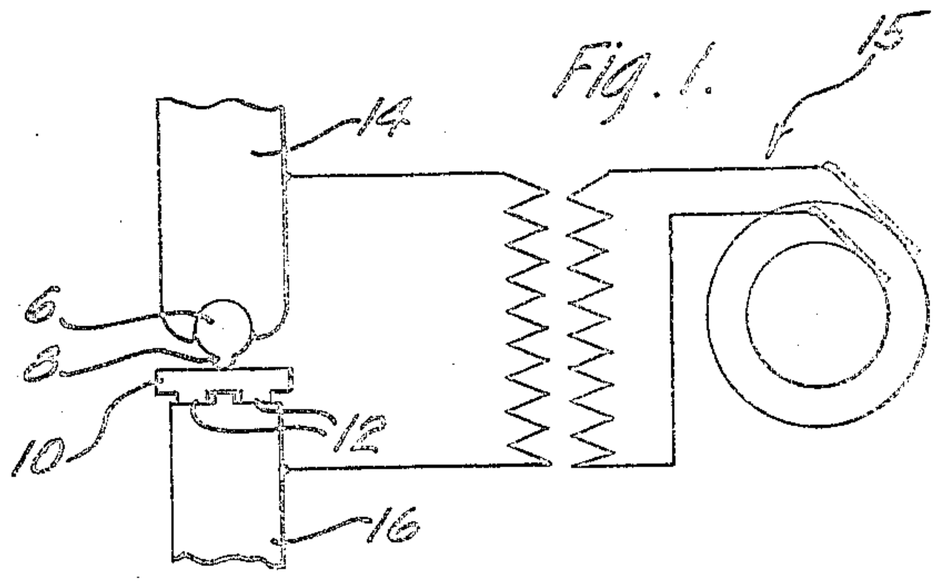


Fig. 2.

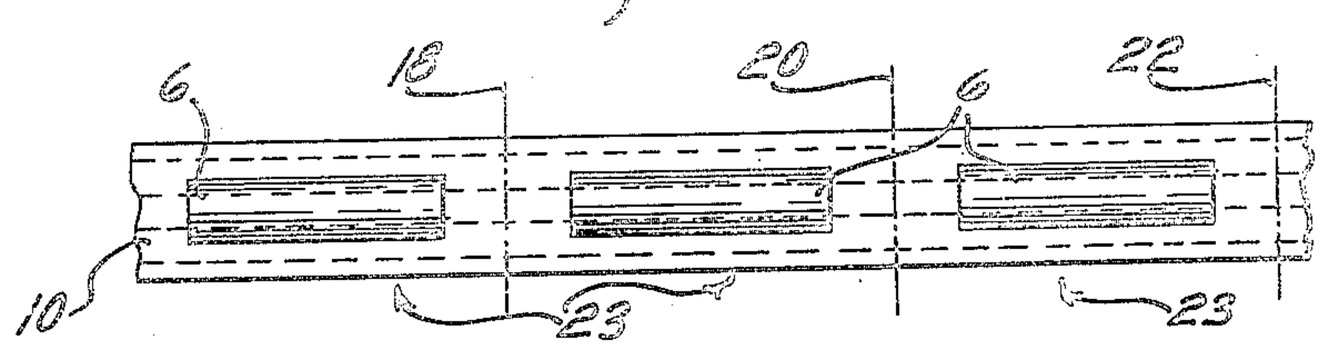


Fig. 3.

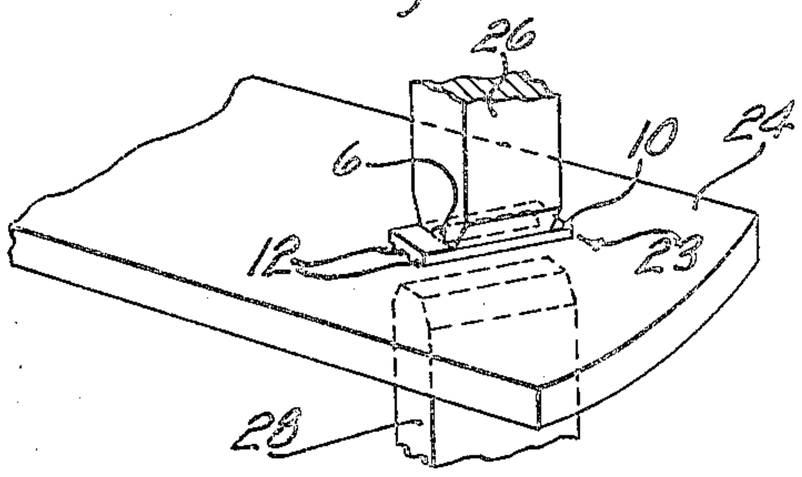


Fig. 4.

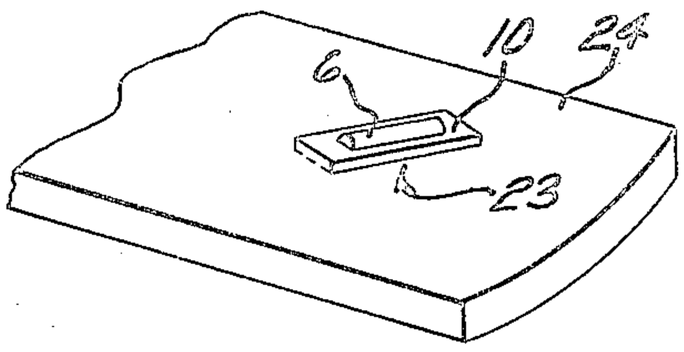
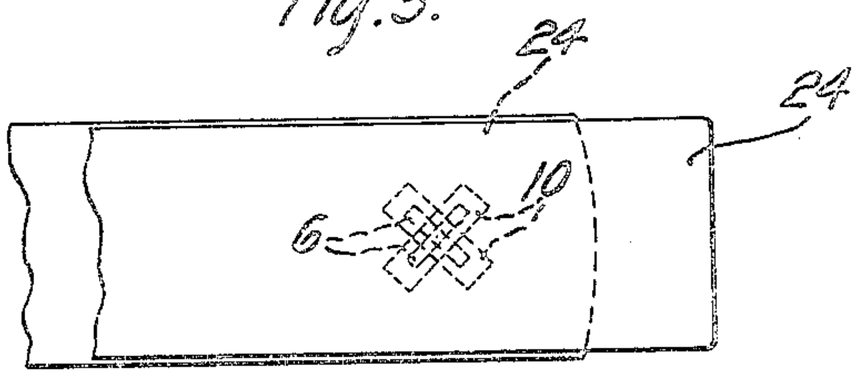


Fig. 5.



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1,907,932

UNITED STATES PATENT OFFICE

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PROCESS OF MANUFACTURING ELECTRICAL CONTACT MEMBERS

Application filed November 24, 1930. Serial No. 497,784.

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

It is an object of the present invention to provide an efficient process of manufacturing composite bimetallic, electrical contacts, utilizing a minimum amount of contact metal.

In accordance with one embodiment, the invention contemplates a process of manufacturing bimetallic contact elements wherein contact metal, such as platinum, palladium or alloys of either of these metals with gold or other of the precious metals particularly adaptable for electrical contact elements is formed into a substantially cylindrical strip or wire having a ridge longitudinally thereof, may be cut to predetermined lengths, and then welded to a base metal such as nickel silver, pure nickel or other metals having a high degree of resistance to corrosion at spaced intervals, which is formed in a strip or ribbon of substantially rectangular cross-section, and which is provided with two ridges extending longitudinally thereof. By having the longitudinal ridge on the wire of contact metal, the current applied for welding purposes to the elements making up the composite contact is localized at the point of contact between the contact wire and the ribbon of base metal thereby insuring a strong welded union and avoiding the possibility of damaging the contact wire or base metal by the heat of the current required to form the weld. A composite contact element thus formed may then be secured to a contact spring of electrical apparatus by welding the base metal which is cut to have its edges extend slightly beyond the edges of the contact metal to the contact spring.

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 an end view of a strip of contact metal and a strip of base metal with the welding electrodes in position prior to the welding operation;

Fig. 2 is a plan view of the ribbon of base metal with the sections of contact metal secured thereto at predetermined intervals;

Fig. 3 is a perspective view of an end of a contact spring with the composite contact element in position thereon with the relative position of the electrodes of the welding circuit shown in dot and dash lines;

Fig. 4 is a perspective view of one end of a contact spring with the composite contact element welded thereto, and

Fig. 5 is a perspective view of a pair of contact springs showing the relative position of the contact elements thereon in their completed form.

Referring now to the drawing wherein the same reference characters designate like parts throughout the several views, the numeral 6 indicates a strip or wire of precious metal of the type commonly used for contact metal in the contacts of electrical apparatus and is formed to a substantially circular cross-section having a rounded ridge 8 extending longitudinally thereof. After the wire 6 of contact metal has been formed to the above described shape, it is cut into predetermined lengths and combined, as shown in Fig. 2, with a strip 10 of base metal which may be nickel silver, pure nickel or other metals which have a high degree of resistance to corrosion, being positioned upon the base metal at spaced intervals with the ridge 8 of the wire 6 engaging the flat upper surface of the strip 10 which is substantially rectangular in cross-section and which has depending ridges 12 extending longitudinally thereof.

The wire 6 of contact metal and the strip 10 of base metal are shown in Fig. 1 engaged by electrodes 14 and 16 electrically connected with a source of current supply 15 so that an electrical welding circuit may be completed through the electrode 14, the wire 6 of contact metal and the strip 10 of base metal to the electrode 16 to weld the contact metal to the base metal. The electrode 14 engages that portion of the wire 6 away from the ridge 8, and the electrode 16 engages the under side of the base metal. Therefore, a welding current passing through the wire of contact metal and the strip of

base metal will encounter its greatest resistance at the line of engagement of the ridge 8 with the flat upper surface of the strip 10, and due to the formation of the wire 6 the electrode 14 engages therewith over a comparatively large area, whereas the ridge 8 provides only a small area of contact with the base metal, thereby resulting in a concentration of the welding current along the line of contact. This concentration of the welding current will cause fusion of the contact metal and the base metal strip 10 and will prevent the base metal from sticking to the electrode 16 or from burning due to the fact that the relatively large cross-section of the base metal provides a chilling effect at the point of contact with the precious metal and causes the ridge of the contact metal which has a relatively small cross-section to rise to the melting temperature at approximately the same time that the base metal is raised to its melting temperature, thus permitting an intimate mixture of the molten metals and a strong weld.

After the wire 6 of contact metal has been formed to the shape shown in Fig. 1, cut to predetermined lengths and welded to the strip 10 of base metal at intervals along the length thereof, as shown in Fig. 2, in the manner described hereinbefore, the composite contact elements thus formed may be cut along the lines 18, 20, and 22 to provide separate composite contact elements 23 which may be attached to contact springs 24 of electrical apparatus.

Referring now to Fig. 3, a composite contact element 23 cut from the strip as just described may be positioned at an angle of approximately 45° upon a flat surface of an electrical contact spring 24 with the ridges 12 engaging the upper surface of the spring. A welding electrode 26 may be engaged with the flat upper surface of the strip of base metal 10 and a welding electrode 28 having a polarity opposite to that of the welding electrode 26 may be engaged with the underside of the contact spring to complete a welding circuit which may be the same as shown in Fig. 1 through the electrode 28, contact spring 24, base metal strip 10 to the welding electrode 26. This welding circuit may be maintained until the downwardly extending ridges 12 of the strip 10 have fused with the upper surface of the contact spring 24 to secure the composite contact element to the spring 24 as shown in Fig. 4. The provision of the downwardly extending ridges 12 on the strip 10 of the base metal provides concentration points for the welding current applied to the base metal and the electrical contact spring so that despite the difference in the fusing temperatures of the metal of the strip 12 and of the contact spring, the fusion of these metals upon application of the welding current will occur substantially simultaneously, thereby preventing sticking of the metals to the welding electrodes or burning of the base metal and providing a good welded union between the two parts.

Contact springs formed in accordance with the above outlined method may be combined as shown in Fig. 5 wherein a pair of springs are shown having positioned near the ends thereof and upon opposing surfaces thereof, a pair of cooperating contact elements. The contact elements are positioned diagonally of the springs and the element carried by one spring is angularly disposed with respect to the cooperating contact element carried by the other or companion spring. By having this arrangement a cross contact is effected between the adjacent surfaces of the two contact elements in response to movement of one of the springs, and it will be apparent that less precious metal is necessary than would be required in the ordinary type of contact element since a comparatively large area is provided for use as contacting surface and even if the associated springs 24 are not exactly aligned a contact will be made between the contact elements upon operation of the springs.

Although a specific embodiment of the invention has been described hereinbefore, it will be understood that modifications and adaptations of the method may be made without departing from the scope of the invention which is to be limited only by 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 element of a higher melting point metal with a depending rounded ridge adapted to engage the base metal, welding the contact metal to the base metal and welding the base metal to a contact spring.

2. The process of manufacturing bimetallic contact elements which includes forming a ribbon of base metal to a substantially rectangular shape having depending ridges on one portion thereof, forming a contact element of a higher melting point metal with a depending ridge adapted to engage the base metal, combining the base metal and contact metal with the depending ridges of the base metal on the side thereof away from the contact metal, welding the contact metal to the base metal, engaging the depending ridges of the base metal with a contact spring and welding the base metal to the contact spring.

3. The process of manufacturing bimetallic contact elements which includes forming a base metal with a depending ridge, forming a contact element of a higher melting point metal having a substantially cylindrical cross-section with a protuberance on its periphery, contacting the base metal and contact metal with the protuberance of the

contact metal engaging the base metal, welding the contact metal to the base metal, and welding the base metal to a contact spring.

4. The process of manufacturing bimetallic contact elements which includes forming a ribbon of base metal of predetermined dimensions, forming a contact element of a higher melting point metal and having a substantially cylindrical cross-section with a protuberance on its periphery, contacting the base metal and contact metal with the protuberance of the contact metal engaging the base metal, applying electrodes to the base metal and that portion of the contact metal farthest removed from the protuberance, applying a welding current to the electrodes to fuse the base metal and contact metal at the point where the protuberance of the contact metal engages the base metal and welding the base metal to a contact spring.

5. The process of manufacturing bimetallic contact elements which includes forming a ribbon of base metal to a substantially rectangular cross-sectional shape having ridges on one surface thereof, forming a wire of contact metal of a higher melting point metal having a substantially circular cross-section provided with a rounded ridge on one surface thereof, cutting the contact metal into predetermined lengths, positioning the contact metal at intervals along the ribbon of base metal with the ridge of the contact metal engaging the surface of the base metal opposite to the surface of the base metal on which the ridges are formed, applying welding electrodes to the base metal and to the surface of contact metal removed from the rounded ridge, applying a welding current to the electrodes to weld the contact metal to the base metal, cutting the base metal with the contact metal welded thereto to predetermined lengths, and welding the base metal to electrical contact springs.

6. The process of manufacturing bimetallic contact elements which includes forming a ribbon of base metal to a substantially rectangular cross-sectional shape having ridges on one surface thereof, forming a wire of contact metal of a higher melting point metal having a substantially circular cross-section provided with a rounded ridge on one surface thereof, cutting the contact metal into predetermined lengths, positioning the contact metal at intervals along the ribbon of base metal with the rounded ridge formed on the contact metal engaging the surface of the base metal away from the ridges formed thereon, applying welding electrodes to the base metal and to the surface of the lengths of contact metal away from the ridge thereon, applying a welding current to the electrodes to weld the contact metal to the base metal, cutting the base metal with the contact metal welded thereto to predetermined lengths, positioning the length of base metal with a section of contact metal welded thereto in a position with the ridges engaging a contact spring, applying a welding electrode to the upper surface of the composite base and contact metal, applying another welding electrode to the underside of the contact spring, and completing an electrical circuit through the welding electrodes to weld the combined contact and base metal to the contact spring.

In witness whereof, I hereunto subscribe my name this 15th day of November A. D., 1930.

EMERSON PUGH.