

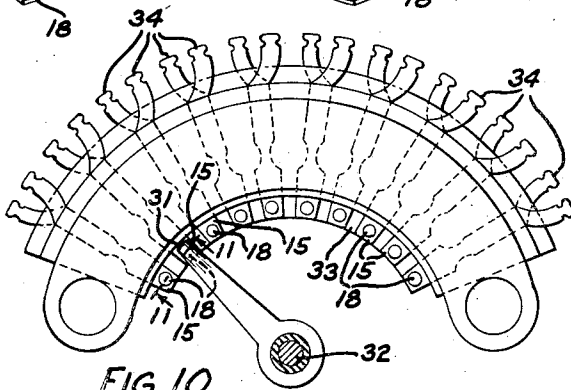
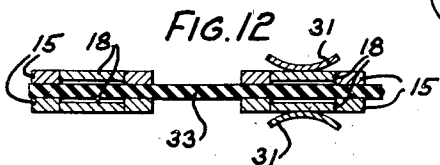
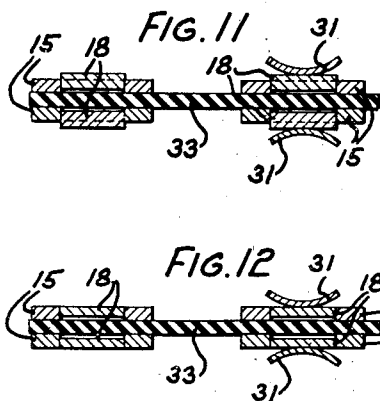
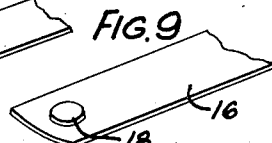
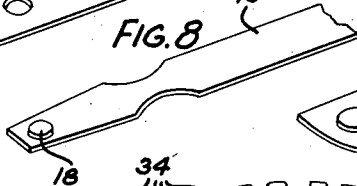
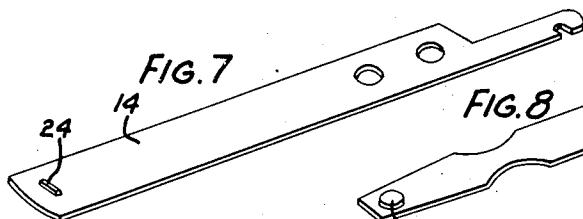
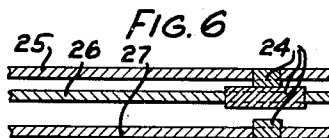
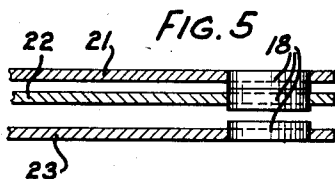
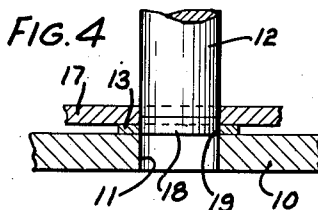
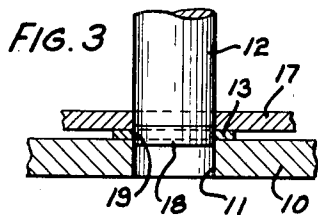
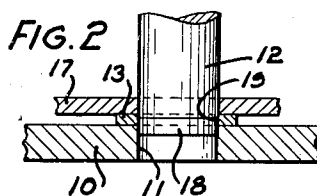
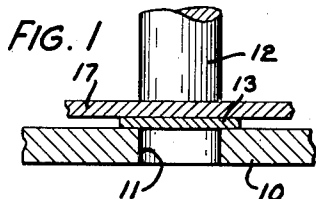
Oct. 10, 1944.

H. W. LARSON

2,360,063

COMPOSITE ARTICLE

Original Filed May 7, 1940



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2,360,063

COMPOSITE ARTICLE

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Original application May 7, 1940, Serial No.
333,737. Divided and this application March
13, 1942, Serial No. 434,561

5 Claims. (Cl. 200—166)

This invention relates to composite articles and more particularly to electrical contacting devices and is a division of the co-pending application of H. W. Larson, Serial No. 333,737, filed May 7, 1940.

In the manufacture of contactors for use in telephone and like industries, it has been proven that contactors comprised of a spring or terminal unit of base material provided with a precious metal facing or insert at the contacting area thereof is much preferable in talking circuits to a contactor formed entirely from base metal since the precious metal is much more resistant to deterioration. Some highly satisfactory contacts have been manufactured heretofore by welding precious metal or bi-metallic members having facings of precious metal to base metal contact springs or terminal elements. However, in some instances, it becomes desirable to eliminate the step of welding the precious metal contact members to base metal strips or terminals, particularly in switches of the type used in the so-called step-by-step dial system of telephone switching mechanisms and in numerous instances in relays or like devices, also for use in the telephone and like industries. It is particularly desirable to so fix or attach the precious metal contact point, if silver is chosen as the contact metal, to the base metal member, that the silver will not contact any insulator used in conjunction with the contactor. This is desirable because of the tendency of silver to migrate or creep through the body of insulation and cause short circuits or leakage, which impairs the connections made in the apparatus.

It is an object of the present invention to provide a simply constructed contacting device including its support which may be formed without welding together of the metallic elements included in the composite article.

In accordance with one embodiment of the invention, a contact spring of base metal and a strip of precious metal, such, for example, as silver, are placed between a punch and die of a punch press and the punch is actuated to simultaneously shear a disc or portion of the precious metal from the sheet thereof, force the disc to perforate a hole in the base metal, and force the disc into the hole being punched in the base metal. In the practice of the present invention, the punch may be forced completely through the precious metal strip and part way through the base metal, or the punch may be forced only part way through the precious metal to shear the disc or portion from the precious

metal and press it tightly into the base metal. The stroke of the punch may be varied in a number of ways so that the precious metal element or portion sheared from the sheet thereof may extend outwardly from both surfaces of the base metal strip, may be flush with one side of the base metal strip, or may extend outwardly from one surface of the base metal strip and be underflush with the other surface thereof.

A further and preferred embodiment of the invention contemplates using a precious metal sheet which is thinner than the strip of base metal which may be a terminal or contact spring and forcing the precious metal sheared portion part way through the base metal and into a position where one surface of it is flush with the surface of the base metal strip or terminal and the other portion of it is underflush with the opposite surface of the base metal to provide a contacting area flush with one surface of the base metal member and spaced from any insulator upon which the base metal strip may rest.

In any of the various embodiments described briefly hereinbefore, it will be understood that the portion sheared from the precious metal sheet forces out a slug from the base metal and replaces the same without the necessity of pre-punching the base metal.

A better understanding of the invention will be had by reference to the following detailed description of the various embodiments thereof when considered in conjunction with the accompanying drawing, wherein

Fig. 1 is a fragmentary view of a punching apparatus wherein imperforate layers or strips of base metal and precious metal are superposed and placed between the punch and die of the apparatus;

Fig. 2 is a fragmentary sectional view of the apparatus shown in Fig. 1 with the punch advanced completely through the precious metal and part way through the base metal to form a composite article comprising a base metal element having a precious metal contact extending outwardly from one surface thereof and spaced inwardly from the other surface thereof;

Fig. 3 is a view similar to Fig. 2 showing the punch advanced partly through the precious metal to so position a disc or contact element of precious metal in a base metal strip that an extending contacting portion will be provided which extends outwardly from the opposite surfaces of the base metal strip;

Fig. 4 is a view similar to Figs. 2 and 3 showing the punch moved part way through a pre-

cious metal sheet to shear a disc from the precious metal sheet and so position it in a base metal strip that one surface of the precious metal disc is flush with one surface of the base metal strip and the other surface of the precious metal disc extends outwardly from a surface of the base metal strip;

Fig. 5 is a fragmentary view in section of the contacting end of three contacting springs having precious metal contacts positioned therein in the manner illustrated in Figs. 3 and 4;

Fig. 6 is a fragmentary view in section of the contacting end of three cooperating contact springs with precious metal inserts which are rectangular in cross section rather than round discs and which may be formed by the steps illustrated in Figs. 3 and 4 by simply providing punches of rectangular cross section and suitable cooperating dies;

Fig. 7 is a view in perspective of a contact spring which may be used in a relay or other circuit closing device and shows the type of contact illustrated in Fig. 6;

Fig. 8 is a fragmentary view in perspective of a contactor of the type used in telephone step-by-step switches having a disc type contact positioned on the contacting end thereof;

Fig. 9 is a fragmentary view in perspective of a contact of the type illustrated in Fig. 5;

Fig. 10 is a plan view of a portion of a step-by-step switch showing a bank of contacts and their associated wiper which, in the operation of the step-by-step switch, may be stepped around into contact with any of the contacts to connect it to various telephone circuits;

Fig. 11 is an enlarged fragmentary sectional view taken along the line 11—11 of Fig. 10 in the direction of the arrows showing precious metal contacts of the type illustrated in Fig. 2 mounted upon terminal elements which are, in turn, positioned upon an insulator in such manner that the terminal elements engage the insulator but the precious metal contacts are spaced therefrom; and

Fig. 12 is a sectional view similar to Fig. 11 showing contacts for use in step-by-step switches wherein the precious metal contact is flush with the outer surface of its associated terminal element, but is spaced from the insulator on which the terminal element is mounted to prevent contact of the precious metal with the insulator.

Other objects and advantages of the invention will be apparent from the following detailed description of the various embodiments thereof, which are illustrated in the drawing, like reference characters designating the same parts throughout the several views.

Referring to Fig. 1, there is shown a die block 10 having a die opening 11 therein for cooperation with a punch 12. Positioned upon the die block 10 is a strip 13 of base metal which may be either a contact spring or a contactor terminal for a piece of electrical apparatus in which a precious metal contact is to be embedded. The strip 13 may be of the contour shown in Figs. 7, 8 or 9, wherein there are illustrated three types of contact elements 14, 15 and 16, respectively. On the other hand, the strip 13 may be a continuous sheet from which contact elements are to be blanked after suitable precious metal contacts have been fixed at spaced intervals in the sheet. Positioned upon the strip 13 of base metal is a sheet 17 of precious metal, preferably silver, which, as will be noted, is appreciably thicker than the base metal strip 13.

In accordance with the invention, the precious metal sheet 17 is to have a contact 18 sheared from it and forced into a hole 19 in the base metal member 13, which hole is formed by the contact 18 forcing a slug (not shown) from the base metal member 13 as the contact is sheared from the sheet 17. It will be noted that the strip of base metal 13, as shown in Fig. 1, is imperforate, as is the sheet 17 of precious metal and, as illustrated in Figs. 2, 3 and 4, a single stroke of the punch 12 is utilized to shear the contact 18 from the precious metal sheet, punch the hole 19, and force the contact into the hole 19, where the contact 18 will be gripped and held in place by the side walls of the hole 19 in the strip 13. As shown in Fig. 2, the precious metal contact 18 has been forced part way through the base metal strip 13, whereas in Figs. 3 and 4, the punch 12 has not been advanced quite as far as is shown in Fig. 2. It will be understood that the punch is shown in its farthest advanced position in each of Figs. 2, 3 and 4 and that three separate types of contacts are formed by the methods illustrated in these figures.

In Fig. 3, the punch 12, as pointed out, has moved only part way through the precious metal sheet 17, thereby to secure a contact 18 in the hole 19 with the contact 18 extending outwardly from both surfaces of the base metal strip 13. In Fig. 4, the punch 12 is shown moved part way through the precious metal sheet 17, whereby the hole 19 will be formed in the strip 13 by the contact 18 and the contact 18 will be fixed in the hole with one surface of the contact flush with a surface of the base metal strip 13, and the other surface of the contact 18 extending outwardly beyond the surface of the metal strip 13.

In Fig. 5, there are shown three contact springs 21, 22 and 23 having contacts 18 fixed therein in the manner illustrated in Figs. 3 and 4, the spring 22 having its contact 18 extending outwardly beyond the upper and lower surfaces of the spring 22, whereby, upon shifting of the spring 22, contact will be made between the contacts in the springs 21 and 22 or 22 and 23, depending upon the direction in which the spring 22 is moved. As shown in Fig. 5, a circuit is being completed between the springs 21 and 22 by means of the contacts 18 fixed in them.

In Fig. 6, there is illustrated an alternate type of contact 24 mounted in contact springs 25, 26 and 27. The contacts 24 are bar type contacts, as clearly shown in Fig. 7, which consist of rectangular shaped precious metal elements that may be formed by the process illustrated in Figs. 3 and 4 simply by changing the shape of the die aperture and punch. The contacts 24 and springs 25, 26 and 27 shown in Fig. 6 accomplish the same purpose as the contacts 18 and springs 21, 22 and 23 shown in Fig. 5 and may be manufactured by the same process as the contactors, the forming of which has been described in detail hereinbefore.

In Fig. 10, there is shown a plan view of a step-by-step switch for use in telephone exchange equipment to which the preferred embodiment of this invention is directed. This switch comprises a plurality of banks of contact elements 15 adapted to be selectively engaged by brushes 31 mounted upon and insulated from a shaft 32. In switches of this type, the contact elements 15 are mounted upon opposite sides of insulators 33 and have terminal portions 34 permanently electrically connected to various parts of the telephone exchange equipment and these 75 parts of the telephone exchange equipment may

be interconnected with other parts of the equipment by moving the brushes 31 into engagement with various ones of the contact elements 15.

As most clearly shown in Figs. 11 and 12, the contacts 18 are so mounted in the contact element 15 that the contacts 18 will be spaced from the insulators 33 but will provide a precious metal surface adapted to be engaged by the brushes 31. This form of contact will provide a precious metal contacting surface spaced from the insulators to effectively prevent migration of the silver through the insulators. In Fig. 11, the contacts 18 are shown spaced inwardly from one surface of each of their respective contact elements 15 and extending outwardly beyond the opposite surface thereof whereas in Fig. 12 a thinner strip or sheet of precious metal is utilized and is forced into the contact element 15 or base metal strip 13 so that one surface of the element 18 is flush with the outer or exposed surface of the contact element 15 and the opposite surface of the contacts 18 are spaced from the insulator 33. It will be understood that the type of contact shown in Fig. 12 may be formed in the manner most clearly illustrated in Fig. 2, it simply being necessary to provide a precious metal sheet which is thinner than the base metal strip 13.

Other modifications and adaptations of the method and articles described hereinbefore may be made without departing from the invention which is to be limited only by the scope of the appended claims.

What is claimed is:

1. The combination of an insulating support with a contactor comprising a base metal strip having an aperture therein and a precious metal contact grippingly engaged in said aperture, said contact being depressed inwardly from one surface of the base metal strip to hold it out of contact with the insulating support.

2. The combination of an insulating support

with a contactor comprising a base metal strip having an aperture therein and a precious metal contact grippingly engaged in said aperture, said contact being positioned flush with one surface of the base metal strip and being underflush with the opposite surface of the base metal strip, which opposite surface is in engagement with the insulating support.

3. A contacting device comprising an insulating support, a base metal strip having an aperture therein positioned upon said insulating support, and a precious metal insert grippingly engaged in said aperture with one surface of said insert parallel with and spaced inwardly from a correspondingly disposed surface of the base metal strip, said surface of the precious metal insert also being spaced from the insulating support.

4. A contacting device comprising an insulating support, a metallic strip having two relatively large flat surfaces, one of said surfaces engaging the insulating support, and a metallic member inlaid in said strip, said member having opposite surfaces substantially parallel with the flat surfaces of the strip and one of said opposite surfaces being set inwardly from the surface of the strip which engages the insulating support.

5. A contacting device comprising a support composed of electrical insulating material, a metallic strip having two relatively large flat surfaces, and a metallic member inlaid in said strip, said member having opposite flat surfaces substantially parallel with the flat surfaces of the strip, one of said flat surfaces of said member being set inwardly from the corresponding surface of the strip, which corresponding surface of the strip engages the support and the other of said surfaces of the member being flush with its corresponding surface of the strip.

HOMER W. LARSON.