March 27, 1956 J. S. COONEY 2,739,370

METHOD OF MAKING ELECTRICAL CONTACTS

Filed March 28, 1952

Fig. 1.

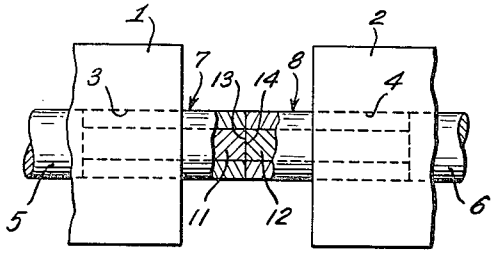


Fig. 2.

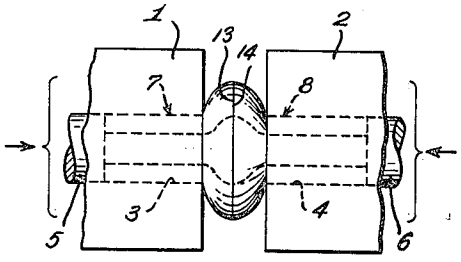


Fig. 3.

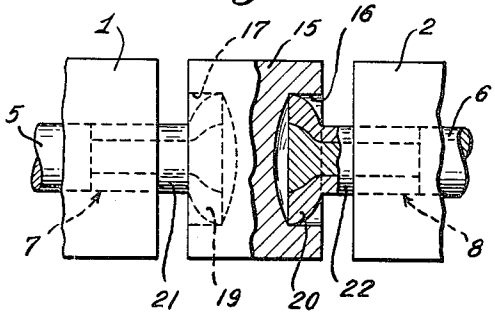
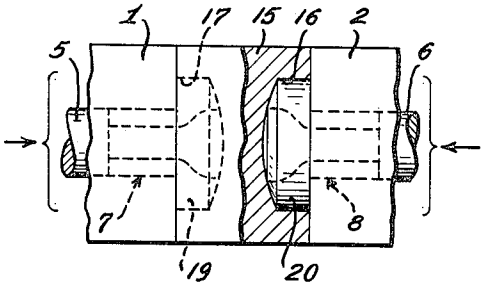


Fig. 4.



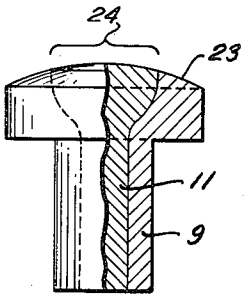


Fig. 5.

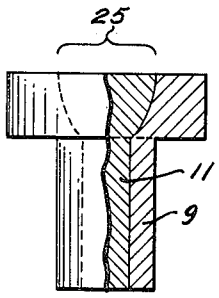


Fig. 6.

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United States Patent Office 2,739,370
Patented Mar. 27, 1956

2,739,370

METHOD OF MAKING ELECTRICAL CONTACTS

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Application March 28, 1952, Serial No. 279,123

5 Claims. (Cl. 29—155.55)

This invention relates to the making of electrical contacts, and in particular to the making of rivet-type contacts in high speed automatic machinery.

In the making of rivet-type electrical contacts on heading machinery, in some instances one of the problems encountered is that of obtaining a desired amount of expansion at the very end of the wire being used to make the contact. In the ordinary type of heading machine, the end of the wire of precious metal being used for the contact is deformed by a laterally inexpandable member or anvil to form the head of the rivet-type contact. Due to the considerable friction existing between the surface of the precious metal and the anvil, free flowing of the very end of the contact metal wire is inhibited.

This problem is acute where it is desired to make an electrical contact from material consisting of a wire having a central core of precious metal (such as platinum or silver, for example) and an outside surrounding sleeve of base metal such as brass or copper. In the making of rivet-type contacts from material of this kind, it is often desired to cause the precious metal core to expand as much as possible and thus comprise as much as possible of the contact face. In the ordinary heading machine, the above-mentioned friction tends to prevent this, and in the finished contact, therefore, made by the ordinary heading machine, the precious metal in the center of the wire may not comprise very much of the contact face.

It is the general purpose, therefore, of this invention to provide a method of manufacturing contacts which permits relatively large expansion at the very end of the wire from which the rivet-type contacts are being made, thus facilitating the making of rivet-type contacts from cored wire. This is accomplished in general by making the contacts in pairs in which the contact head (as it is formed) of one contact acts as an expanding anvil against which the contact head of the other contact can and does form.

Therefore, among the several objects of the invention may be noted the provision of a method of making electrical contacts in pairs in such manner that one contact becomes a heading anvil for the other contact; the provision of a method of making electrical contacts in which the contact material is allowed to expand freely at its end against an expanding anvil; the provision of a method for making an electrical contact from cored wire in which, during the making of the contact head, the cored wire is caused to expand a maximum at the outer end or face of the head; and the provision of a simple and economical method of making contacts in an automatic heading machine.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the ingredients, the combinations of ingredients, the proportions thereof, steps and sequence of steps, and features of composition and manipulation, which will be exemplified in the products and methods hereinafter described, and the scope

of the application of which will be indicated in the following claims.

In the accompanying drawings in which certain features of various possible embodiments of the invention are shown:

Fig. 1 shows a first stage in the method of this invention, illustrating schematically certain tool elements useful therefor;

Fig. 2 shows a second stage of the method of this invention, with contacts being formed in the tool elements of Fig. 1;

Figs. 3 and 4 show optional third and fourth stages of the method of this invention; and

Figs. 5 and 6 show elevations (partly in section) of alternative contacts which may be made by the steps of this invention.

Similar reference characters indicate corresponding parts throughout various views of the drawings.

Referring now to the drawings for a detailed description of the invention:

This invention will be described particularly in reference to the manufacture of rivet-type contacts made from cored wire, because it is in the manufacture of these contacts that the principles of the invention are illustrated most readily and clearly. Referring to Fig. 1, there are shown the left and right die blocks 1 and 2 respectively with holes 3 and 4, respectively, bored therethrough. In hole 3 is movably located the plunger 5 which is a snug sliding fit in hole 3. Similarly, plunger 6 is snugly but slidably fitted into hole 4 in die block 2. Plungers 5 and 6 are arranged in conjunction with suitable cams, to be held either immovable in respect to die blocks 1 and 2 during one part of the cycle of contact making, or may be slid back and forth in die blocks 1 and 2 for further steps in making a contact. The camming elements necessary for this control of plungers 5 and 6 are not shown herein, since the machinery for performing the steps of this invention, is not a part of this application.

Inserted in holes 3 and 4, respectively, and butting against plungers 5 and 6, are sections 7 and 8 of cored wire from which a pair of contacts is to be made by the steps of this invention. It will be understood that sections 7 and 8 have been loaded into their respective holes 3 and 4 by any one of well-known means used in standard type heading machines wherein the sections of wire are first cut off and then loaded into die blocks for further operations thereon. Such steps of cutting off sections of wire and loading them into the aforesaid die blocks are not a part of this invention.

It is obvious, of course, that instead of the plungers 5 and 6 being in holes 3 and 4, contact wire from spools thereof may be inserted in said holes with the end projecting as shown in Fig. 1, the wires being clamped in the respective holes by suitable and well-known clamping means. That is, the particular method or methods used to load die blocks 1 and 2 with wire are not critical, and can be either of the two methods described above. The first method, as illustrated in Fig. 1, is the preferred method.

Each of wires 7 and 8 (by way of example in this instance) comprises an outer surrounding sleeve of base metal 9 and 10, and an inner core 11 and 12 of precious contact metal, such as silver, or platinum, or gold, etc. The base metal sleeves 9 and 10 may be copper, brass, bronze, or steel, etc. As indicated by the dotted lines, the cores 11 and 12 may extend throughout the whole length of the sections 7 and 8, respectively.

I have found that certain combinations of metals tend to stick together in the second step of my invention which is now to be described. To prevent this, I find it necessary to have at least one of the ends of the sections 7 and 8 coated with a parting compound. This compound

may be oil, and may be applied either additionally or may already be present as a result of shearing operations on oil coated wire.

In the second step of my invention, the die blocks 1 and 2 are forced together as shown in Fig. 2, with plunger 5 being held immovable with respect to its die block 1, and plunger 6 likewise being held immovable with respect to its die block 2. As die blocks 1 and 2 with their respective plungers are moved toward each other, it will be observed that the projecting sections 7 and 8 butt together and expand outwardly. It will also be noticed further that the very ends of faces 13 and 14 of sections 7 and 8, respectively, expand the most, as shown in Fig. 2, the reason being that as one section (7, for example) starts to expand, the opposing section (8, for example) acts as an expanding anvil for it. Thus there is no friction between ends 13 and 14 to prevent them from expanding freely. The expansion takes place approximately as shown in Fig. 2, and thus the material at the faces 13 and 14 expands the most. Since this is so, the cores 11 and 12 also expand the most at the surfaces 13 and 14.

If it is desired to have finished contacts with the flat faces 13 and 14 as produced by the Figs. 1 and 2 operations, these contacts may now be unloaded from blocks 1 and 2 by retracting each of the blocks on the respective plungers 5 and 6 to eject the contacts therefrom. However, it is within the purview of my invention to add a further forming operation to produce more conventionally shaped heads on these rivet-type contacts. These additional steps will now be described.

After the forming operation illustrated in Fig. 2 has been performed, each of the die blocks is moved away from the other, with each of the respective plungers 5 and 6 acting again as a unit with its die block. A third die block 15 is now inserted between die blocks 1 and 2. Die block 15 has recesses 16 and 17 formed in opposite faces thereof as shown which are adapted to receive the heads 19 and 20 of the Fig. 2 rivets. After this insertion has been made, die blocks 1 and 2 are moved toward and against die block 15. As a result of this, the metal of each of the heads 19 and 20 together with a portion of the respective shanks 21 and 22 immediately adjacent to the heads, is caused to flow and fill the recesses 16 and 17. If this flowing is not sufficient to fill completely the recesses 16 and 17, then plungers 5 and 6 are also caused to move inwardly in their respective dies 1 and 2, thus forcing the shanks 7 and 8 of the respective rivets toward each other to fill out the enclosed recesses 16 and 17.

After this additional forming step has been performed, the die blocks 1 and 2 are separated, and the finished contacts are ejected therefrom.

Referring now to Figs. 5 and 6, there are shown as examples two different types of contact heads that may be produced by this last described step. In Fig. 5 there is illustrated (partly in section) a contact produced by the die blocks shown in Figs. 3 and 4 as shown above. The head has a round surface 23 as its face, the central core of precious metal 11 and the outside sleeve 9. It will be observed that the end of the precious metal core 11 has been expanded to the extent indicated by the bracket 24 and thus occupies a major portion of the contact face. These remarks also apply to Fig. 6 which shows (partly in section) a flat headed rivet which may also be produced by the operations of Figs. 3 and 4, but in which the recesses 16 and 17 of die block 15 are correctly shaped to produce the Fig. 6 contact. Again, the central core of precious metal has been expanded to occupy a major part of the contact face, as indicated by bracket 25.

To obtain the most satisfactory results, in the practice of this invention, it will be found desirable to have the materials of wires 7 and 8 of approximately the same ductility.

The invention has been described particularly in connection with a method of making electrical contacts from wire material having a central core of precious metal.

However, it is obvious that the invention may be applied with equal ease and for beneficial results in many instances to wires made of solid contact material throughout, the expansion of the contact face taking place readily and easily, as described above.

In view of the above, it will be seen that the several objects and advantages of the invention are achieved and other advantageous results attained. As many changes could be made in carrying out the above steps of the methods without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing, shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A method of making electrical contacts by cold working comprising butting two portions of contact material together in face-to-face relation with a layer of parting material therebetween and forcing said portions toward each other in alignment to cause lateral expansion of the materials along the faces thereof, the expanding face of one portion acting as as expanding anvil against which the face of the other portion expands.

2. A method of making electrical contacts by cold working comprising butting two lengths of wire in end-to-end relationship with a layer of parting material therebetween and thereafter forcing said wires together axially to cause lateral expansion of the butted-together ends, the expanding end of one wire acting as an expanding anvil against which the end of the other wire may expand.

3. A method of making electrical contacts by cold working comprising butting two lengths of wire in end-to-end relationship with a layer parting material therebetween; forcing said lengths together axially to cause lateral expansion of each of the butted-together ends, the expanding end of one length acting as an expanding anvil against which the end of the other wire may expand; and thereafter forming said expanded portions into a predetermined shape.

4. The method of claim 3 in which each of said wires comprises a central core of contact material surrounded by an outer sleeve of base metal, and in which said expansion is continued until the surface area of the core material on the face of the expanded portion is a useful part of the contact face area of said expanded portion.

5. A method of forming electrical contacts having a head and a shank, by cold working, which comprises providing a first length of contact wire; providing a second length of contact wire; placing each of said lengths in opposing die blocks with ends exposed; bringing the exposed ends of said lengths into juxtaposition with a layer of parting material therebetween; and thereafter forcing said lengths towards each other axially to cause an outward flowing of the material of each length at the junctions of said lengths, each of said wires acting as an expanding anvil against which the lateral expansion of the other length may take place; continuing said forcing together until each of said lengths has become expanded for a portion of itself to form a contact head; and thereafter forming said expanded contact head into a predetermined shape.

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