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J. N. REYNOLDS

2,252,899

METHOD OF MANUFACTURING CONTACT SPRINGS

Filed Nov. 14, 1939

FIG. 1

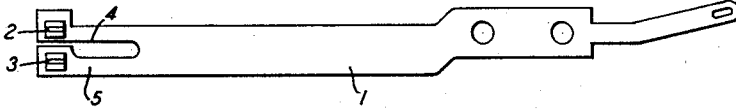


FIG. 2



FIG. 3

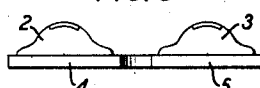


FIG. 4

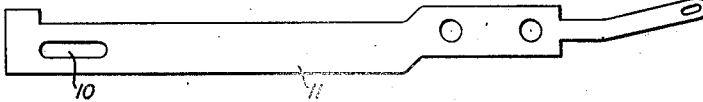


FIG. 5



FIG. 6

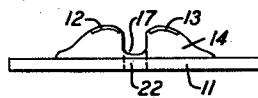


FIG. 7

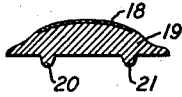


FIG. 8

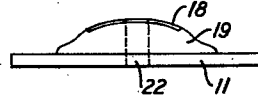


FIG. 9

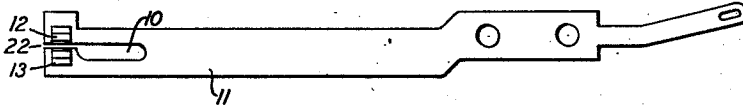


FIG. 10

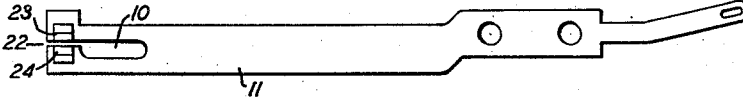
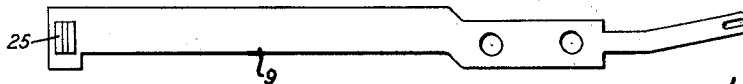


FIG. 11



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METHOD OF MANUFACTURING CONTACT SPRINGS

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2 Claims. (Cl. 29—155.55)

This invention relates to contact springs for relays and similar switching devices and has for its object to cheapen the cost of manufacturing such springs.

Relays now in extensive use are equipped with both passive or stationary springs and active or armature operated springs made of suitable spring material such as nickel silver. The ends of the active springs are bifurcated and to each bifurcated portion a short bar of contact metal is welded with its linear axis extending parallel to the linear axis of the spring. Each passive or stationary spring, for mating with an active spring, is not bifurcated but has two short bars of contact metal welded transversely of the spring, which two contact bars cooperate respectively with the two bars welded to the bifurcated active spring. By bifurcating the end of the active spring, a contact between at least one of its contact bars with one of the contact bars of its mate passive spring is insured.

In manufacturing a pair of such contact springs, the spring blanks are first stamped out, the four short bars of contact metal are cut to the required length from a ribbon of the contact metal and then the four short bars are separately welded to the springs. It is thus apparent that four separate welding operations are required in the manufacture of each pair of contact springs.

In accordance with the present invention, the manufacture of the bifurcated active spring has been simplified by first stamping out a spring blank without the bifurcating slot, then welding a short duplex bar of contact metal to the end of the blank with its linear axis extending in substantial alignment with the linear axis of the blank and then slitting the end of the blank through the depression between the duplex portions of the bar to bifurcate the blank so that one portion of the contact bar will be carried by each bifurcated portion of the blank. As an alternative construction, the ribbon from which the contact bar is cut may be wider in cross-section than the usual ribbon so that when the bar is welded to the end of the spring blank and the end of the blank is bifurcated, the bar becomes severed axially to form two contact portions, each portion carried by a bifurcated portion of the blank. Since with either type of construction the crests of the contact portions are close together, separated only by the bifurcating slot, it is possible to use a single short transverse contact bar on the mating or passive spring which will cooperate with both of the contact

portions on the active spring. This bar can therefore be welded to the passive spring by a single welding operation. Thus in the manufacture of a pair of mating springs, but two welding operations are necessary.

For a more comprehensive understanding of the invention reference may be had to the following detailed description taken in connection with the accompanying drawing in which:

Fig. 1 discloses an active or armature spring of the type now in extensive use;

Fig. 2 is an enlarged cross-sectional view of the contact ribbon from which the contact bars disclosed in Fig. 1 are cut;

Fig. 3 is an enlarged end view of the spring of Fig. 1 showing short bars of contact ribbon of the type disclosed in Fig. 2, separately welded to the bifurcated end portions of the spring;

Fig. 4 shows a blank of an active or armature spring as stamped out in accordance with the present invention;

Fig. 5 is an enlarged cross-sectional view of an improved duplex contact ribbon manufactured in accordance with the present invention;

Fig. 6 is an enlarged end view of the spring blank of Fig. 4 to which a short bar of contact ribbon of the type disclosed in Fig. 5 has been welded;

Fig. 7 is an enlarged cross-sectional view of a modified form of contact ribbon;

Fig. 8 is an enlarged end view of the spring blank of Fig. 4 to which a short bar of contact ribbon of the type disclosed in Fig. 7 has been welded;

Fig. 9 shows the spring of Fig. 4 after a bar of contact ribbon of the type shown in Fig. 5 has been welded thereto and the end of the spring has been slotted to bifurcate it;

Fig. 10 shows the spring of Fig. 4 after a bar of contact ribbon of the type shown in Fig. 7 has been welded thereto and the end of the spring has been slotted to bifurcate it; and

Fig. 11 shows a passive or stationary spring for mating with either the spring of Fig. 9 or the spring of Fig. 10.

Heretofore in the manufacture of springs for relays or similar switching devices, the blanks of active or armature springs have been stamped out of spring material such as nickel silver with bifurcated contact bearing ends in the form illustrated by the blank 1 of Fig. 1 and the blanks of passive or stationary springs have been stamped out of heavier spring material in the form disclosed in Fig. 11. To complete an active spring two short contact bars 2 and 3 have then

been cut from a ribbon of contact material of the type disclosed in Fig. 2 and separately welded to the two end portions 4 and 5 of the spring blank extending parallel to the longitudinal axis of the spring blank 1. The contact ribbon from which the contact bars have been cut is illustrated in cross-section in Fig. 2 and has been fabricated by welding a strip of contact metal 6 to a strip of base metal 7 such as nickel or a similar material and then rolling the composite structure into a ribbon having the cross-section illustrated. In rolling, a rib is formed as indicated by the numeral 8 on the bottom face of the ribbon to enable a better weld to be made with the spring blank. To complete a passive spring, two short contact bars similar to the bars 2 and 3 have been cut from the ribbon of contact material and separately welded with their linear axes in alignment and extending transversely across the end of a spring blank of the type disclosed in Fig. 11. It will thus be noted that heretofore in manufacturing a pair of mate springs, four welding operations have been required to secure the contact bars to the two spring blanks.

In accordance with the present invention, these welding operations have been reduced to two by the following improved construction. The blank for the active spring is first stamped out of the spring material in the form illustrated by the blank 11 of Fig. 4 with a slot 10 therein near the contact end but with no slot extending therefrom to the end of the blank. The end of the spring blank is not therefore bifurcated. The ribbon of contact material from which the contact bar to be welded to the spring blank is cut has a cross-section illustrated in Fig. 5 or Fig. 7. The ribbon disclosed in Fig. 5 is fabricated by welding two strips 12 and 13 of contact alloy metal to a strip of base metal 14 and then rolling the composite structure into a ribbon having the cross-section illustrated. In the rolling operation two ribs 15 and 16 are formed on the base of the ribbon to enable a better weld to be made when a bar of the ribbon is welded to a spring blank and the longitudinal depression 17 is formed between the contact strips 12 and 13 which nearly divides the ribbon into two separate portions. This ribbon is thus essentially a double-crested or duplex ribbon with the contact strips on each of its crests.

As an alternative construction, the ribbon may be made similar to the ribbon disclosed in Fig. 2 but with a wider contact strip 18 welded to a wider base metal strip 19 and with two welding ribs 20 and 21 as illustrated in Fig. 7.

In the further fabrication of the contact spring, a short bar may be cut from the ribbon of Fig. 5 and welded to the end of the blank between the slot 10 and the end of the blank with its linear axis extending parallel to the linear axis of the spring blank 11. Fig. 6 shows the contact end of the blank after the contact bar has been welded thereto. If the contact bar is cut from the ribbon shown in Fig. 7, the end of the spring blank 11 would appear as disclosed in Fig. 8 after the bar has been welded thereto. In either case after the welding operation has been completed, the end of the spring blank is slotted at 22 by making a saw kerf or by a similar procedure along the dotted lines shown in Figs. 6 and 8 whereby the slot 10 in the blank is extended to the end of the blank as illustrated in Figs. 9 and 10.

If a bar of double-crested or duplex ribbon is used, the saw kerf 22 is made in alignment with the depression 17 as illustrated in Figs. 6 and 9 and the completed spring then appears as shown in Fig. 9 with the contact strips 12 and 13 of the contact bar separated only by the saw kerf 22. If a bar from a ribbon of the type disclosed in Fig. 7 is used, the saw kerf divides the bar into two similar portions and the completed spring then appears as shown in Fig. 10 with the halves 23 and 24 of the contact strip 18 separated only by the saw kerf 22.

In the fabrication of the passive spring disclosed in Fig. 11, a single bar 25 of contact ribbon of the type disclosed in Fig. 2 is welded by a single welding operation, transversely across the contact end of the blank 9. This bar may be short since the contact portions of the bars on the active spring with which the passive spring is mated are close together as previously described.

From the foregoing it will be apparent that by the fabrication procedures above described, the welding operations required in attaching contact bars to a pair of mate springs have been reduced from four to two and that as a consequence the cost of manufacture has been materially reduced. Furthermore, since a single short bar of contact material is welded to each passive spring, a substantial saving in the cost of precious metal contact material is also attained.

What is claimed is:

1. The method of making a bifurcated contact spring having a contact on each bifurcated portion thereof which consists in forming a ribbon with one substantially flat face and with its opposite face provided with two parallel ridges extending longitudinally of the ribbon, welding strips of contact metal to the crests of said ridges, cutting a short section from said ribbon to form a contact bar, welding said bar to a supporting spring with its axis positioned in substantial alignment with the axis of said spring and its flat face in engagement with one face of said spring and slitting the end of said spring in alignment with the depression between the ridges of said contact bar whereby the end of said spring is bifurcated and the contact bar is divided into two sections, each of which is supported on a bifurcated portion of said spring.

2. The method of making a bifurcated contact spring having a contact on each bifurcated portion thereof which consists in forming a ribbon with one substantially flat face and with its opposite face provided with two parallel ridges extending longitudinally of the ribbon, welding strips of contact metal to the crests of said ridges, punching out a supporting spring with an axially extending slot near one end thereof, cutting a short section from said ribbon to form a contact bar, welding said bar to said spring between the end of the spring and the near end of said slot with its axis positioned in substantial alignment with the axis of said spring and its flat face in engagement with one face of said spring and slitting said spring between the end thereof and said slot and in alignment with the depression between the ridges of said contact bar whereby the end of said spring is bifurcated and the contact bar is divided into two sections each of which is supported on a bifurcated portion of said spring.

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