April 5, 1960 W. J. WEINFURT 2,931,876

ELECTRIC CONTACT

Filed April 17, 1957

FIG. 1.

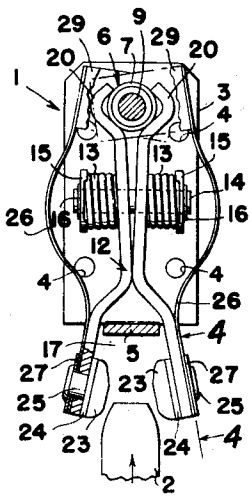


FIG. 2.

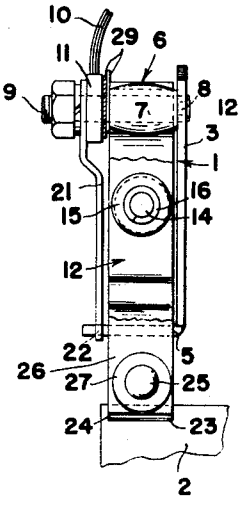


FIG. 3.

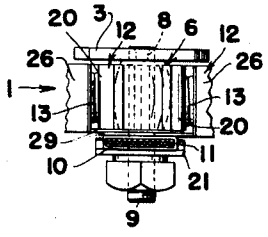
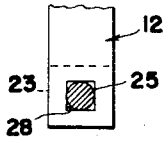


FIG. 4.



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ELECTRIC CONTACT

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5 Claims. (Cl. 200—166)

This invention pertains to an electric switch contact assembly for making and breaking an electric circuit in cooperation with a suitable complementary contact.

A serious problem in the manufacture of prior art electric contacts has been the annealing of the contact tip carrying arms when the tips are attached to the arms by a method involving application of heat, such as welding or brazing. Since the arms are frequently required to transmit the force which develops contact pressure between the tips and a cooperating contact, the softness of the annealed arms permits them to bend and thereby develop faulty contact pressure with the cooperating contact, often resulting in thermal destruction of the switch. This defect was especially pronounced in contacts whose contact tip supporting arms were made of a material such as hard drawn copper that anneals extensively when heated and does not return to near its original hardness after being cooled.

A further problem in the design of prior art contacts has been to secure proper alignment between current interchanging tips of the stationary contact assembly and the bridging bar or other such cooperating contact.

It is a primary object of the present invention to provide a contact assembly which is manufactured in such manner that it avoids the necessity of applying heat to any of the parts which are later required to transmit contact pressure force.

It is a further object of this invention to provide a contact assembly whose current interchanging tips are so mounted and connected that current may be efficiently transferred directly from the tips to a stationary member without the current traversing the contact pressure creating arm or any movable junction.

Another object is to so mount the contact tips that they are self-aligning with any cooperating contact member received between them, especially where the novel assemblies are used in pairs and placed in circuit through the agency of a movable contact in the form of a bridging bar, for example.

A general object of this invention is to provide an improved electric contact.

A more detailed description of the invention will now be set forth in connection with the drawing in which:

Fig. 1 is a front elevational view of the novel contact assembly with parts broken away;

Fig. 2 is a view taken on the right side of Fig. 1 with certain parts broken away and with certain parts added that were omitted from the previous figure;

Fig. 3 is a top view of the contact assembly illustrated in Fig. 1, with parts broken away; and

Fig. 4 is a sectional view taken on a line corresponding with 4—4 of Fig. 1.

As shown in Figs. 1 and 2, the novel contact assembly, designated generally by the reference numeral 1, is adapted to cooperate with a movable contact element 2 to close an electric circuit. Contact assembly 1 may be used with another like it and both may be arranged for being bridged by an elongated movable bar 2 which may be

actuated vertically by any suitable switch operating mechanism, not shown.

Contact assembly 1 constitutes a metal base plate member 3 that may be attached to any suitable support by means of rivets disposed in base holes 4, for example. Base plate 3 is provided with an integral ear 5 bent at a right angle from the bottom of the base plate as is clearly evident in Fig. 2. The purpose of ear 5 will be explained later.

Near the upper end of base plate 3 there is located a contact arm supporting post, generally designated by the reference numeral 6. Post 6 has a body portion 7 of barrel-shaped configuration but its exact contour is somewhat optional. It is here shown as a surface of revolution created by revolving the arc of a circle about a central axis. It may also be formed by revolving the arc of an ellipse or any other regular curve.

One end 8 of bearing post 6 is diametrically reduced so that it will fit through an appropriate hole in base plate 3. The diametrically reduced portion 8 is hollow for expanding into its cooperating hole, in the manner of a hollow rivet, to thereby anchor post 6. At an end axially opposite from the diametrically reduced portion 8, contact post 6 is provided with an integral threaded stud portion 9 which facilitates effecting a high pressure electrical connection with a lead 10 constituting a composite of conductive strips and including a clamping band 11 that is appropriately perforated for sliding over the threaded stud 9.

The contact 1 includes a pair of similar arms 12 that are biased toward each other by means of opposite compression springs 13 surrounding a pin 14 that extends loosely through both arms 12. Springs 13 are retained on pin 12 by means of a recessed retainer washer 15 secured by means of a snap ring 16. Due to the construction of the contact assembly, pressure arms 12 may be made of steel or any other hard but poorly conductive metal, since they are not called upon to conduct electricity when in use.

Each arm 12 is offset so that when they are arranged in face-to-face relationship as illustrated in Fig. 1, the offset portions create a gap 17 into which the cooperating movable contact 2 may enter when it is desired to close an electric circuit. When the movable contact 2 is withdrawn a predetermined distance from between contact arms 12, a minimum gap is established between the offset portions due to the abutment of one arm against the other as shown in Fig. 1.

One end of each contact arm 12 is provided with an indentation 20 which complements a similar indentation on the other arm for embracing the barrel-shaped portion 7 of the contact post 6 therebetween. It will be evident that the indentations develop a total of four points of tangency where they contact the barrel-shaped portion 7. When arms 12 are spread away from each other the indented portions 20 tend to slide circumferentially about the portion 7. If the arms 12 are misaligned with the movable contact 2, both arms will swing within a limited degree on portion 7 so that the gap 17 may be lined up for reception of the movable contact 22. The amount of such movement is limited by the ear 5 which extends from the bottom of the base plate 3. If the misalignment occurs in a plane normal to the assembly as viewed in Fig. 1, the indentations 20 on each contact arm move in opposite axial directions along the surface of the barrel-shaped portion 7 and thereby seek correct alignment in all planes.

In Fig. 2 it is evident that the contact arms 12 have some axial free play on barrel-shaped portion 7 but the arms are retained against swinging too far to the left by the presence of an offset vertical metal strap member 21 that is anchored at its upper end on threaded stud 9. The

lower end of strap 21 is notched at 22 for interlocking with a pair of notches in ear 5 in the same region 22.

As illustrated, contact arms 12 are provided at their lower ends with contact tips 23 which may be of copper or any suitable arc resistant material such as molybdenum copper alloy. Before mounting tips 23 on arms 12, the tips are separately welded, brazed, or soldered to a small pad 24 which is provided with a projection 25 in the nature of a rivet body for facilitating attachment of the composite tip and pad to the contact arm in a manner clearly evident from inspection of the broken away portion in Fig. 1. Note that contact tips 23 may be attached without application of heat to the contact arms 12. In other words, tips 23 may be preassembled to pad 24 by any process involving the use of heat and then the tip assembly may be riveted to the arm in the manner suggested above.

In order to effect the most direct possible electric circuit between tips 23 and stationary post 6, each arm 12 is provided with a shunt strip 26. Shunt strips 26 are thin, highly conductive metallic members that are electrically connected to the contact tips 23 through the agency of rivet head projection 25 extending from the pad 24. In order to enhance the bearing surface between the peened head of projection 25 and shunt strip 26, a small washer 27 is interposed between them.

Note in Fig. 4 that the projection 25 of the pad 24 extends through a square hole 28 in the lower end of the contact arm 12. When the projection 25 is peened, its constituent metal cold flows and substantially assumes the cross sectional shape of the square hole 28, thereby providing a more secure attachment of the tip 23 and prohibiting its rotation if the edge of the tip is subjected to an inordinately large blow by movable contact 2.

It is to be noted that shunt strips 26 are provided with right angularly bent integral tabs 29 that are appropriately perforated for passing over threaded stud 9 on the post 6. The whole of tabs 29 are outlined in Fig. 1 but the tabs are actually broken away as indicated lest the post 6 be obscured in that figure. When the nut is tightened down, tabs 29 are secured in tight compressive relation directly against a shoulder formed at the intersection of the threaded portion 9 and the barrel-shaped portion 7 and on the other side the tabs are in direct contact with the clamping band of lead 10. Thus, the contact assembly avoids interchanging current through any parts that are movable or hinged with respect to each other except for the separable connection that occurs between tips 23 and movable contact bar 2.

In summary, it is seen that the novel contact assembly 1 is advantageous in the respect that it employs arcing or contact tips 23 which are mounted in such manner that no direct heat need be applied to the arms on which the tips are supported. This obviates the once existing problem of annealing the arms.

Moreover, mounting the contact tips in the manner taught herein enables use of arms 12 that are adapted to rock in several degrees of freedom on a barrel-shaped surface 7 for achieving self-alignment with a cooperating movable contact element 2. There is no danger of arcing or pitting between the indented portion 20 of arms 12 and the surface 7 since, further in conformity with the invention, current is transferred around such junction by means of a shunt strip 26 that makes a direct connection between tips 23 and the arm supporting terminal post 6.

Although a preferred form of the invention has been described, such description is to be interpreted as illustrative rather than limiting for the invention may be variously embodied and is to be construed in accordance with the scope of the claims that follow.

It is claimed:

1. A contact assembly comprising a pair of complementary arms each of which is offset away from the other near one end and oppositely indented near the other end, a bearing post terminal whose surface is substantially ellipsoidal embraced between said indentations, spring means intermediate said ends biasing said arms toward each other and into compressive sliding tangential relation with said post, a contact tip including a projection riveted to respective arms near their offset ends, and flexible shunt means connected at one end to said contact tip through the agency of said riveted projection and at the other end to said bearing post terminal.

2. A contact assembly comprising a pair of complementary arms each of which is offset away from the other near one end and oppositely indented near the other end, a bearing post terminal means whose surface substantially defines a truncated-ellipsoid embraced between said indentations, interconnected compression spring means on corresponding sides of the arms biasing said arms toward each other and the indentations into compressive tangency against the surface of said post, pad means and a contact tip affixed thereto, said contact tip including a projection riveted to respective arms at their offset ends, and flexible shunt means connected at one end to said tips through the agency of said riveted projection and at the other end to said bearing post terminal.

3. A contact assembly comprising a pair of complementary arms of comparatively high resistance rigid metal each of which arms is offset away from the other near one end and oppositely indented near the other end, bearing post means whose lateral surface is curved outwardly from its axis embraced between said indentations, said arms thereby being adapted for self-aligning rotational sliding and rocking movement with respect to each other and to the post, spring means biasing said arms toward each other and generating a sliding compressive connection between the indentations and the post means.

4. A contact assembly comprising a pair of adjacent complementary arms, electric contact means at one end of each arm and an opposite indentation at the other end thereof, a bearing post terminal whose surface substantially defines a truncated-ellipsoid embraced between opposite indentations and effecting tangent points of contact with the indentations, said arms thereby being adapted for self aligning rotational, rocking and sliding movement with respect to each other and the post, spring means biasing said arms toward each other and into compression against the post, and flexible shunt means electrically connecting said post and said contact means.

5. A contact assembly comprising a pair of complimentary arms each of which has contact means near one end, bearing post means, said contact arms each having complementary opposed bearing post engaging portions near their other ends for embracing said bearing post, at least those areas of the surface of said bearing post means which are embraced by said engaging portions being curved outwardly from its axis so that said contact arms are independently rockable and slidable relative to each other and to said bearing post means, and spring means biasing said arms toward each other and generating a sliding compressive connection between said portions and said bearing post means.

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