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3,149,899

ELECTRICAL CONTACT ELEMENT

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Fig. 1

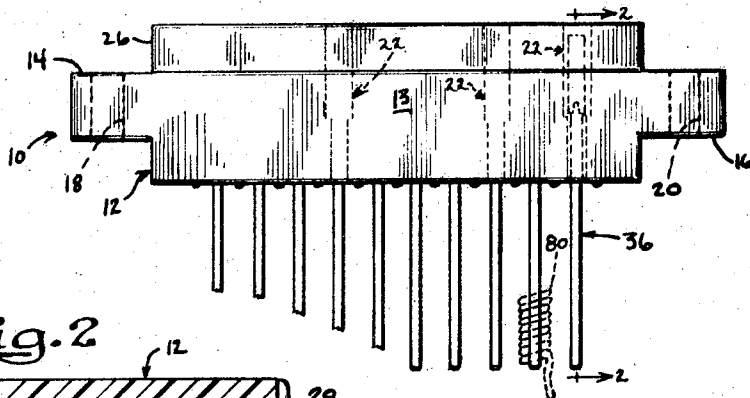


Fig. 2

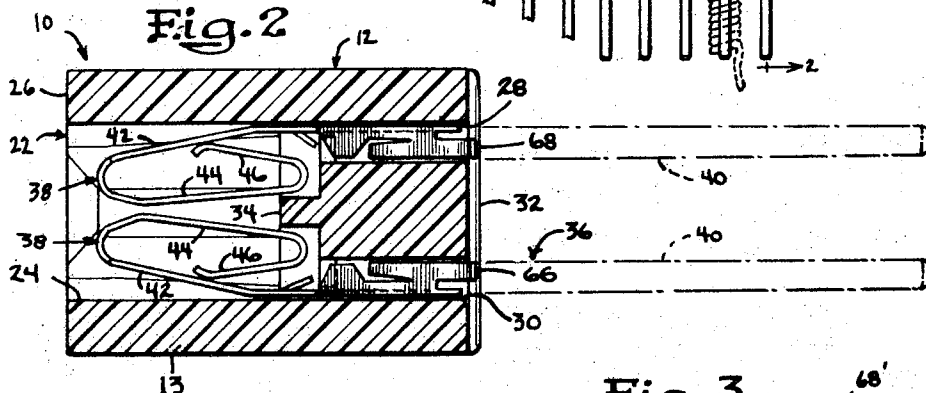


Fig. 3

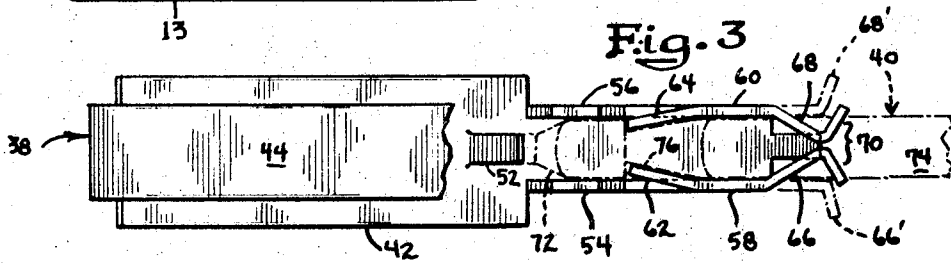


Fig. 4

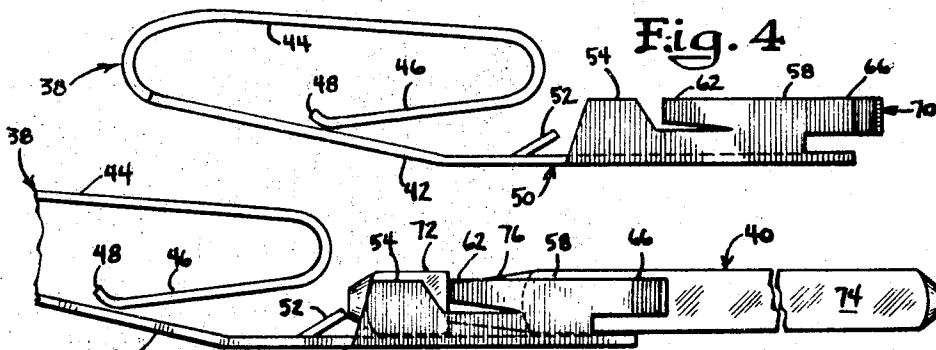


Fig. 5



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ELECTRICAL CONTACT ELEMENT

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1 Claim. (Cl. 339-258)

The present invention relates to an improved electrical connector and an improved electrical contact element therefor.

The connector and contact elements of the present invention are particularly adapted for use with the "wire wrap" method of connection of electrical leads to contacts. The wire wrap method of connection is commonly employed in the art today in view of the efficiency with which the electrical interconnection can be made and of the efficient physical electrical contact defined between the electrical leads and the contact elements with said method of interconnection.

The wire wrap method of interconnection of electrical leads and contact elements involves the insertion of a suitable wire wrap tool having a bore which bore is adapted to carry the electrical lead to be fastened. Of essence the tool is of substantial size in comparison to the post of the contact element to which the lead must be affixed. Considerable relative leverage is developed in placing of the wire wrap tool upon the post of the contact element and on occasion the post to which the tool is temporarily affixed may become bent. It would be desirable to have a post associated with the contact element that is of substantial physical proportions so that the post would not become bent or otherwise damaged during the wire wrap operation. Such physical construction for the wire wrap post of the contact element has heretofore been considered impractical. In order to make the manufacture of the contact elements of the type illustrated herein economically feasible it is necessary to turn them out in large volume. The electrical contact elements of the type utilized in conjunction with connectors illustrated herein are manufactured by stamping a blank shaped portion from a thin, electrically conductive, sheet of material. The blanked portion is then formed into the shape of the finished element in a continuous processing operation. The contact elements of the type employed herein are manufactured from relatively thin sheets of material, normally on the order of .010" in thickness. It is readily apparent that with material of this magnitude in thickness it is unreasonable to expect that the post provided at one portion of the element will be very sturdy. In order to provide a greater degree of structural stability for the wire wrap post of said elements it has sometimes been necessary in the manufacture of said elements to fold the post portion of the terminal, or to form said post portion in the shape of a box channel. This presents an unsatisfactory situation in that an additional and expensive forming step is required in the manufacture of said elements and the resultant post formed thereby is devoid of the relatively sharp corners desired to provide gripping portions for the wire to be fastened thereto. An additional drawback of integral element construction resides in the fact that when a short is encountered or the terminal has been defectively wired, or some other electrical or mechanical defect is encountered it is necessary to remove the entire electrical contact element to replace the same and to restore the electrical circuit to normal. In view of the fact that the major usage of such elements resides in conjunction with relatively miniaturized connector components the removal of a contact element or elements from said connectors becomes a time consuming and necessarily expensive operation. It, thus, is desirable to provide a construction to obviate this undesirable feature.

In accord with the present invention an improved con-

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tact element is provided wherein the electrical contact is provided of thin, easily formed and manufactured materials and the wire wrap post is provided of a relatively sturdy and rigid construction. An additional desirable feature of the present invention resides in the provision of a separable wire wrap post in the contact element.

It is accordingly a general object of the present invention to provide an improved electrical contact element having an electrical lead connector portion associated therewith that is relatively rigid.

An additional object of the present invention resides in the provision of an improved electrical contact element having a removable electrically conductive member associated therewith.

A further object of the present invention is to provide an improved contact element having a folded spring-like portion at one terminal thereof and a U-shaped post receiving channel at the other terminal thereof adapted to receive a separable wire wrap post therein in electrically conductive relation therewith.

Still a further object of the present invention resides in the provision of an improved electrical contact assembly having a relatively thin contact element adapted to be affixed within an insulating body and a relatively rigid, sturdy, electrical lead receiving terminal member removably received at one terminal of the thin portion of the contact element.

The novel features which are believed to be characteristic of the present invention are set forth with particularity in the appended claim. The invention itself, however, together with further objects and advantages thereof, will best be understood by reference to the following description taken in connection with the accompanying drawings, in which:

FIGURE 1 is a top plan view of an electrical connector employing the improved contact elements;

FIGURE 2 is a cross-section view of the connector of FIGURE 1 taken through lines 2-2 of FIGURE 1 with the wire wrap posts schematically represented;

FIGURE 3 is a top plan view of the improved contact element of the present invention, partly broken away to show details, with the sturdy lead receiving terminal schematically represented in cooperative relation therewith;

FIGURE 4 is a side elevation of the relatively thin portion of the improved contact element of the present invention; and

FIGURE 5 is an enlarged fragmentary view of the improved contact element of the present invention illustrating the contact assembly.

Referring more particularly now to FIGURE 1, the electrical connector assembly is indicated generally at 10. The connector is comprised of an insulating body, indicated generally at 12, having a main body portion 13 and a pair of mounting dogs 14 and 16, respectively, integral therewith extending from either side of the main body portion 13. Each of the mounting dogs 14 and 16 are provided with fastener receiving openings 18 and 20, respectively, extending therethrough. The insulating body 12 of the connector 10 is provided with a plurality of channels 22 extending therethrough at spaced intervals therealong, said channels adapted to receive the contact elements of the present invention as described below. As shown in FIGURE 2, each of the channels 22 are provided with a main opening 24 at one end thereof, said main opening 24 extending from one face 26 of said insulating body 12 into said insulating body for substantially one half the distance thereof. The main opening 24 of the insulating body 12 merges into a pair of spaced channels 28 and 30, which channels extend from the inner terminal of the main opening 24 through the re-

remainder of the insulating body 12 to the opposite face 32 of said body. A projection 34 extends outwardly from the inner terminal of the main opening 24 a predetermined distance toward the face 26 of the insulating body 12.

The improved contact element 36 of the present invention is comprised of a thin portion indicated generally at 38 and a relatively rigid, sturdy portion indicated at 40.

The thin contact element portion 38 of the contact element 36 includes a main body portion 42. The main body portion 42 extends integrally outwardly into a narrower portion 44 the main body portion 42 being folded in the area of width reduction defined between the integral interconnection between the portions 42 and 44 of the contact element. The narrower portion 44 of the main body portion 42 is folded back over the main body portion 42 and in spaced relation thereto to define an open loop. The free end 46 of the narrower portion 44 is again folded, as shown in FIGURES 2 and 4, inwardly towards the main body portion 42 to define a substantially closed spring-like loop in combination with portions 42 and 44 of said contact element. It can readily be seen that the spring-like loop may be easily flexed in accord with the inherent physical characteristics of the material from which the contact element 38 is formed. The inner terminal 48 of the free end 46 is bent slightly away from the main body portion 42 at the portion adjacent thereto to provide a non-interfering bearing member for the spring loop and to prevent resistance to the flexure action of the spring-like loop.

The main body portion 42 of the contact element 36 extends continuously into the U-shaped channel portion 50 and is angularly related thereto, as indicated in FIGURES 2 and 4. A lug 52 extends upwardly and away from the bottom face of the U-shaped channel portion 50 and defines the inner terminal of said channel portion. A pair of upstanding walls 54 and 56 define the side walls of the channel portion 50, in combination with the static wall portions 58 and 60 of the spring clip area of the channel. A pair of inwardly biased spring clip members 62 and 64 extend slightly into the channel defined by the side walls, said clips being integral with the static wall portions 58 and 60 and positioned on the main body portion 42 side of said wall portions. The other end of the walls 58 and 60 are integrally joined to spring clip members 66 and 68. As indicated in FIGURE 3, the members 66 and 68, in their rest position, extend into the channel defined by the wall portions and are substantially in touching engagement at their innermost terminals. The free ends of each of the clips 68 and 66 extend outwardly and away from said channel and form a gradually inwardly sloping female-type receptacle 70 adapted to facilitate insertion of the rigid portion 40 within the channel.

The rigid portion 40 is formed from electrically conductive stock approximately .05" in thickness. The thickness of the member 40, thus, is four to five times as thick as the thin material employed in the forming of the thin contact portion 38 of the contact element 36. The additional thickness lends rigidity to the member 40 that would not otherwise be obtained if said member 40 were formed integrally with the thin portion 38 of the contact element. The rigid portion 40 may be formed from square wire stock. The advantage in employing the square stock resides in the provision of relatively sharp corner portions on the member 40 to provide gripping points for the wire to be formed thereon at a later stage.

The member 40 includes a head portion 72 defined at one terminal thereof, said head portion being integrally joined to the main body portion 74 of said element, the region of interconnection between the head portion 72 and body portion 74 being defined by a gradually sloping area 76. The sloping area 76 is defined about each of the surfaces of the element 40 said sloped wall portions

extending inwardly from the body portion 74 to the head portion 72.

In assembly of the connector 10 of the present invention the thin portions 38 of the contact elements are inserted into the openings 22 of the insulating body 12. The channel portion 50 is inserted into the main body opening 24 and the element 38 urged inwardly until the channel portions 50 extend fully into the openings 28 and 30, respectively, the spring clip portions 66 and 68 of the channel member 50 extending substantially into the plane of the face 32 of the insulating body 12. The element 38 may be affixed in the insulating body 12 by any of the conventional means, such as, for example, a cleat (not shown) integral with the element 38 and adapted either to bite into the relatively soft insulating body or to rest upon a ledge provided therein and adapted to prevent withdrawal of the element 38 from the insulating body 12.

The narrower portion 44 of the element 38 is adapted to rest against the projection 34 in the main body opening 24. The projection 34 orients the spring-like loop within the opening 24 and prevents initial contact of the mating elements 38 within the opening. As shown in FIGURE 2, the mating elements 38 are in slightly spaced relation within the opening 24 of the insulating body. A printed circuit board (not shown) is adapted to be received within the opening 24 of the body 12. The printed circuit board, as is well known in the art, is provided with an electrically conductive ribbon along the surfaces thereof which ribbons are adapted to be received in electrically conductive relation with the narrower portion 44 of the element 38. In the embodiment illustrated in FIGURE 2, the printed circuit board would be provided with electrically conductive ribbons along the top and bottom faces thereof said ribbons being electrically conductively engaged by the top and bottom banks of element 38 to complete a dual circuit therebetween.

The relatively rigid element 40 may then be inserted into the U-shaped channel portion 50 of the element 38 to be locked therein by the inwardly biased clips 62 and 64 which clips engage the rear portion of the head and prevent withdrawal of the member 40 under normal circumstances. Spring clip members 66 and 68 further define retaining means for the element 40 and assist in confining the element 40 within the U-shaped channel. The clips 66 and 68 are urged outwardly upon urging of the element 40 therepast and assume the positions illustrated by the dashed lines 66' and 68' of FIGURE 2 when said element is disposed within said channel portion 50. When the element 40 is inserted fully within the channel portion 50 the head portion 72 will abut the upwardly extending lug which defines the inner terminal of said channel and prevent insertion of the element 40 beyond a pre-determined distance.

When it is desired to electrically interconnect the connector element 10 with the remainder of the circuit within which it is to be utilized, the wire wrap gun is placed over each of the posts or elements 40, in succession, and the electrical leads wrapped thereabout as schematically represented at 80 in FIGURE 1. The likelihood of damage occurring during the wire wrapping operation is considerably reduced in view of the fact that the connector element of the present invention is provided with a substantially stronger post 40 than heretofore had been conveniently employed. Even if one or more of the posts 40 should become damaged during the wrapping operation it is only necessary to withdraw the post from the U-shaped channel portion 50 of the element 38 and replace it with another undamaged post. It can readily be seen that it is not necessary to remove the entire contact element 36 in the event the post 40 becomes damaged.

While there is shown and described a specific embodiment of the present invention it will, of course, be understood that other modifications and alternative construc-

tions may be used without departing from the true spirit and scope of this invention. It is, therefore, intended by the appended claim to cover all such modifications and alternative constructions as fall within their true spirit and scope.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

An improved electrical contact comprising:

a first electrically conductive member having a main body portion, said body portion having a yieldable contact portion at one end, the other end of said main body portion having a U-shaped channel comprising a pair of opposed upstanding wall portions extending along a portion of the length of said other end, each of said wall portions having at its end away from said contact portion a deflectable portion extending inwardly to intersect a continuation of the plane of said channel, each of said wall portions having a clip element spaced from said deflectable portion in the direction of said contact portion, said clip elements being in opposed relation and extending inwardly to intersect said channel, said deflectable portions and said clip elements being resiliently outwardly deflectable under pressure, the inner terminal of said channel being defined by a lug extending outwardly from said main body portion; and

a second electrically conductive member having a rigid body portion and a head element at the forward end of said body portion, said head element having a rearwardly facing shoulder portion, said second conductive member being retained within said channel

by resilient engagement of said clip elements behind said shoulder portion, said deflectable portions being urged outwardly upon insertion of said second conductive member into said channel to contact said body of second member in resilient electrical engagement when said second member is in assembly with said first conductive member within said channel.

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