

Nov. 11, 1969

J. F. CHIRUMBOLO
ELECTRICAL CONNECTOR

3,478,305

Filed Sept. 26, 1966

2 Sheets-Sheet 1

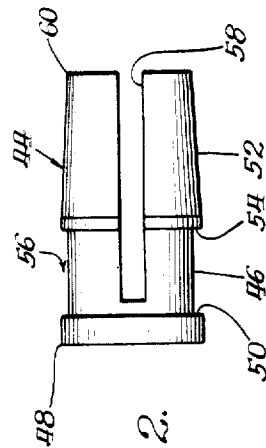
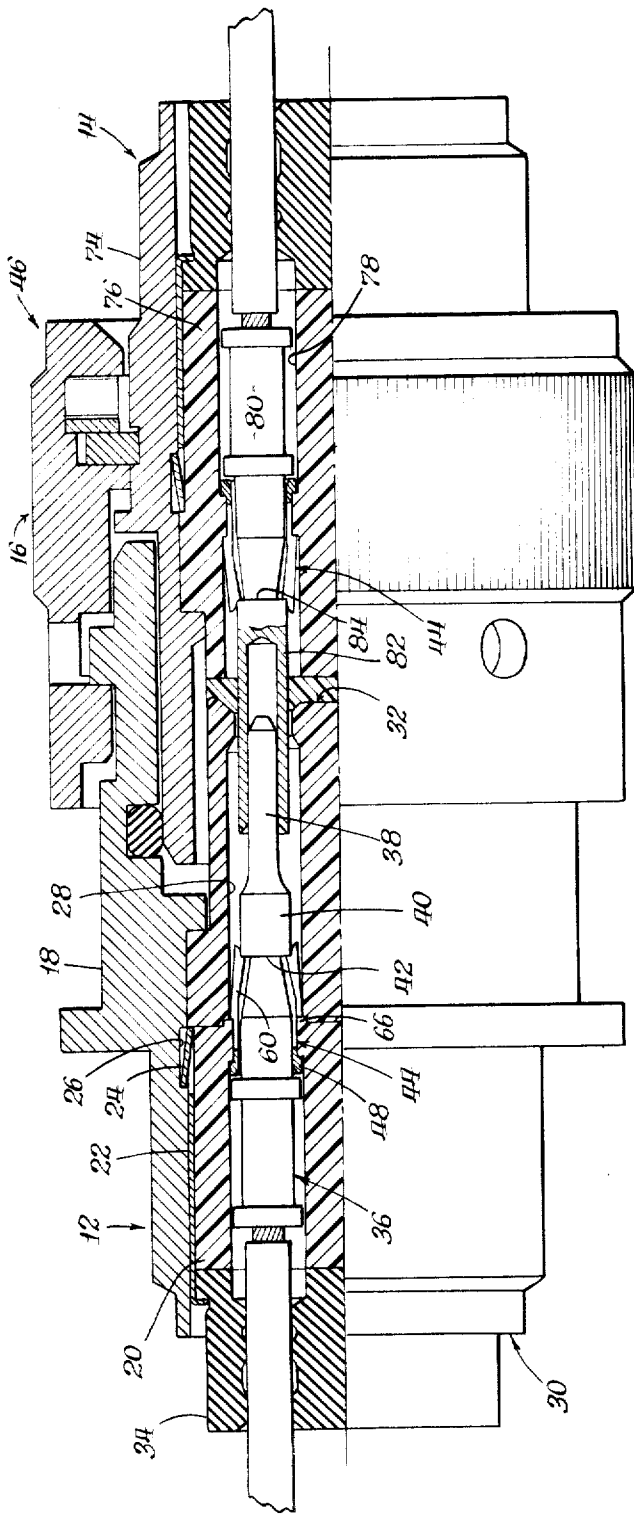


Fig. 1.

Fig. 2.

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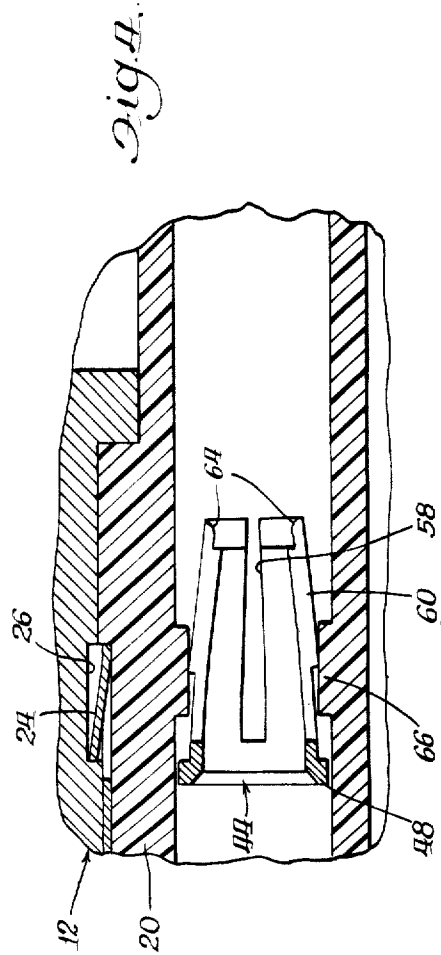
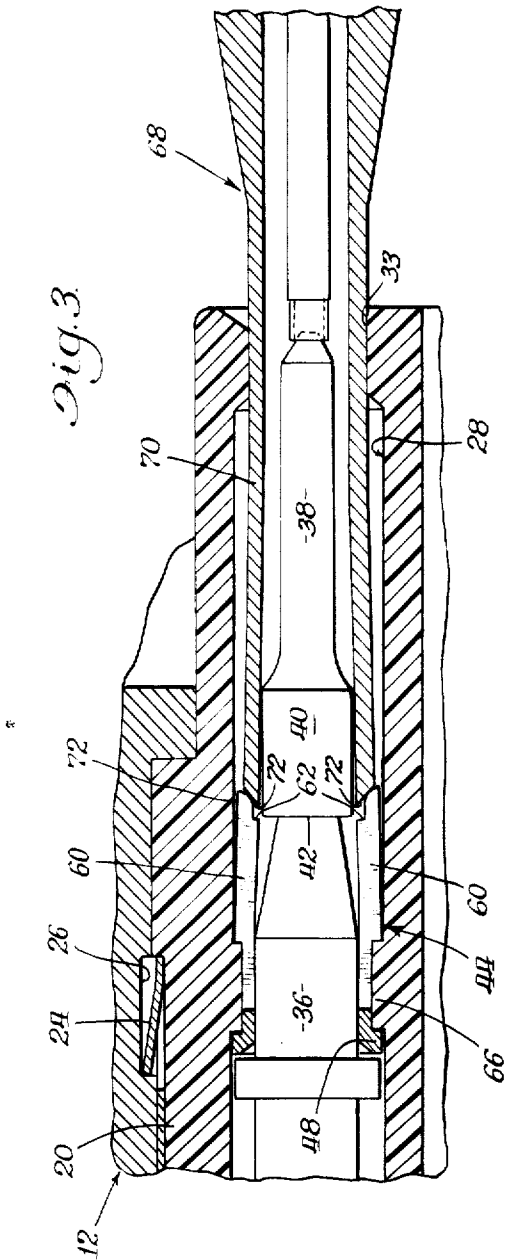
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ELECTRICAL CONNECTOR

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 Filed Sept. 26, 1966, Ser. No. 581,903
 Int. Cl. H01r 9/12, 13/24

U.S. Cl. 339-217

1 Claim

ABSTRACT OF THE DISCLOSURE

An electrical connector having removable contacts, and a removable, snap-in contact mounting assembly. The mounting assembly includes a tubular insert made of a substantially rigid dielectric material, and a contact retention ring or clip removably mounted in the tubular insert. The retention ring comprises a tubular sleeve with an annular groove spaced from the rear end thereof to form an annular collar, and a gradually tapered front portion with the forward end thereof smaller than the rearward end thereof. The sleeve is further provided with slotted portions extending from the forward end into the area of the annular groove and terminating at a location adjacent to the rearward collar. The slotted portions of the sleeve allow it to be compressed as the retention ring, with its tapered portion, is inserted into the bore of the tubular insert and against a circumferential rib provided in the bore for locking the retention ring in place.

The present invention relates to an electrical connector.

The invention relates to a cable type electrical connector including a receptacle and a plug, each having a plurality of contacts therein exposed for connection with the counterpart contacts in the other connector part. Each connector part has a body portion in the form of a dielectric insert in which the contacts are removably mounted.

A broad object of the invention is to provide an electrical connector of the foregoing general character including a novel arrangement for so removably mounting the contacts.

The construction of the electrical connector includes a hard dielectric insert, the material of which is sufficiently rigid to prevent the deformation or injury to any of the elements of the connector in the step of removing the contacts from the connector part.

More specifically, the cable connector of the invention includes a construction of the character just referred to in which the hard dielectric insert includes apertures receiving the contacts, and clips in the apertures surrounding the contacts with fingers self-biased inwardly into engagement with the contacts to retain them in position, but movable outwardly to release them; when they are moved outwardly they engage the wall of the aperture, and the material of the dielectric insert forming such wall is sufficiently rigid to withstand forces tending to damage the clips or contacts; also the hard dielectric material confines the usual tool, used for removing the contacts, against misalignment and consequent injury to the contacts.

Other objects and advantages of the invention will appear from the following detailed description taken in conjunction with the accompanying drawing in which:

FIGURE 1 is an axial sectional view of an electrical connector embodying the features of the present invention;

FIGURE 2 is an elevational view of a contact retention clip included in the connector of FIGURE 1;

FIGURE 3 is an axial sectional view of a portion of the connector of FIGURE 1 showing the contact retention clip in expanded, releasing position; and

FIGURE 4 is an axial sectional view of a portion of the connector of FIGURE 1 with the contact removed and showing the clip itself in a released position.

Referring now in detail to the accompanying drawings, attention is directed first to FIGURE 1 showing an electrical connector embodying the features of the present invention. The connector is of the type for connecting cable lengths each having a plurality of wires or conductors. The connector includes two main parts, a receptacle 12 and a plug 14 releasably connected together by a coupling ring 16, the connector embodying a connecting construction disclosed and claimed in the copending application of John Cameron, Ser. No. 580,744 filed Sept. 20, 1966, assigned to the assignee of the present invention.

The receptacle 12 and plug 14 are similar to each other from the standpoint of the construction described below for retaining the contacts in those connector parts. The plug 12 includes an outer shell 18 having an insert 20 therein of hard dielectric material. This insert may be retained in the shell by suitable means such as a retainer sleeve 22 of suitable kind having spring tabs 24 engageable in a groove 26 in the inner surface of the shell. The insert 20 has a plurality of axially extending apertures 28 there-through leading from a rear end 30 and opening through a forward end 32 facing the other connector part. The apertures 28 are of the closed entry type having terminal end portions 33 (FIGURE 3) of reduced diameter, which eliminate or greatly reduce bending of the contact as to be referred again hereinbelow. Rearwardly of the insert is a grommet 34 of suitable kind. Disposed in each of the apertures 28 is a pin contact 36 having a forward reduced pin element 38 rearwardly of which is a large diameter base portion 40 having a rearwardly facing shoulder 42.

Surrounding the pin contact 36 is a snap-in retention ring or clip 44 shown in its entirety in FIGURE 2. This retention ring is generally tubular in form having a rear relatively small diameter section 46 rearwardly of which is a collar 48 forming a forwardly directed shoulder 50. Forwardly of the section 46 is a large portion 52 forming a rearwardly directed shoulder 54, the two shoulders 54, 50 thus forming a peripheral external groove 56. The clip is provided with a plurality of slots 58 preferably four in number leading from the forward end rearwardly through the shoulder 54 and into the section 46 to a position adjacent the collar 48 forming a plurality of fingers 60 which possess a degree of flexibility for snapping into the connector and for releasably retaining the pin contact therein. The fingers 60 are provided with internal forwardly facing shoulders 62 (FIGURE 3) forwardly of which are internal chamfered or camming surfaces 64 as indicated in FIGURE 4. The outer surfaces of the fingers 60 are of slight conical shape to enable outward flexing as referred to again hereinbelow.

The clip 44 is first inserted into the apertures 28 from the rear before the pin contact is in place, in a known manner. For use in securing the clip in place, the surface of the aperture 28 is provided with an internal circumferential bead or rib 66 and upon inserting the clip into position, the outer surface of the fingers 60 engage the bead and are cammed and flexed inwardly. The clip is then forced forwardly sufficiently that the rib 66 is received in the groove 56 whereupon the fingers snap outwardly to their normal position shown in FIGURES 1 and 2, in which the outer surface of the fingers forwardly of the shoulder 54 do not engage the surface of the aperture (FIGURE 1) except possibly only slightly at the vicinity of the shoulder 54.

Then the pin contact 38 is inserted in place by inserting it from the rear, or the left of FIGURE 1, in a known manner, forcing it through the clip 44 whereupon the fingers 60 spread to enable this movement and then again contract with the shoulders 62 engaging the shoulder 42 on the pin contact. The pin contact is thereupon locked in place.

For removing the pin contact a tool 68 (FIGURE 3) is utilized, such as that disclosed and claimed in the copending application of John Cameron Ser. No. 589,550 filed Oct. 26, 1966, assigned to the assignee of the present invention. Such tool includes a probe portion 70 of tubular form having a chamfered leading end surface 72. The probe is inserted through the front end of the aperture 28 and over the pin element 38 and base portion 40, and upon continued such movement, the chamfered surface 72 engages the chamfered or camming surfaces 64 on the fingers 60. This action springs the fingers outwardly to a position wherein the shoulders 62 are moved radially outwardly beyond the shoulder 42 on the pin contact, and preferably only barely therebeyond. The pin contact is then released and can be removed out of the rear end of the connector part, to the left as viewed in FIGURE 1.

The plug 14 includes an outer shell 74 also having an insert 76 of hard dielectric material provided with apertures 78 in which are positioned socket contacts 80. Each contact is provided with a socket element 82 forming a shoulder 84 against which a second clip 44 engages for holding the socket contact in position. The socket element 82 is of the same external diameter as the base portion 40 and the use of the second clip 44 in the plug is precisely the same as described above in connection with the receptacle 12.

The plastic material of the dielectric insert 20 is of such rigidity and non-yieldability that its geometry does not change in the steps of inserting or removing the contacts, i.e., the fingers 60 of the clip may be forced outwardly into engagement with the surface of the aperture 28, the aperture being appropriately dimensioned, but are at that point relatively limited in their movement whereby to eliminate damage to the clip. Previously in the use of soft dielectric material, the pin contact was often damaged in its removal because of the misalignment of the pin contact which caused bending thereof.

In the use of the removal tool 68 for example the user may not retain the tool in perfectly axially aligned position but in the present instance the confining effect of the closed entry 33 of the aperture 28 prevents misalignment or wobbling of the tool, the hardness of the dielectric material in this instance also preventing such misalignment.

Another advantage of the construction is that the clip 44 may be of lesser dimensions and finer construction because of the confinement by the hard dielectric insert, re-

sulting in saving in manufacturing in this respect and ease in manipulation of the clip in removing the pin, the damage to the clip being avoided nevertheless by the confinement of the surface of the aperture.

While I have herein disclosed a certain preferred form of the invention it will be understood that changes may be made therein within the spirit and scope of the appended claim.

I claim:

1. In an electrical connector of the type having removable contacts, a snap-in contact mounting assembly including an insert of relatively rigid dielectric material having at least one contact cavity therein with a reduced diameter terminal end portion; each said cavity consisting of a generally cylindrical bore extended through the dielectric with a reduced diameter portion providing forwardly and rearwardly facing shoulders on an internal rib within the bore; together with a snap-in, removable contact retention ring adapted to be received within the aforesaid bore; said retention ring consisting of a tubular sleeve having an annular groove adjacent to but spaced from one end of the sleeve to provide an annular collar at the rearward end and having a front portion of gradually tapered smooth conical shape with the forward end of the sleeve of substantially smaller diameter than the rearward end thereof; said sleeve having a plurality of slots extending from the forward end into the area of the annular groove and terminating adjacent to the rearward collar whereby the sleeve may be inserted into the bore of the dielectric with the tapered surfaces of the forward portion thereof functioning as cooperating cams to allow the sleeve to be compressed as it enters the rib of the contact cavity and to snap into locked position with the front and rear shoulders of the rib of the bore engaging the front and rear shoulders of the annular groove of the sleeve.

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U. S. Cl. X.R.

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