

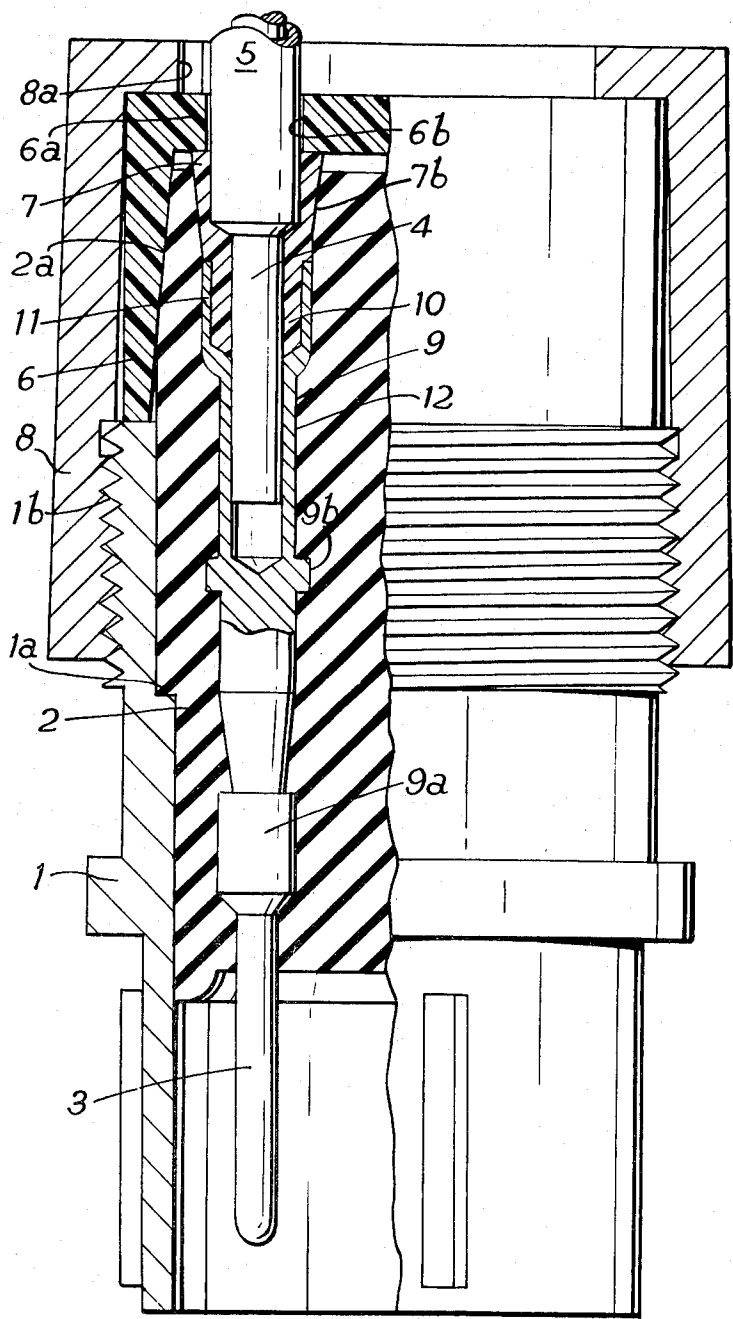
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SEALED MULTI-CONTACT ELECTRICAL CONNECTOR

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SEALED MULTI-CONTACT ELECTRICAL CONNECTOR

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6 Claims. (Cl. 339—60)

This invention relates to plug and socket type electrical connectors.

In connectors of the kind in which contact elements, such as the pin and socket contacts of a cable connector, are mounted in a body of rubber or similarly resilient insulating material, it is usual to provide each contact element with projecting flanges, which are lodged in appropriate recesses of the rubber or like insulating body for axial location of the element, and these flanges or the like have hitherto been exclusively relied upon for preventing the connector element from being withdrawn from the insulating body by pull on the cable or wire. While a satisfactory resistance to withdrawal can be achieved in this manner if a divided rubber or like block is used, such a division of the block is not very satisfactory from an electrical point of view; in the absence of such division on the other hand, the need of introducing the flanged connector element axially through the narrower parts of the bore in which the element is lodged, limits the maximum diameter of the flanges to such an extent as to make it difficult to achieve satisfactory pull-out resistance.

The present invention has for an object to provide an improved connector of the kind specified which provides additional pull-out resistance independent of the cooperation of the retention flanges with the rubber or like insulating body.

According to the invention the wire-receiving end of each connector element, or a rigid member attached thereto, is arranged to face at a close distance a retention plate or cap of rigid material which is supported on the connector housing, for example by being held in position by a cap nut co-operating with a thread on the circumference of the connector housing. At least one, and preferably both, of the retention cap and sleeve consist of insulating material.

One embodiment of the invention is illustrated in the accompanying drawing, which is an elevation of a multi-pin connector plug member, partly in section along the axis of a contact element.

Referring now to the drawing, the illustrated plug member comprises an insulating body 2 of moulded electrically insulating resilient material, for example rubber or silicone rubber, provided with suitably profiled through bores serving for the accommodation of contact elements 9, only one of which is shown, and which each include a contact pin 3 projecting through one end face, hereinafter called the front end, of the body 2, while its rear end is attached to a wire 4 projecting from insulation 5. This body is inserted in a metal shell 1 having an internal shoulder 1a against which a complementary shoulder of the body 2 rests, and external screw threads 1b for engagement by a cap nut 8 the crown of which has a central bore 8a. The rear end of the cylindrical body 2 is tapered as shown at 2a and co-operates with a corresponding internal taper of a retainer cap 6 of rigid insulating material, for example fibre-reinforced phenol-formaldehyde material. This cap has a bottom 6a, which is provided with wire-clearance apertures 6b in coaxial alignment with each contact-receiving hole of the insulating body 2, the perforations 6b being a sliding fit on the covering 5

of conductor wires 4. A retention sleeve 7, which consists of polystyrene, polytetrafluoroethylene, or other rigid insulating material and which has a tapered end portion 7b, is placed around the wire 4 between the contact element 9 and the end wall 6a of the retaining cap 6 and is so dimensioned as to extend, when the connector is assembled, into close proximity to the end plate 6a of the retaining cap 6, which itself is held rigidly in position on the connector housing body 1 by the cap nut 8. Both the retention sleeve 7 and the retaining cap 6 consist of material which is of rigid nature, in contrast to the resilient nature of the moulding 2 in which the contact elements 9 are accommodated. Therefore if a pull is exerted on the wires 4, 5, the contact element 9 will be moved sufficiently to bring the retention sleeve 7 into contact with the end wall 6a of the retaining cap. This small amount of movement will be readily permitted by the resilience of the body 2 without dislodging the locating flanges 9a and 9b; thereafter the force of the pull will be transmitted direct from the body of contact element 9 via the retention sleeve 7, retaining cap 6, and cap nut 8, to the connector body 1, thus avoiding any risk of a contact element being dislodged and accidentally withdrawn from the resilient body 2.

To assemble the connector, the insulated wires 4, 5, are each passed from the rear through the central aperture 8a of the cap nut 8 and threaded through the appropriate perforation 6b in the end wall 6a of the retainer cap 6. A retention sleeve 7 whose end portion 7b serves to ensure sealing engagement with the body 2, is then slipped over the stripped end of each wire 4 to cover the end of the insulation 5, and thereafter the stripped wire end 4 is introduced into the axial bore of a thimble part 12 of the contact element 9 equipped with the pin 3, and the cylindrical end portion 10 of the retention sleeve 7 is introduced into a cup-shaped widened extension 11 of the thimble part of contact element 9. The thimble part 12 of the contact element is then crimped to the wire 4, thereby trapping the sleeve 7 between the thimble 12 and the insulation 5 of the wire.

The contact body 9 is then pushed home into its seat in the resilient rubber or like body 2, whereafter the retainer cap 6 is pushed towards the body 2, and clamped to it by the cap nut 8. Thereafter the nut 8 is tightened, whereupon the cap 6, due to its tapered bore, compresses the resilient body 2 to form a close seal on each contact element 9. When the edge of the cap 6 abuts the end of the shell 1, the end wall 6a of the retainer cap 6 will also be in contact with, or at least closely adjacent to, the end of the retention sleeve 7, so that, as mentioned above, any appreciable pull on the contact element 9 by the wire will be transmitted by the sleeve 7, cap 6 and nut 8 to the body 1 of the connector without undue strain upon the seating surfaces in the moulding 2.

The dimensions of the insulating elastomer body 2 are so chosen that when the connector member is thus assembled, the elastomer body is subjected to a certain amount of compression due to the action of the inner cone surface of the retainer cap 6 upon the tapered end portion 2a of the body 2. The conical shape of the last-mentioned surfaces improves the gripping and sealing action of the elastomer body around each contact element.

While a connector plug member has been described with reference to the drawing, it will be evident to those skilled in the art, that the invention is equally applicable to connector socket members, in which case the illustrated pin-type contact elements 9 are replaced by socket-type contact elements which, instead of carrying a contact pin 3, are formed with a pin-receiving socket bore. Various other features of the illustrated embodiment may also be modified within the scope of the invention. Thus while preferably both the retention sleeve 7 and the retainer cap

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6 are made from insulating material, this is not essential for the operation of the invention so long as at least one of these elements is made of insulating material. For example the cap 6, which is subject to somewhat greater mechanical stress, may be made of aluminum or other metal, provided that the retention sleeve 7 consists of insulating material.

What is claimed is:

1. An electrical connector member, comprising an insulating body of elastomer material having a first and a second end face parallel to each other and at least one contact-receiving through bore extending between said end faces, a contact element positioned in each said contact-receiving through bore and at least accessible for contact engagement through the first of said end faces, and a connector housing in which said insulating body is secured with said first end face exposed and at least the ends of said through bores in the other end face accessible through said housing for the insertion of an insulated wire, the combination including a retaining plate facing said second end face and at least supported in said housing, said plate having through bores respectively aligned with each of said through bores of the insulating body in at least one relative position of said plate, and at least one retention sleeve extending, when the connector member is assembled, over at least the greater part of the distance from such contact element to the opposed face of the retaining plate to transmit, direct from the contact element to the retaining plate and housing, at least after slight deformation of the elastomer body, any forces due to pull exerted upon a wire attached to the contact element and extending through the retaining plate, both the retaining plate and the retention sleeve being made of substantially rigid material and at least one of them consisting of insulating material.

2. A connector member as claimed in claim 1, wherein

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the connector housing comprises a screw-threaded shell and a cap nut.

3. A connector member as claimed in claim 1, wherein the retaining plate forms the bottom of a retaining cap having a conical collar co-operating with a corresponding cone surface on the elastomer body.

4. An electrical connector member as claimed in claim 1, wherein the axial bore of the retention sleeve is stepped, forming a small-diameter portion to accommodate a length of stripped wire end, and a larger-diameter portion adapted for accommodating the end portion of the insulation of the wire.

5. A connector member as claimed in claim 1, wherein each contact element is formed, at its wire-receiving end, with a wire-receiving thimble extended to form a cap into which one end of the retention sleeve fits.

6. An electrical connector member as claimed in claim 5, wherein the axial bore of the retention sleeve is stepped, forming a small-diameter portion to accommodate a length of stripped wire end, and a larger-diameter portion adapted for accommodating the end portion of the insulation of the wire.

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