

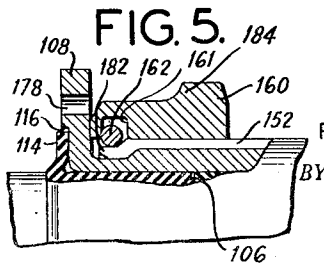
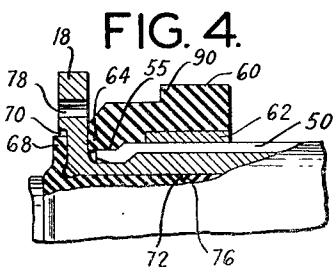
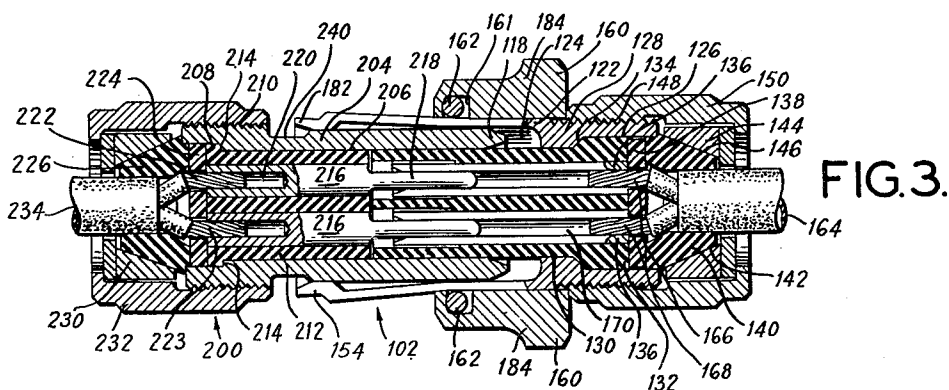
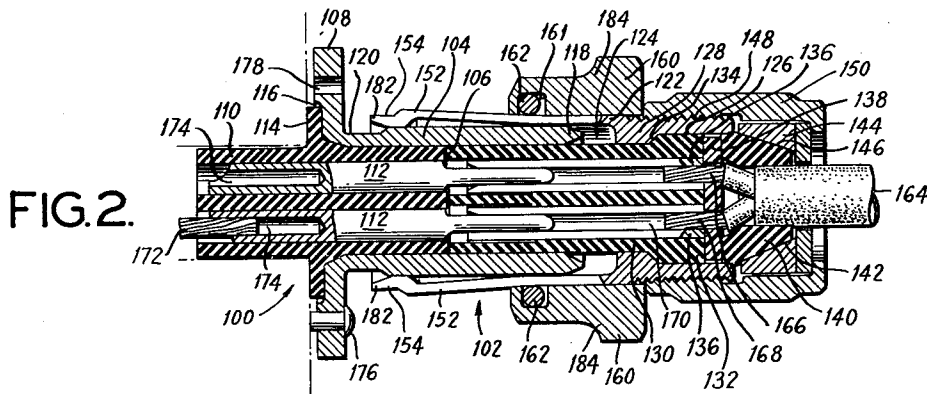
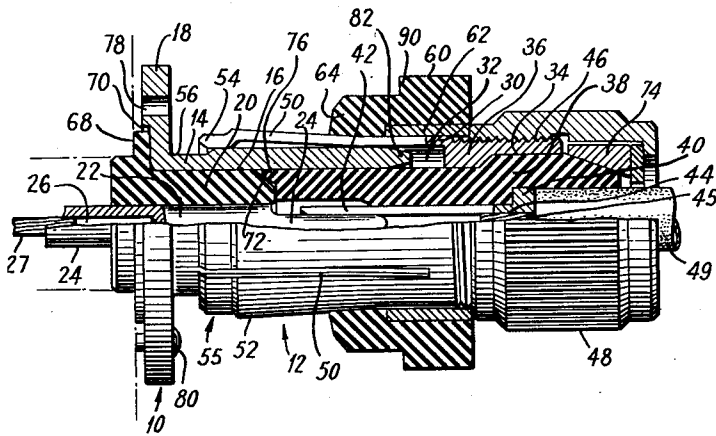
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ELECTRICAL CONNECTOR

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ELECTRICAL CONNECTOR

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1 Claim. (Cl. 173—328)

1

This invention relates to electrical connectors. In particular this invention is directed to plug-in connectors of improved construction; and its principal objects are to provide for one-handed quick action connection and disconnection, tight holding and positive engagement, which is resistant to dislodgment due to vibration and the like, superior electrical conductivity, and high degree of sealing against water penetration and electrical leakage.

The principal objects, as well as other objects and advantages of the invention will become evident from the following description of the invention taken in connection with the accompanying drawings:

Fig. 1 is a view, partly in cross-section and partially broken away, of an embodiment of the invention (shown not fully engaged) providing for a single prong plug-in connection, the base of the connector being adapted for permanent affixation to a supporting body.

Fig. 2 is a cross-section of a two-prong plug-in embodiment of the invention (shown not fully engaged), the base of the connector likewise being adapted for permanent affixation to a support.

Fig. 3 is a cross-section of a further embodiment of the invention (shown not fully engaged) providing for two-prong plug-in connection, and adapted for the juncture of two free wires or cables.

Fig. 4 is a view partially broken away and partially in cross-section, showing the connector of Fig. 1 in closed and locked position.

Fig. 5 is a view partially broken away and partially in section, showing the connector of Fig. 2 in closed and locked position.

Referring now to Fig. 1, the numeral 10 designates one member of the connector and the numeral 12 the complementary member, one of said members having the prong or pin and the other the complementary female element into which the prong is inserted.

The member 10 comprises a tube 14, of metal or other appropriate material, having a bore 16. Tube 14, terminates at the rear in a flange 18. A cylindrical insulator 20, of resilient material such as rubber or other suitable material, is positioned within bore 16. A conductive element 22, set within the insulator 20, terminates in an externally extending prong or pin 24. The opposite end of element 22 may be provided with a bore 26, within which is secured, by soldering or other appropriate means, the bared end of a wire 27.

The member 12 comprises a tube 30, of metal or other appropriate material, having a front

2

bore 32, and a rear bore 34, the bores being spaced apart from each other by a shoulder 36. A cylindrical insulator 38, of material similar to insulator 20 or otherwise (as for example glass or hard rubber), is positioned within the tube 30. A conductive element 40, is set lengthwise within insulator 38, and terminates forwardly in a female section 42 (adapted to engage prong 22), and rearwardly is provided with a bore 44, within which is secured, by soldering or the like, the bared end of a wire 45. The rear end of tube 30, has external threads 46, to receive the knurled nut 48, which securely locks the assemblage of insulator 38, the sheathing 49 of the wire 45, and the tube 30, together. The locking will be more particularly described below. The forward end of tube 30, is constricted, and said tube is provided with a plurality of longitudinal slots 50. The slots form in effect, a plurality of concentrically arranged spring-like elements 52, whereby the same can be sprung outward and thereby be slipped over tube 14. These spring-like elements securely hold the tube 14, by the engagement of the grips 54, within the peripheral channel or groove 56, at the base of tube 14, adjacent to the flange 18. A slidable collar 60, of resilient material, is mounted on the tube 30. The forward end 64, of collar 60, has a molded lip of small diameter that will snap into the groove formed by the outer surface of grip 54, as shown in Fig. 4. A metal ring 62, is set within the rear of the collar 60. This rigid ring, when in locked position (Fig. 4) will not allow elements 52, to be sprung out of the recess or groove 56, and thus the elements 20 and 30 are locked together.

Referring now more particularly to the details of construction of the connector, it will be seen that the rear end of insulator 20, is flared out as at 68, the flared portion setting within the recess 70, at the base of the flange 18. The forward end of insulator 20, is bevelled as at 72. Insulator 38, is bevelled at the rear end so as to provide a seat for ring 74, of metal or other appropriate material, the inner face of said ring being angularly disposed so as to be set properly. The forward end of the insulator 38, is provided with a lip 76, which sits against the bevel 72.

The flange 18, may be provided with bores 78, whereby the member 10 may be fastened, as by screws 80, rivets or the like, in position of permanent affixation. In effectuating such affixation the flared portion at the base of the insulator 20, will spread out and thus provide a tight seal between the member 10 and the structure to which it is affixed, and also resiliently locate insulator

3

20 with respect to member 18. The forward end of tube 14, is bevelled as at 82 to allow for the easier passage thereof of the grips 54.

In assembling the member 12 with a wire, the nut 48, and the ring 74, are slipped over the insulated wire. The bared end of the wire is positioned within the bore 44, of element 40, and soldered thereto. This assembly is now positioned in bore of insulator 38, and is set within the tube 30, the lower end of the insulator being seated against shoulder 36. The ring 74, is then seated on the bevel of insulator 38, and the nut 48, screwed on threads 46, until the assemblage is tightly fastened. The collar 60, may then be slipped over the tube 30, and brought to rest against the nut.

To make a connection between members 40 and 12, the latter (12), with the slidable collar positioned as in Fig. 1, is sprung over tube 14, and the motion continued until the grips 54, snap into the groove 56. In this position insulator 38, is pressed against forward face of insulator 20, thus producing a tight seal. The tension is maintained because the rear end of insulator 20, has been displaced or compressed, as shown in Fig. 4, by the joining motion of unit 12 to unit 10. If it is desired to lock the elements 10 and 12 together, the slidable collar is then moved into the position shown in Fig. 4 and the joiner thus locked.

To separate member 12 from member 10, the shoulder 90, of collar 60, may be grasped between one's fingers and brought rearwardly, thus releasing the grips 54. Continued pulling on the collar, now butting against the nut, results in disengaging the grips from the channel 56, and the member 12 can be withdrawn from engagement with member 10.

Referring now to the embodiment illustrated in Fig. 2, it will be observed that the structure in its basic aspects is similar to that of Fig. 1, differing therefrom (a) in the provision of two or more prongs instead of one; and (b) in the form of the locking collar. This modification comprises the complementary members 100 and 102. Member 100 comprises a tube 104, having a bore 106, which terminates in a flange 108. A cylindrical insulator 110, is positioned within the bore 106. Two conductive elements, 112, similar to element 22, are set within the insulator 110. The rear end of insulator 110 is flared out as at 114, and sets within the recess 116, in the base of the flange 108. The forward end of the tube 104, is bevelled as at 118, and grooved peripherally as at 120; the bevel and the groove function similarly to those of Fig. 1.

Member 102 comprises the tube 122, having a forward bore 124, and a rear bore 126, said bores being separated from each other by shoulder 128. A cylindrical insulator 130, is set within tube 122, the base 132 of the insulator being of enlarged diameter, and its forward end 134, being seated against the shoulder 128. Two female conductive elements 136, similar to element 40, are set lengthwise within the insulator 130, and are positioned so as to receive the prongs or pins of elements 112. An insulating separator 138, having two holes in registry with elements 136, is seated against the base 132. A circular insulator 140, of resilient material, bevelled rearwardly as at 142, is seated against the separator 138. A metal ring 144, the inner face of which is angularly disposed, as at 146, is seated against the bevel 142. The rear end of tube 122, is threaded as at 148 to receive the knurled nut 150. Tube 122, is

4

constricted at its forward end and provided with a plurality of longitudinal slits 152, thus forming a plurality of spring-like elements 154. The slidable locking collar 160, made of metal or the like, is provided with an internal annular groove 161, within which is set a split ring 162.

In assembling member 102 and wires attached thereto, the operation may be carried out as follows: The nut 150, the ring 144, and the insulator 140, are slipped over the insulation of the two-wire conductor 164, and the ends 166 and 168, of each wire bared. The bared end of each such wire is then passed through one of the holes of separator 138, and inserted in the bores 170, on conductive elements 136, and soldered thereto. The insulator 130, is then inserted in tube 122, and the nut 150, screwed thereon until the assemblage is tightly fastened. The locking collar 160, is then slipped over the tube 122.

Member 100 may be assembled and positioned as follows: The bared ends 172, of two wires are each set within the bores 174, of elements 112, and soldered thereto. Then the insulator 110, with the wire affixed thereto, is slipped into the tube 104, and the flange 108, fastened to a support as by screws, rivets or the like 176, through the holes 178. The prongs 180, of element 112, are in registry with the female section of elements 136.

To make a connection between members 100 and 102, the latter (with the locking collar 106, in the retracted position shown in Fig. 2) is slipped over the tube 104, and the motion continued until the grips 182, slip into and become engaged within the peripheral groove 120. Then the locking collar 160, is moved into the position shown in Fig. 5, with the resultant contraction of the split ring 162, thereby securely engaging the grips 182 in the groove.

To separate member 102 from its joiner with member 100, the shoulder 184, of the locking collar 160, may be grasped between one's fingers and the locking collar thus brought rearwardly until it comes into engagement with the nut, thereby releasing the grips. Continued pulling on the collar, now seated against the nut, results in the complete disengagement of the grips from the groove, and member 104 is readily withdrawn from engagement with member 100.

Referring now to the embodiment illustrated in Fig. 3, it will be observed that the structure in its basic aspects is similar to that of Fig. 2, differing therefrom in that both members are used for the joiner of two free wires. This modification comprises the complementary members 200 and 102. Member 200 comprises the tube 204, having a forward bore 206, and a rear bore 208, of larger diameter than bore 206. The external rear end of the tube 204, is threaded as at 210. Set within the bore 206, is a cylindrical insulator 212, the rear end of which is flanged to be seated within the rear bore 208, and be held in position by the shoulder 214. Set lengthwise within the insulator 212 are conductive elements 216, the forward end of said elements terminating in pins 218, and the rear ends being bored as at 220 to receive the bared ends 222 and 223, of wires. Seated against the base of the insulator is an insulating separator 224, and positioned rearwardly thereto is the bevelled angular insulator 226. Seated against the bevelled side of said angular insulator is a ring of metal 230, the inner face of which is angularly disposed. A knurled nut 232, is screwed on to the tube 204.

5

In assembling member 200, the nut 232, the ring 230, and the angular insulator 226, are slipped over the insulating sheathing of the two-wire cable 234. The free ends 222 and 223 of the wire, are passed through the holes of the insulating separator 224, and positioned within the bores 220, of the conductive elements and soldered thereto. The cylindrical insulator 212, with the wires connected thereto, is then slipped into the tube 204 until it comes to rest against the shoulder 214. Then the nut 232, is screwed on to the tube 204, until the assemblage is tightly fastened. To make a connection between members 200 and 102, the former is grasped with one hand and the latter with the other, the locking collar 160, being in retracted position as shown in Fig. 3. The tube 104, is slipped over the tube 204, and the motion continued until the grips 182, are securely engaged within the peripheral channel 240, of tube 204. The collar 160, is then moved forwardly until the split ring thereof contracts and encircles the grips 182.

To separate member 102 from 200, member 200 is grasped with one hand and the shoulder of the locking collar grasped between the fingers of the other hand, bringing the latter rearwardly and thus releasing the grips. Continued pulling on the collar, now seated against the nut, results in the complete disengagement of the grips from the peripheral groove, with resulting separation of the members from each other.

It will be observed that the telescoping complementary members of the connectors hereinabove described, when joined together, provide complete and positive locking therebetween, so that they are secure against dislodgment resulting from vibration and other disturbing means. It will also be noted that when the telescoping members of the connector are snapped together, in order fully and effectively to close them, the insulators, within which are set the contact elements, undergo compression and travel back with resultant distortion, as shown for example in Fig. 4. Thus, the longitudinal dimensions of the insulators are such that their combined length when the telescopable members are disconnected is greater than their combined length when the said members are telescoped and locked together. The tolerances and clearances are of such dimensions that the two insulators can be placed under effective compression so as fully to seal the connector against water penetration and electrical leakage. A particular advantage of my connector is that engagement or disengagement can be effected with one hand, which makes this connector especially adaptable for mounting in confined spaces. It will further be observed that as a result of the secure engagement of the telescoping members with each other, the conductive contact elements are likewise

6

securely held tightly engaged, so as to insure effective electrical connection between them. It will further be noted that the internal insulation of these connectors is so complete as to provide positive sealing of the contact elements against penetration by water and electrical leakage. It is apparent that this invention can be used for purposes other than electrical connectors, as, for example, hydraulic couplings, pneumatic couplings, and the like. In these uses the gasket and sealing ring arrangements may be altered in conventional ways to adapt my connector to the use to which it will be put.

It will be understood that the embodiments hereinabove described are but illustrative of the manner of accomplishing this invention and, accordingly, that the appended claim is to be understood as defining the invention within the full spirit and scope thereof.

I claim:

An electrical connector comprising: a pair of inner and outer telescoping tubular members each housing, in registry, at least one of a pair of sealed telescoping contact elements, the outer tubular member comprising concentrically and longitudinally disposed springs, the free ends of said springs being inturned; a peripheral groove on the surface of the inner tubular member forming a recess for engaging the inturned ends of said springs, the diameter of the outer telescoping member at the point of inturnment of the springs being approximately equal to the diameter of the peripheral groove of the inner telescoping member, a slidable collar on the outer tubular member, the collar including a rigid ring set within a larger ring of extensible material, the rigid ring being set at the side opposite the free ends of the springs, whereby the extensible material holds the inturned ends of the springs in engagement with the groove when set therein.

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