

July 12, 1960

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2,945,203

CONNECTOR CONSTRUCTION

Filed Nov. 13, 1956

2 Sheets-Sheet 1

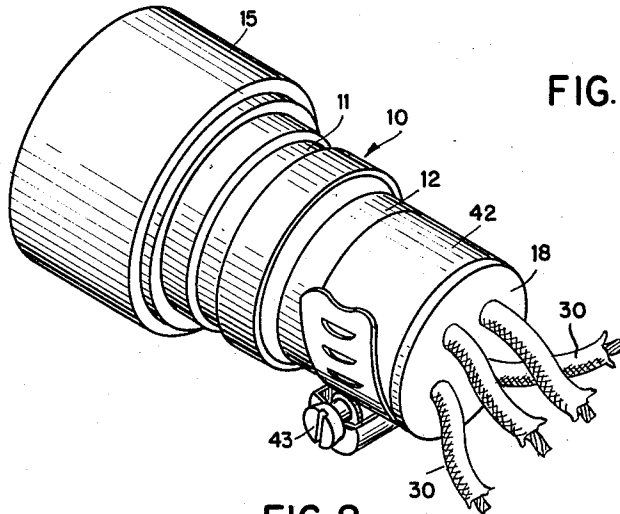


FIG. 2

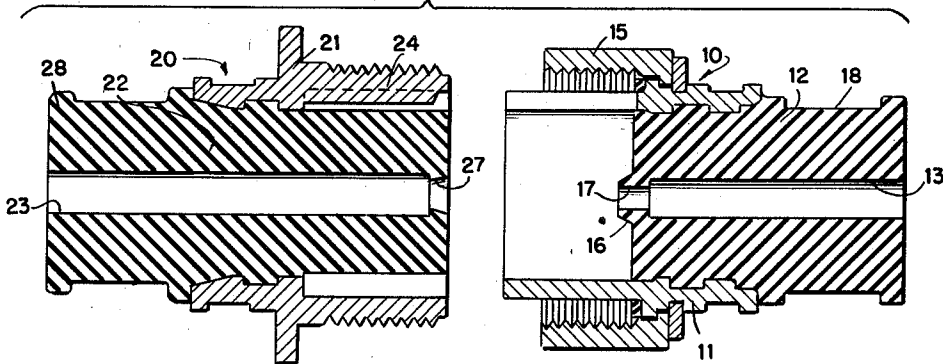
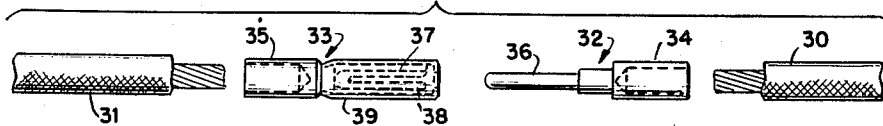


FIG. 3



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FIG. 4

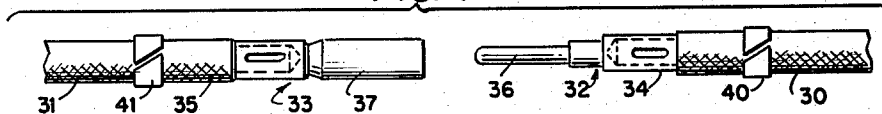


FIG. 5

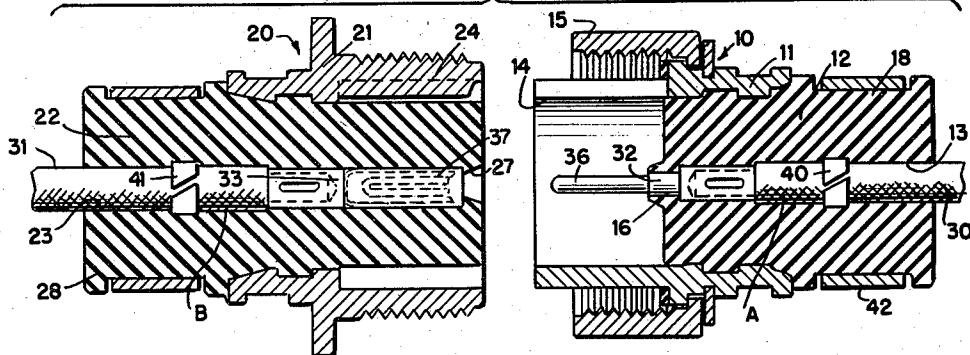


FIG. 6

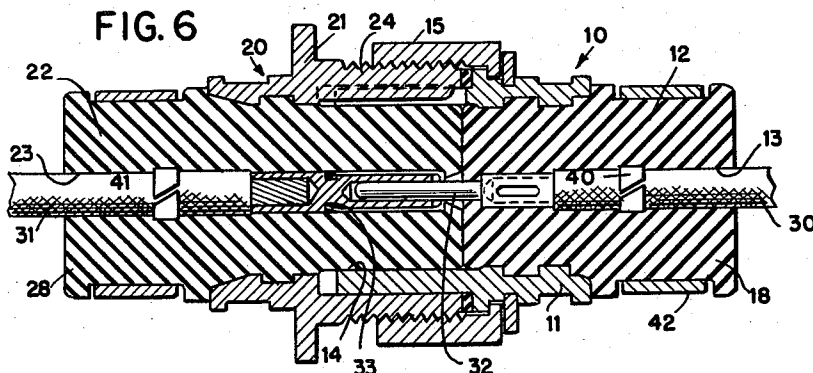
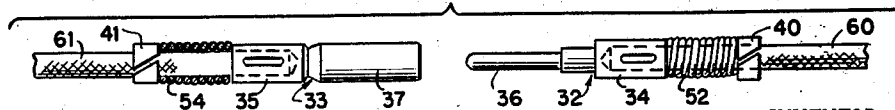


FIG. 7



FIG. 8



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2,945,203

CONNECTOR CONSTRUCTION

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Filed Nov. 13, 1956, Ser. No. 621,957

4 Claims. (Cl. 339—59)

My invention relates to electrical connectors of the axial connecting type and in particular provides a construction for mounting contact members and conductors in the resilient body of such a connector.

In my copending application, Serial Number 593,863, filed June 26, 1956, I have described a method of forming axially mating conductor bodies in which the resilient connector body is molded in the conventional rigid shell and is provided with suitable bores for receiving axially mating contact members designed to mate with correspondingly disposed contact members in a complementary connector.

It is a principal object of my present invention to provide a moisture proof seating construction for securing both contact members and conductors within such bores in a manner preventing extrusion of such contacts and conductors upon the axial mating of such a connector with a correspondingly arranged complementary connector. It will, however, be apparent that the construction of my present invention is applicable to mounting contacts and conductors in any resilient connector body provided with bores for receiving such contacts and conductors.

It is a further object of my invention to provide a contact and conductor mounting construction in which a variety of conductor sizes can be employed for any given bore diameter and in the resilient connector body.

These and other objects of my invention are essentially obtained by securing the conductor to the non-mating end of the contact member, by positioning a gripping band about the insulated covering of the conductor, by inserting the assembled contact, conductor and band within a bore through the resilient connector body, the rigid band being compressed about the insulated covering of the conductor and wedged within the bore. The conductor, where it extends between the contact member and gripping band, should be self-supporting. Accommodation to conductor sizes smaller in diameter than the bore is achieved by positioning a resilient coil about the conductor abutting the face at the confronting ends of the contact member and rigid band in the case of very small conductors, and abutting the end faces of confronting ends of the contact member and insulated covering of larger conductors which are, however, not of sufficient diameter to be self-supporting within the resilient connector body. Preferably in the completed connector construction the resilient body extends at the non-mating end of the conductor beyond the rigid shell receiving such resilient body and the rigid bands used to grip the connectors in position are arranged to lie within such extended portion of the connector body.

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An adjustable hose clamp tightened about such extended portion thereby increases the grip offered by the band between the resilient connector body and the insulated covering of the conductor.

For a more complete understanding for the principles of my invention, reference is made to the appended drawings in which:

Figure 1 is an isometric view of a connector plug including the contact and conductor mounting construction of my invention;

Figure 2 is a longitudinal sectional view of a plug and receptacle prior to insertion of contacts;

Figure 3 is a view of socket and pin contacts and appropriate stripped conductors arranged prior to connection of the contacts and conductors;

Figure 4 is a view similar to Figure 3 showing the contacts and conductors assembled for insertion in the connector bodies shown in Figure 2;

Figure 5 is a longitudinal sectional view similar to that shown in Figure 2 illustrating the connectors with contacts and conductors inserted in position;

Figure 6 is a view similar to Figure 5 showing the connectors in mating position;

Figure 7 is a view similar to Figure 4 illustrating another arrangement of contact and conductor connection; and

Figure 8 is another view similar to Figure 4 illustrating still another arrangement of contact and conductor connection.

In the drawings referring particularly to Figure 2, the reference numeral 10 represents a connector plug and the reference numeral 20 represents a complementary connector receptacle for axially mating with plug 10.

Plug 10 is provided with a rigid, substantially cylindrical shell 11 in which is molded a resilient body 12. Body 12 preferably is formed in shell 11 by the method of my aforementioned copending application. It however can be separately molded and subsequently inserted in shell 11 in the conventional manner. Receptacle 20 is similarly provided with a shell 21 in which is molded a resilient body 22.

Each of resilient bodies 12 and 22 are provided with a plurality of longitudinal bores 13 and 23, respectively, of which one only of each is shown for the sake of clarity. Bores 13 and 23, as will be seen in Figure 2, are aligned when plug 10 is positioned to mate with receptacle 20 upon relative axial movement, that is, they are correspondingly disposed in their respective connector bodies. It will be further observed that the mating end 14 of shell 11 is provided with a freely rotatable, internally threaded coupling nut 15 for securing engagement of plug 10 with receptacle 20 in the conventional manner receiving externally threaded end portion 24 of shell 21. It will be further observed that in the conventional manner end 14 of shell 11 extends beyond body 12 and end 24 is spaced from body 22 in order that on axial engagement of connectors 10 and 20 a rigid mechanical fit between shell 11 and shell 21 can be obtained.

It will be further observed that the mating face of resilient body 12, which is recessed within end 14 of shell 11, is provided with a short boss 16 projecting toward the mating face of resilient body 22 and enclosing an axial extension 17 of bore 13 which has a diameter reduced from that of the major portion of bore 13. The

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mating face of resilient body 22 is provided with a tapered opening 27 leading into bore 23 having a diameter as it enters bore 23 significantly less than the diameter of bore 23.

The ends 18 and 28 of resilient bodies 12 and 22 remote from their respective mating ends project beyond rigid shells 11 and 21, respectively.

Referring to Figure 3 there is shown a pair of insulated conductor ends 30 and 31 in which the insulation is stripped back to bare the conductor for a short length. Also shown in Figure 3 are a typical pin contact member 32 and a typical socket contact member 33 the latter being more fully shown in my copending application Serial Number 504,635, filed April 28, 1955, now abandoned. Pin contact number 32 is provided with an axially bored base portion 34 and a pin portion 36. Socket contact member 33 is similarly provided with an axially bored base portion 35 and a socket portion 37 including a plurality of tines 38 covered by a sleeve 39 such as disclosed in my copending application Serial Number 504,635.

Referring to Figure 4, it will be observed that pin contact number 32 and conductor 30 are secured together by inserting the stripped end of the conductor into the axial bore of base 34. Base 34 is thereupon crimped to close it upon the stripped end of conductor 30 leaving the insulation of conductor 30 flush with and abutting the terminal end of base portion 34. A strip of metal is then wrapped about the insulation of conductor 30 a short distance from the terminal end of base portion 34 to provide a band 40 firmly gripping the insulation of conductor 30. Also referring to Figure 4, socket contact member 33 and conductor 31 are similarly connected with the stripped end of conductor 31 crimped in position in the axial bore of base portion 35 and with the insulation of conductor 31 abutting the terminal end of base portion 35. A strip of metal 41 is similarly wrapped about the insulated covering of insulated conductor 31 a short distance from the terminal end of base portion 35.

Referring to Figure 5, it will be observed that the assembled conductors and contacts shown in Figure 4 are inserted into bores 13 and 23 in the connector bodies shown in Figure 2, thus pin contact member 32 is positioned in bore 13 with its pin portion 36 extending through bore 17 and emerging from boss 16. Band 40 wedges into bore 13 since bore 13 has essentially the same diameter as insulated conductor 30. Band 40 thus provides a firm grip between resilient body 12 and conductor 30. Also for the same reason the portion of insulated conductor 30 indicated by the reference letter A is self-supporting in bore 30, that is there is no freedom of motion between insulated conductor 30 and bore 13.

Also referring to Figure 5, socket contact member 33 is similarly positioned in bore 23 with a tip of its socket portion 37 resting against the reduced diameter of tapered bore 27. In the same manner as in the case of plug 10, because the diameter of insulated conductor 31 is substantially the same as bore 23, band 41 provides a firm grip between resilient body 22 and conductor 31, and the portion of insulated conductor 31 lying between band 41 and contact 33, indicated by the reference letter B, is self-supporting in bore 23.

It will be also noted that ideally the position of bands 40 and 41 fall respectively within the extended portions 14 and 28 of bodies 12 and 22. Additional gripping action can be achieved by providing an adjustable hose clamp secured and tightened about such extended portions. Thus in Figure 1 which shows an end view of a typical connector plug 10 a hose clamp 42 of conventional construction provided with an adjusting screw 43 is positioned over extended portion 18 and tightened to increase the pressure on gripping bands 40. A similar hose clamp 44 can be employed to tighten end portion 28 of receptacle 20 about bands 41.

Referring to Figure 6 the assembled plug 10 and re-

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ceptacle 20 shown in Figure 5 are illustrated in mated position with pin portion 36 received by socket portion 37 and with boss 16 tightly received in tapered bore 27 providing a fluid tight, moisture proof seal about mated contacts 32 and 33 between the mating faces of resilient bodies 12 and 22. During axial engagement of plug 10 and receptacle 20 extrusion of contacts 32 and 33 is prevented since bands 40 and 41 firmly are seated in position and at the same time the self-supporting portions denoted by the reference letters A and B prevent conductors 30 and 31 from buckling within bores 13 and 23.

The same sure seating action can be achieved using conductors having diameters smaller than those of the bores in which they are seated. All that is required is that the portion of the conductor extending between the terminal end of the contact and the gripping band be enlarged to render the conductors self-supporting. Thus in Figure 7, I have illustrated in a manner similar to that of Figure 4 an arrangement for securing a typical pin contact 32 and socket contact 33 to smaller diameter conductors 50 and 51. In this instance the end of conductor 50 is stripped a considerable distance such that, upon insertion and crimping the stripped conductor in place in the axial bore of base portion 34, a tightly spaced helical wire coil 52 positioned over the stripped portion of conductor 50 between the terminal end of base portion 34 and the end of the insulated portion of insulated conductor 50 enlarges the effective diameter of the conductor to produce a tight fit within bore 13 which will maintain that portion of the conductor between contact 32 and gripping band 40 in a self-supporting state. The stripped end of conductor 51 is similarly secured in socket contact 33 with a portion of the stripped end extending from the terminal end of base portion 35 to receive a similar helical wire coil 54 which will render conductor 51 self-supporting in bore 23 between the terminal end of base portion 35 and gripping band 41.

When it is desired to employ conductors of even smaller diameters, a similar arrangement allowing the insulated covering to extend beneath the helical coils will achieve exactly the same result. Thus in Figure 8 a pair of small diameter insulated conductors 60 and 61 are shown secured respectively to pin contact 32 and socket contact 33 with their insulated portions extending up to the terminal ends of base portions 34 and 35 respectively. In this arrangement coils 52 and 54 are positioned over such insulated covering and about the terminal ends of the socket contacts and the associated gripping bands 40 and 41.

I claim:

1. A connector of the axial mating type which comprises a resilient body having a bore therethrough, a first elongated contact member disposed in said bore for axially mating at one end with a second contact member correspondingly disposed in a complementary connector, said first contact member being axially slidable in said bore, a conductor extending into said bore affixed to the other end of said first contact member, an insulated covering about said conductor extending into said bore, a rigid band tightly positioned over said insulated covering in said bore spaced from said first contact member, thereby leaving a portion of said conductor extending in said bore between said band and said first contact member, said band being of a size tightly received in said bore, said conductor being of a size loosely received in said bore whereby said portion of said conductor is spaced from the walls of said bore, and means positioned in said bore surrounding said portion of said conductor abutting said other end of said first contact member and filling the space between said portion of said conductor and the walls of said bore to support said portion of said conductor in said bore between said band and said first contact member.

2. A connector according to claim 1 in which said means comprises an extension of said insulated covering

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in said bore from said band up to and abutting the other end of said first contact member.

3. A connector according to claim 1 in which said means comprises a coiled element positioned in said bore surrounding said portion of said conductor at one end abutting said other end of said first contact member and at the other end abutting the end of said insulated covering. 5

4. A connector according to claim 1 in which said means comprises an extension of said insulated covering in said bore from said band up to and abutting the other end of said first contact member, and a coiled element 10

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positioned in said bore surrounding said portion of said conductor and said extension of said insulated covering at one end abutting said band and at the other end abutting said other end of said first contact member.

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