

March 1, 1966

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3,238,494

SEALED COAXIAL CABLE CONNECTOR

Filed Dec. 4, 1962

4 Sheets-Sheet 1

Fig. 1

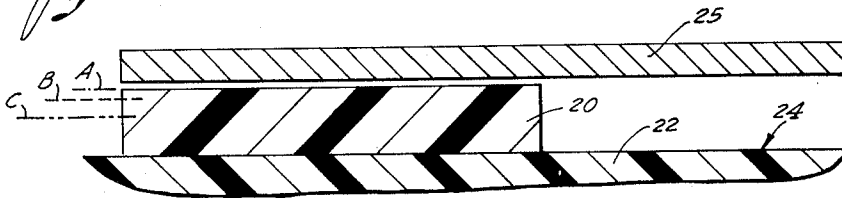


Fig. 2

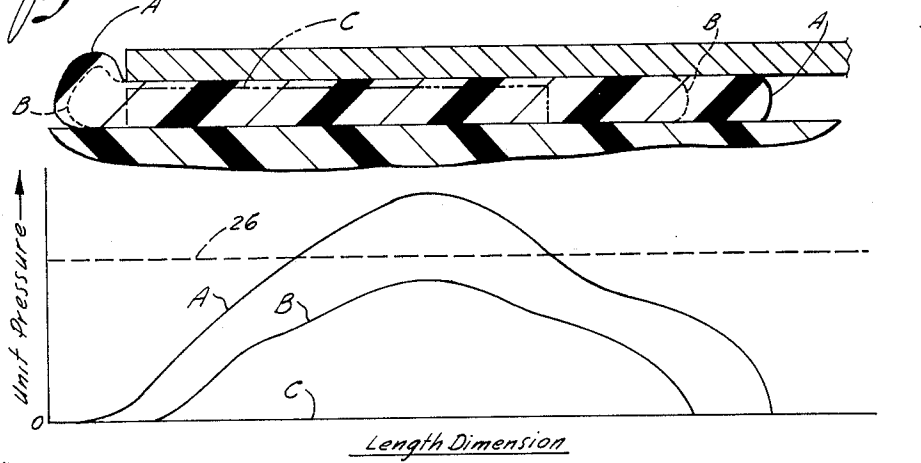


Fig. 3

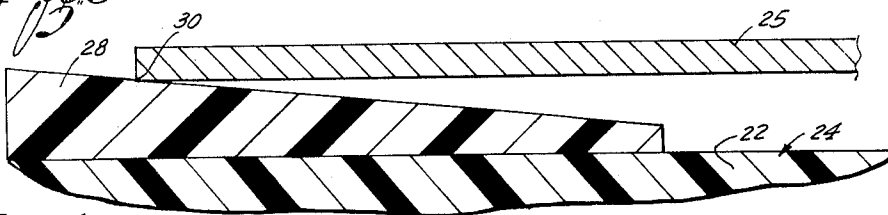
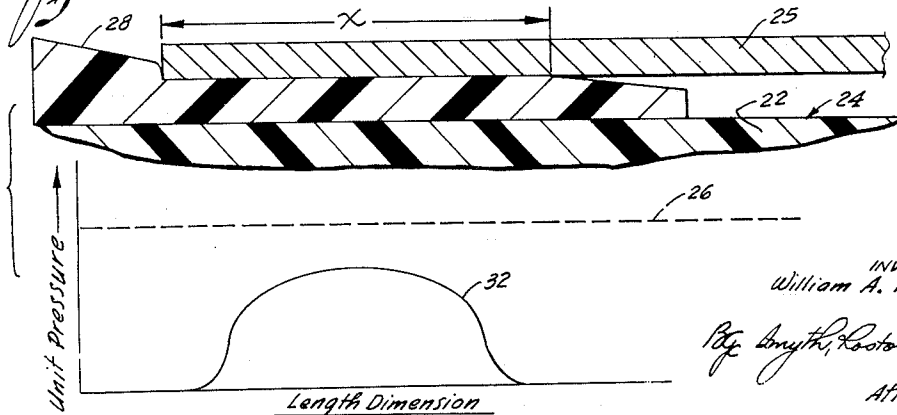


Fig. 4



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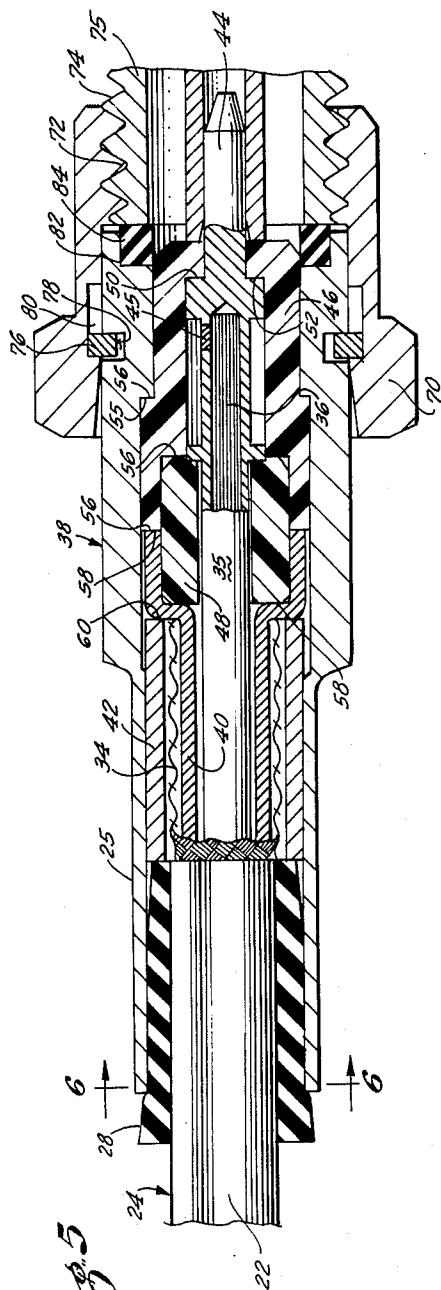


Fig. 5

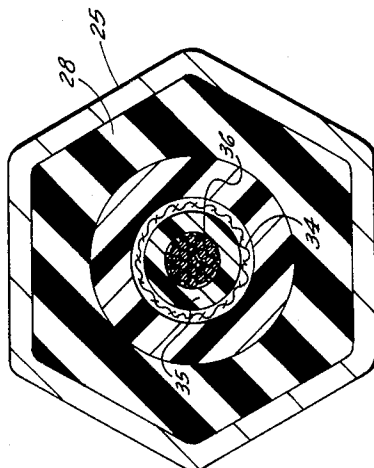


Fig. 6

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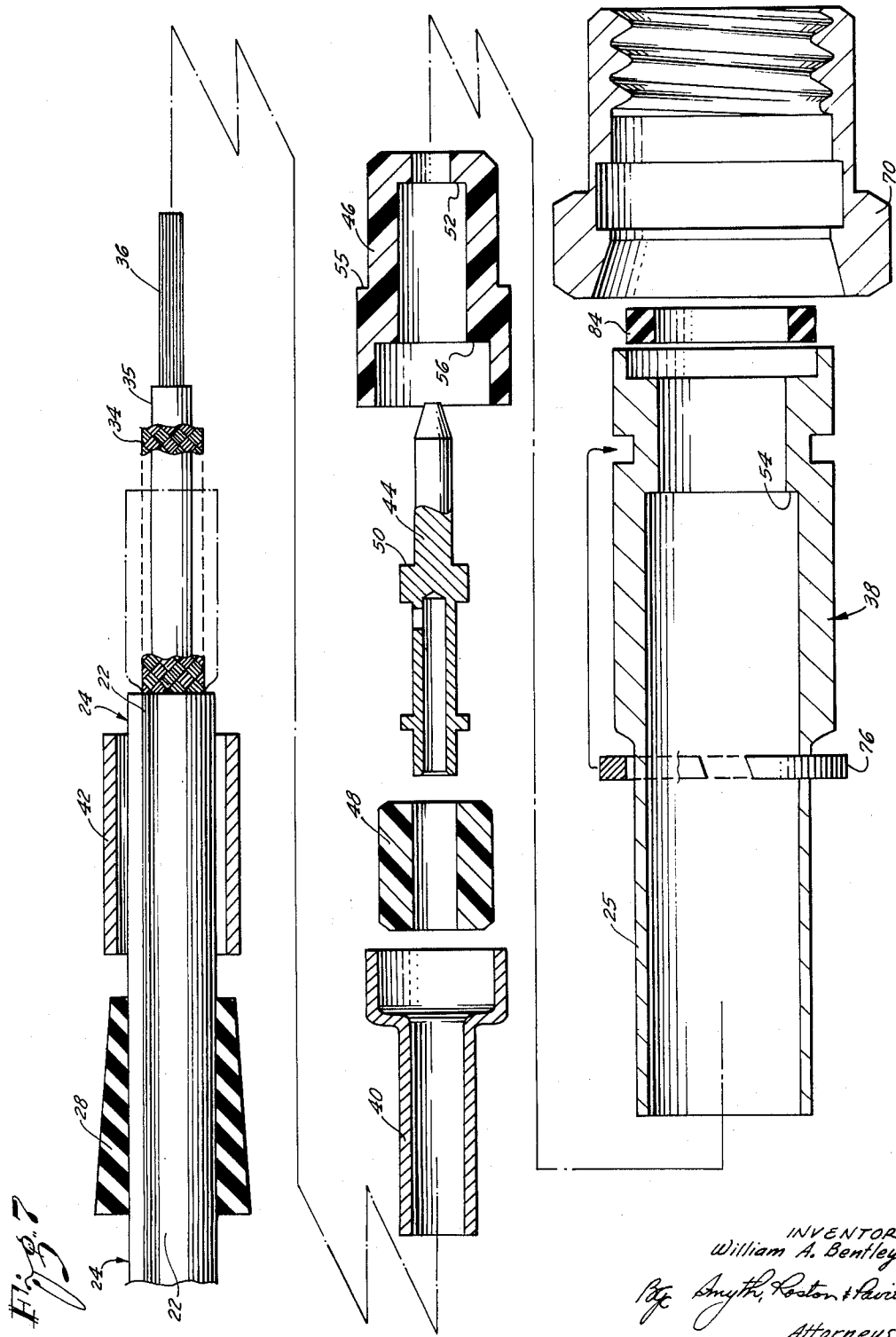
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4 Sheets-Sheet 3



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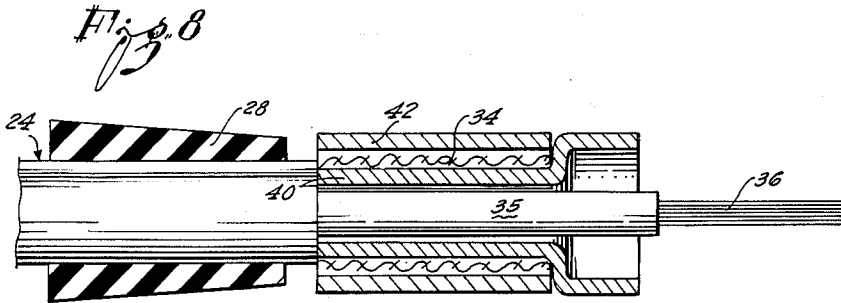
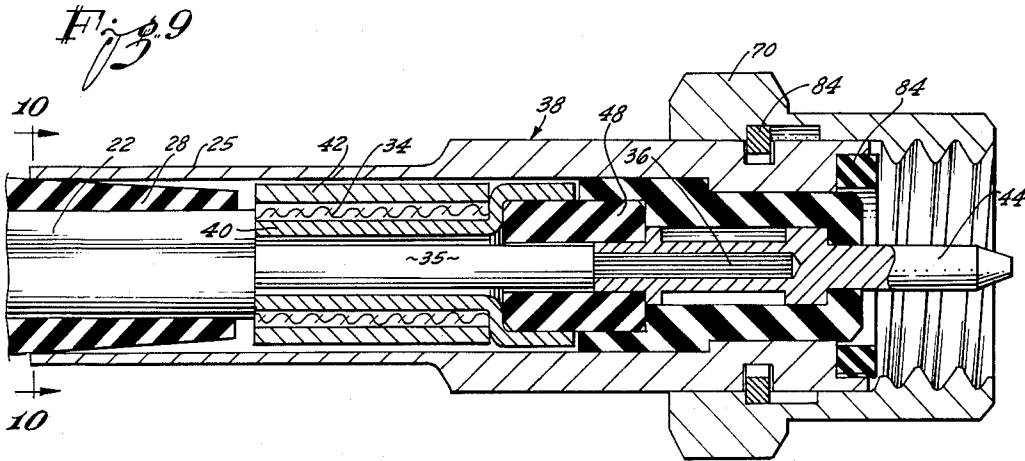
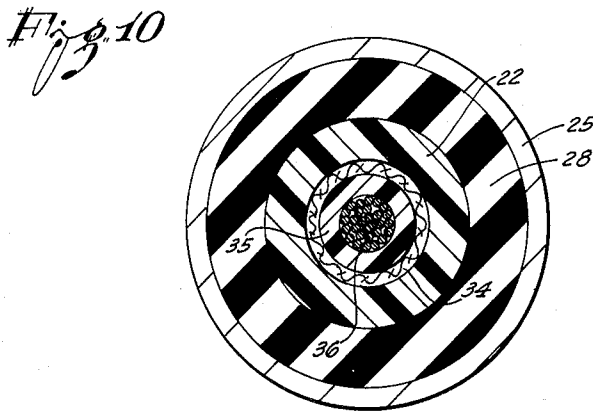
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Filed Dec. 4, 1962

4 Sheets-Sheet 4



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SEALED COAXIAL CABLE CONNECTOR

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Filed Dec. 4, 1962, Ser. No. 242,255
11 Claims. (Cl. 339-177)

This invention relates to a coaxial cable connector for releasable engagement with a complementary connector and has the four-fold object of achieving reliability, hermetic sealing, economy, and suitability for connectors of small dimensions.

Reliability requires effective mechanical interlocking of the parts, effective mechanical and electrical connection with both the inner and outer conductors of the coaxial cable, and avoidance of damaging concentration of stresses when the cable is subjected to loads, tension and torsion.

Hermetic sealing requires a continuous seal around the outer jacket of the cable as well as effective sealing at the juncture of the two mating connectors.

Economy involves not only reducing the number of parts, but also constructing the parts for low cost quantity production. Economy also requires a construction that permits a simplified fabrication procedure for reduction of assembly labor.

Miniaturization involves more than merely reducing the size of the parts of an electrical connector and especially because the problem of accumulated dimensional tolerance becomes increasingly difficult as the scale of a hermetically sealed connector is reduced.

In practice these four objects of the invention are so inter-related that all must be kept in mind. Hermetic sealing must not be achieved at the cost of mechanical efficiency and mechanical efficiency must not be accomplished at excessive cost in material and labor.

The connector of the present invention for attaining these four objects includes a housing shell or body shell that is crimped to carry out a number of functions simultaneously. By mechanically clamping an elastomeric sleeve against the peripheral surface of the outer jacket of the cable the crimped body shell effects both a seal and a mechanical connection with the cable. With the outer braided conductor of the coaxial cable telescoped between an inner sleeve and an outer metal sleeve, the crimped body shell crimps the outer metal sleeve for the purpose of further mechanically connecting the body shell to the cable as well as for electrically connecting the braided conductor to the body shell. Since the crimped body shell confines and engages insulation means which, in turn, confines and engages the usual pin contact or socket contact, the crimped body shell mechanically interlocks both the insulation means and the contact with the coaxial cable.

The feature and advantages of the invention may be understood from the following detailed description, together with the accompanying drawings.

In the drawings, which are to be regarded as merely illustrative:

FIG. 1 is a diagrammatic fragmentary sectional view on a greatly enlarged scale, of a conventional cylindrical elastomeric sealing sleeve telescoped between the outer jacket of a coaxial cable and a surrounding connector body shell, the parts being shown ready for a crimping operation to effect a seal around the cable;

FIG. 2 is a similar view after the crimping operation with an accompanying graph showing the unit pressure of the compressed elastomeric sleeve along the length of the sleeve resulting from different magnitudes of accumulated tolerance;

FIG. 3 is a fragmentary sectional view similar to FIG.

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1 showing a tapered elastomeric sleeve of the present invention substituted for the conventional cylindrical elastomeric sleeve;

FIG. 4 is a view similar to FIG. 2 showing the effect of the crimping operation on the tapered sleeve with respect to the distribution of pressure longitudinally of the sleeve;

FIG. 5 is a longitudinal section on a greatly enlarged scale of a connector embodying the invention;

FIG. 6 is a transverse section along the line 6-6 of FIG. 5;

FIG. 7 is an exploded longitudinal sectional view showing the parts of the connector positioned relative to the end of a coaxial cable in preparation for assembly of the connector to the cable;

FIG. 8 is a sectional view showing parts positioned on the end of the coaxial cable at an intermediate stage in the assembly procedure;

FIG. 9 is a longitudinal sectional view showing all of the parts of the connector in their assembled positions prior to the final crimping step; and

FIG. 10 is a transverse section along the line 10-10 of FIG. 9.

The fact that unavoidable tolerance in the dimensioning of parts for a small scale connector creates a serious problem in a production run may be understood by reference to FIGS. 1 and 2.

In the fragmentary radial sectional view shown in FIG. 1, a conventional cylindrical elastomeric sealing sleeve 20 embraces the outer jacket 22 of a coaxial cable, generally designated 24, and a thin metal wall 25 of a connector body shell surrounds the elastomeric sleeve. The parts shown in FIG. 1 are ready for a crimping operation which contracts the thin metal wall 25 to compress the elastomeric sleeve 20 radially in the manner shown in FIG. 2.

It is apparent that six different dimensions may vary in a production run, namely, the outside diameter of the jacket 22 of the coaxial cable, the inside diameter of the elastomeric sleeve 20, the outside diameter of the elastomeric sleeve, the inside diameter of the thin metal wall 25, the outside diameter of the thin metal wall 25 and the degree to which the crimping tool contracts the thin metal wall 25.

There is only a small probability that the variations among the six dimensions will cancel out to result in an effective seal around the jacket of the cable when the thin metal wall 25 of the connector body is crimped to a predetermined size. The greater probability is some of the tolerances will accumulate to cause corresponding variation in the annular clearance around the cable that must be closed by the crimping action. In one instance, for example, the spacing of the outside diameter of the elastomeric sleeve 20 from the inner circumference of the thin metal wall 25 may be the clearance designated A in FIG. 1, or in another instance the clearance designated B, or in still another instance the clearance designated C. Obviously the degree of compression of the elastomeric sleeve by the crimping action will vary for these three different clearances.

FIG. 2 illustrates the effect of applying a crimping tool to reduce the outside dimension of the thin metal wall 25 to a given cross section. The configuration of the elastomeric sleeve 22 resulting from the clearance A is shown in solid lines; the configuration resulting from clearance B is indicated by the dotted lines designated B and there is no change in configuration resulting from the excessive clearance C as indicated by the dotted outline designated C.

In the graph which is a part of FIG. 2, the unit pressure of the compressed elastomeric sleeve 20 against the

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peripheral surface of the coaxial cable 24 is designated by curves A, B and C corresponding to the three clearances. It will be noted that the curve A rises to a relatively high peak in the longitudinal cylindrical region of the radially compressed elastomeric sleeve; curve B rises to a lesser and broader peak; and curve C is actually no curve at all since no unit pressure whatsoever is developed. The magnitude of unit pressure indicated by the broken line 26 is the unit pressure that the outer jacket 22 will withstand without significant deformation. Indentation of the outer jacket 22 is undesirable and may have serious effects. It will be noted that curve B in FIG. 2 is an optimum curve for effective sealing action without deformation of the coaxial cable whereas curve A represents effective sealing action at the cost of serious deformation of the coaxial cable.

As heretofore indicated, the preferred practice of the present invention is characterized by the use of a tapered elastomeric sleeve 28 which is shown in FIG. 3. In FIG. 3 the tapered sleeve is advanced into the interior of the thin metal wall 25 until the tapered outer surface of the sleeve makes light wedging contact with the inner circumferential edge 30 at the end or rim of the thin metal wall and the crimping operation is carried out with the tapered sleeve in this lightly wedged position.

In FIG. 3 it is assumed for the sake of simplification of explanation that the radial clearance between the jacket 22 of the cable and the inner circumference of the thin metal wall 25 is the same as in FIG. 1, the only tolerance being in the dimensioning of the tapered sleeve 28. It is apparent that the dimensions of the tapered sleeve are not critical since variations in the dimensions merely change the proportion of the length of the sleeve that is telescoped into the thin metal wall 25 at the initial lightly wedged position of the sleeve. On the other hand, it may be assumed that all of the tapered sleeves that are employed are of exactly the same dimensions with accumulated tolerance affecting only the radial clearance between the cable jacket 22 and the thin metal wall 25. In that event the degree to which the tapered elastomeric sleeve is telescoped into the annular space at the initial light wedging position of the tapered sleeve varies with the magnitude of the radial clearance between the jacket and the thin metal wall. Thus all the variations in accumulated tolerance merely change the initial longitudinal position of the tapered sleeve and, in effect, the tapering of the sleeve eliminates any accumulation of tolerance that is attributable to the sleeve itself.

Since elastomeric material may be regarded as practically incompressible, the elastomeric material of the sleeve must be displaced longitudinally to accommodate the crimping action and in general the sealing pressure that is developed varies with the elongation of the sleeve. Thus in FIG. 2 the relatively small clearance A around the conventional sleeve necessitates excessive elongation of the sleeve to accommodate the crimping action with the consequent creation of excessive radial pressure against the jacket of the coaxial cable.

Referring to FIGS. 3 and 4 it is to be noted in FIG. 4 that the longitudinal dimension X of the tapered sleeve is under compression. This dimension X will vary with variations in the initial radial clearance in FIG. 3 between the cable jacket 22 and the thin metal wall 25, but the variation in the dimension X will not be excessive because it is not affected by variations in dimension of the tapered sleeve itself. The variations will be far less than indicated by the curves A, B and C of FIG. 2 and in all instances an effective seal is obtained because in all instances the tapered sleeve may be initially advanced to the desired light wedging position. The general character of the distribution of unit pressure obtained with a tapered elastomeric sleeve is indicated by the curve 32 in FIG. 4.

It is to be noted that with other factors unchanged the dimension X varies inversely with the angle of taper of the sleeve 28. An excessive dimension X with consequent

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excessive compression pressure may be avoided, if necessary, by increasing the angle of taper of the sleeve.

FIG. 5 shows the selected embodiment of the invention in the form of a connector mounted on the end of a coaxial cable 24. In preparation for the assembly of the connector to the coaxial cable, the coaxial cable is stripped to a stepped configuration that is best shown in FIG. 7. Thus the outer jacket 22 of the coaxial cable 24 is removed to expose an end portion 34 of the outer braided conductor of the cable, an end portion 35 of the inner dielectric of the coaxial cable is exposed beyond the braided conductor, and finally, an end portion 36 of the inner multiple strand conductor is exposed beyond the end portion of the dielectric.

The principal parts of the completely assembled connector shown in FIG. 5 include: a connector body shell 38 having the previously mentioned thin metal wall 25 at its rearward end; a previously mentioned tapered elastomeric sleeve 28; an inner rigid sleeve 40, preferably made of metal, which is telescoped into the end portion 34 of the braided conductor between the braided conductor and the inner dielectric of the cable; an outer sleeve 42 which is telescoped over the end portion 34 of the braided conductor; a contact element 44, in this instance a pin contact, telescoped over the end portion 36 of the inner conductor and secured thereto by solder 45; and insulating means comprising a molded insulating sleeve 46 and an associated insulating bushing 48 both of which may be made of a suitable plastic material.

The thin metal wall 25 of the body shell 38 is crimped radially inward against both the tapered elastomeric sleeve 28 and the outer sleeve 42 that embraces the end portion 34 of the braided conductor. This outer sleeve 42 is crimped, in turn, by the crimping of the body shell to clamp the end portion 34 of the braided conductor radially inward against the inner sleeve 40. It is contemplated that a single operation carried out by a suitable crimping tool will crimp the thin metal wall 25 in one operation to place the tapered elastomeric sleeve 28 under radial sealing compression and simultaneously both to crimp the body shell into engagement with the outer sleeve 42 and to crimp the outer sleeve against the braided conductor. While any suitable crimped configuration may be employed, preferably the crimping tool contracts the cylindrical thin metal wall 25 to the hexagonal configuration shown in FIG. 6.

It is apparent that the body shell 38 effectively engages the coaxial cable 24 in two ways. In the first place the crimped portion of the body shell effectively grips the outer jacket 22 of the coaxial cable by means of the tapered elastomeric sleeve 28. In the second place, the crimped body shell effectively engages the end portion 34 of the braided outer conductor by means of the crimped outer sleeve 42. At the same time the crimped engagement of the body shell with the crimped outer sleeve 42 and the crimped engagement of the outer sleeve 42 with the outer braided conductor effectively electrically connects the body shell with the outer conductor as required for a coaxial connection.

In effectively engaging the coaxial cable 24 in this manner, the connector body shell 38 effectively interlocks the confined parts of the connector with the coaxial cable by virtue of pairs of abutting shoulders as may be seen in FIG. 5. The pairs of abutting shoulders include: a rearwardly facing inner circumferential shoulder 50 of the insulating sleeve 46 in abutment with a forwardly facing annular shoulder 52 of the pin contact 44; a rearwardly facing inner circumferential shoulder 54 of the body shell 38 in abutment with a forwardly facing outer circumferential shoulder 55 of the insulating sleeve 46; an inner circumferential shoulder 56 of the insulating sleeve 46 in abutment against the forward end of the insulating bushing 48; the rear end of the insulating bushing 48 in abutment with an inner circumferential shoulder 58 of the inner sleeve 40; and a rearwardly facing outer

circumferential shoulder 60 of the inner sleeve 40 against the forward end of the outer sleeve 42. It is apparent that the crimped body shell 38 tightens the whole assembly of confined parts in a unitary manner.

The connector body shell 38 may be adapted in any suitable manner for mating with a complementary connector to complete an electrical joint. In this particular embodiment of the invention, the body shell 38 is provided with a captive nut 70 having an internal screw thread 72 for releasable engagement with an external screw thread 74 of a complementary body shell 75. The nut 70 may be held captive by means of a snap ring 76 which seats in an outer circumferential groove 78 in the body shell 38 and also seats in a wider inner circumferential groove 80 of the captive nut.

Where a completely sealed electrical joint is desired, suitable sealing means is employed at the juncture of the two connector body shells. In the construction shown, the leading end of the body shell 38 is formed with an inner annular recess 82 to seat a suitable elastomeric sealing ring 84 which is compressed by screw thread action between the leading ends of the two body shells. Thus the sealing ring 84, which may be a conventional O-ring, in combination with the tapered elastomeric sleeves 28 of a pair of mating connectors, provides a fully sealed electrical joint.

The described construction makes possible a convenient and rapid assembly procedure that may be understood by reference to FIGS. 7-10.

With the coaxial cable stripped to the described stepped configuration, first the tapered elastomeric sleeve 28 and then the outer metal sleeve 42 are backed onto the outer jacket 22 of the coaxial cable as shown in FIG. 7. Then the end portion 34 of the outer braided conductor is slightly flared by simple manipulation to permit the inner sleeve 40 to be telescoped into the braided conductor, the inserted position being best shown in FIG. 8. As indicated in FIG. 8, the outer sleeve 42 is then advanced to telescope over the braided conductor and the tapered elastomeric sleeve may be advanced at this time or later, as desired.

For the next step the insulating bushing 48 is backed into the enlarged forward end of the inner sleeve 40, the pin contact 44 is telescoped over the inner conductor 36 of the coaxial cable in abutment with the insulating sleeve 46 and then the pin contact is soldered to the inner conductor. The insulating sleeve 46 is then backed onto the pin contact 44 and the body shell 38 is backed onto the insulating sleeve to its final position. The parts are then in the positions shown in FIG. 9 and the assembly is ready for the final crimping operation.

It is apparent that the described fabrication procedure may be carried out easily and quickly without requiring any particular skill and without requiring any special tool other than a crimping tool. It is not necessary to completely unravel the exposed braided conductor nor is it necessary to fold the braided conductor back on itself. It is a simple matter to flare the end of the braided conductor sufficiently for ready admission of the inner sleeve 40.

Once the braided outer conductor of a coaxial cable is expanded by insertion of the inner sleeve 40 it would be difficult and time consuming to attempt to slip a snug fitting outer ring 42 over the leading end of the braided conductor. It can be seen that the invention avoids this difficulty by two provisions. The first provision is to make the outer ring oversized so that it will initially fit loosely around the braided conductor. The second provision is to initially back the oversized outer ring onto the cable jacket.

It is contemplated that the tapered elastomeric sleeve 28 will be so dimensioned that at any magnitude of accumulated tolerance a portion of the elastomeric sleeve will protrude from the crimped end of the body shell to serve as a guard for the coaxial cable. Thus the tapered

elastomeric sleeve provides bend relief in that it causes the coaxial cable to bend at a radius with consequent effective distribution of the bending stress. The compressed elastomeric sleeve also provides torsion relief since torsion strain is distributed longitudinally of the sleeve. In addition, the confined elastomeric sleeve distributes stresses arising from tension loading of the cable, the stresses being distributed along the length of the compressed portion of the sleeve.

My description in specific detail of the selected embodiment of the invention will suggest various changes, substitutions and other departures from my disclosure without departing from the spirit and scope of the appended claims.

I claim:

1. In a connector assembly on the end of a coaxial cable for mating with a complementary connector device having a complementary contact element where the coaxial cable includes an inner conductor, an outer conductor in insulated relationship to the outer conductor and an outer insulating jacket, the combination of:

an axial contact element on the end of the inner conductor of the coaxial cable to mate with the complementary contact element of the complementary connector device;

insulating means surrounding the said axial contact element;

a housing shell confining said insulating means and said axial contact element, said housing shell being in electrical communication with the outer conductor of the coaxial cable and having a particular portion surrounding the outer insulating jacket of the coaxial cable; and

an elastomeric sleeve embracing the outer insulating jacket of the coaxial cable inside said particular portion of the housing shell,

said particular portion of the housing shell being crimped for radial compression of the elastomeric sleeve into sealing contact with both the housing shell and the outer insulating jacket of the coaxial cable, said elastomeric sleeve being tapered in its unrestrained configuration and being compressed, as a result of the crimping of the particular portion of the housing shell, into sealing contact with said portion of the housing shell and with the outer insulating jacket of the coaxial cable, with the larger end of the sleeve protruding from said end portion of the housing shell.

2. In a connector assembly on the end of a coaxial cable for mating with a complementary connector device having a complementary contact element where the coaxial cable includes an inner conductor, an inner dielectric on the inner conductor, an outer conductor on the inner dielectric and an insulating jacket on the outer conductor and where the outer conductor extends beyond the insulating jacket, the combination of:

an axial contact element on the end of the inner conductor of the coaxial cable to mate with the complementary contact element of the complementary connector device;

insulating means surrounding the axial contact element; an inner conductive sleeve telescoped into the end of the outer conductor of the coaxial cable between the outer conductor and the inner dielectric of the cable where the outer conductor of the cable extends beyond the insulating jacket;

an outer conductive sleeve telescoped over the end of the outer conductor of the coaxial cable beyond the insulating jacket;

an elastomeric sleeve embracing the outer insulating jacket of the coaxial cable at a position contiguous to the outer conductive sleeve; and

a conductive housing shell having a particular portion embracing both said outer sleeve and said elastomeric sleeve, both said particular portion of the housing

shell and said outer conductive sleeve being crimped in the axial region of the inner sleeve clamping the outer conductor of the coaxial cable between the outer conductive and inner conductive sleeves and to connect the housing shell with the outer conductive sleeve, said particular portion of the housing shell being additionally crimped to obtain a radial compression of the elastomeric sleeve into sealing contact with both the housing shell and the outer insulating jacket of the coaxial cable, said elastomeric sleeve being tapered in its unrestrained configuration and being compressed, as a result of the crimping of the particular portion of the housing shell, into said portion of the housing shell with the larger end of the sleeve protruding from the housing shell.

3. In a connector assembly on the end of a coaxial cable for mating with a complementary connector device having a complementary contact element where the coaxial cable includes an inner conductor, an inner dielectric on the inner conductor, an outer conductor on the inner dielectric and an insulating jacket on the outer conductor and where the outer conductor extends beyond the insulating jacket, the combination of:

an axial contact element on the end of the inner conductor of the coaxial cable to mate with the complementary contact element of the complementary device, said axial contact element having a forwardly facing shoulder;

insulating means surrounding the axial contact element and formed with an inner rearwardly facing shoulder and an outer forwardly facing shoulder, said inner shoulder engaging the shoulder of the axial contact element;

a housing shell confining said insulating means and having a rearwardly facing shoulder engaging said outer shoulder of the insulating means, said housing shell being in electrical communication with the outer conductor of the coaxial cable beyond the outer insulating jacket and having a particular portion surrounding the outer insulating jacket of the coaxial cable; and

an elastomeric sleeve embracing the outer insulating jacket of the coaxial cable inside said particular portion of the housing shell at a position adjacent to the outer conductor of the cable where the outer conductor extends beyond the insulating jacket, the elastomeric sleeve having a tapered configuration in an unconstrained relationship,

said particular portion of the housing shell being crimped and said elastomeric sleeve being compressed, as a result of the crimping, to provide a sealing contact of the elastomeric sleeve with both the particular portion of the housing shell and the outer insulating jacket of the coaxial cable, whereby the particular portion of the housing shell, upon being crimped grips the outer insulating jacket of the coaxial cable and interlocks said contact element and said insulating means with the outer jacket of the cable.

4. In a connector assembly on the end of a coaxial cable having an outer insulating jacket and an outer conductor surrounding the outer insulating jacket, the connector assembly being adapted to be mated with a complementary connector device, the combination of:

a conductive housing shell in electrical communication with the outer conductor of the coaxial cable and having a particular portion surrounding the outer insulating jacket of the coaxial cable; and

an elastomeric insulating sleeve embracing the outer insulating jacket of the coaxial cable inside the particular portion of the housing shell, the particular portion of the housing shell being crimped for compression of the elastomeric sleeve into sealing contact with both the housing shell and the outer insulating jacket of the coaxial cable, the elastomeric

sleeve being tapered in its unrestrained configuration and being compressed, as a result of such crimping, into the particular portion of the housing shell with the larger end of the tapered sleeve protruding from the end portion of the housing shell.

5. In a connector assembly as set forth in claim 4 where the outer conductor of the cable extends beyond the outer insulating jacket of the cable, and

a conductive sleeve disposed on the outer conductor of the cable in contacting relationship with the outer conductor of the cable at a position beyond the outer insulating jacket of the cable and disposed in contiguous relationship with the elastomeric sleeve and in contacting relationship with the particular portion of the housing shell, the conductive sleeve being crimped by the particular portion of the housing shell into electrical contact with the particular portion of the housing shell and the outer conductor of the cable.

6. In a connector assembly on the end of a coaxial cable for mating with a complementary connector device having a complementary contact element where the coaxial cable includes an inner conductor, an inner dielectric on the inner conductor, an outer conductor on the inner dielectric and an insulating jacket on the outer conductor and where the outer conductor extends beyond the insulating jacket, the combination of:

an axial contact element on the end of the inner conductor of the coaxial cable to mate with the complementary contact element of the complementary device, said axial contact element having a forwardly facing shoulder;

insulating means surrounding the axial contact element and formed with an inner rearwardly facing shoulder and an outer forwardly facing rearwardly facing shoulder, said inner shoulder engaging the forwardly facing shoulder of the axial contact element;

an inner conductive sleeve telescoped into the end of the outer conductor of the coaxial cable between the outer conductor and the inner dielectric of the cable beyond the outer insulating jacket of the cable;

an outer conductive sleeve telescoped over the end of the outer conductor of the coaxial cable beyond the outer insulating jacket of the cable;

an elastomeric sleeve disposed on the outer insulating jacket of the cable in contiguous relationship to the outer conductive sleeve, the elastomeric sleeve having a tapered configuration in its external periphery; and

a housing shell confining said insulating means and having a rearwardly facing shoulder engaging said outer shoulder of the insulating means for retention thereof, said housing shell having a particular portion embracing both said outer sleeve and said elastomeric sleeve, said particular portion of the housing shell and said outer sleeve being crimped in the region of the inner conductive and outer conductive sleeves and the elastomeric sleeve and, as a result of such crimping, clamping the outer conductor of the coaxial cable between the outer and inner sleeves and connecting the housing shell to the outer sleeve, said elastomeric sleeve embracing the outer insulating jacket of the coaxial cable inside said particular portion of the housing shell,

said particular portion of the housing shell being crimped and radially compressing the elastomeric sleeve into sealing contact with both the housing shell and the outer insulating jacket of the coaxial cable, whereby the crimped portion of the housing shell in gripping the outer insulating jacket of the coaxial cable forms a seal around the outer insulating jacket of the coaxial cable and also interlocks said contact element and said insulating means with the outer jacket of the cable.

7. In a connector assembly on the end of a coaxial cable for mating with a complementary connector device having a complementary contact element where the coaxial cable includes an inner conductor, an inner dielectric on the inner conductor, an outer conductor on the inner dielectric and an insulating jacket on the outer conductor and where the outer conductor extends beyond the insulating jacket, the combination of:

an axial contact element on the end of the inner conductor of the coaxial cable to mate with the complementary contact element of the complementary device, said axial contact element having a forwardly facing shoulder;

insulating means surrounding said axial contact element and formed with an inner rearwardly facing shoulder and an outer forwardly facing shoulder, said inner shoulder engaging the forwardly facing shoulder of the axial contact element;

an inner sleeve telescoped into the end of the outer conductor of the coaxial cable between the outer conductor and the inner dielectric of the cable at a position beyond the outer insulating jacket of the cable;

an outer conductive sleeve telescoped over the end of the outer conductor of the coaxial cable and over the inner sleeve at a position beyond the outer insulating jacket of the cable;

an insulating sleeve disposed on the outer insulating jacket at a position contiguous to the outer conductive sleeve and having a tapered configuration; and

a housing shell confining said insulating means and having a rearwardly facing inner shoulder engaging said outer forwardly facing shoulder of the insulating means, said housing shell having a particular portion embracing said outer conductive sleeve and said insulating sleeve, said particular portion of the housing shell and said outer sleeve being both crimped in the axial region of the inner sleeve to clamp the outer conductor of the coaxial cable between the outer and inner sleeves and to compress the insulating sleeve against the particular portion of the housing shell and against the outer insulating jacket of the cable and connect the housing shell to the outer sleeve to interlock said axial contact and said insulating means with the cable.

8. In a connector assembly on the end of a coaxial cable having an outer conductor and having an outer insulating jacket radially external to the outer conductor and having an inner dielectric within the outer conductive sleeve, the connector assembly being adapted to be mated with a complementary connector device, the combination of:

an inner sleeve telescoped into the end of the outer conductor of the coaxial cable between the outer conductor and the inner dielectric of the cable;

an outer conductive sleeve telescoped over the end of the outer conductor of the coaxial cable and over the inner sleeve;

an elastomeric insulating sleeve embracing the outer insulating jacket of the coaxial cable and having a tapered configuration in its unrestrained configuration; and

a conductive housing shell having a particular portion embracing both the outer sleeve and the elastomeric sleeve, both the particular portion of the housing shell and the outer conductive and inner sleeves being crimped at a position adjacent the inner sleeve to clamp the outer conductor of the coaxial cable between the outer and inner sleeves and to electrically connect the housing shell with the outer sleeve and the outer conductor of the cable, the particular portion of the housing shell being additionally crimped for radial compression of the elastomeric sleeve into sealing contact with both the housing shell and the outer insulating jacket of the

coaxial cable, the elastomeric sleeve being telescoped, as a result of such crimping, into the particular portion of the housing shell with the larger end of the sleeve protruding from the housing shell.

9. In a connector assembly as set forth in claim 8 where the outer conductor of the cable extends beyond the outer insulating jacket of the cable, the inner sleeve being telescoped into the end of the outer conductor of the coaxial cable at a position beyond the outer insulating jacket of the cable and being electrically conductive and the elastomeric sleeve being disposed in contiguous relationship to the outer conductive sleeve.

10. In a connector assembly on the end of a coaxial cable for mating with a complementary connector device having a complementary contact element where the coaxial cable includes an inner conductor, an inner dielectric on the inner conductor, an outer conductor on the inner dielectric and an insulating jacket on the outer conductor and where the outer conductor extends beyond the insulating jacket, the combination of:

an axial contact element on the end of the inner conductor of the coaxial cable to mate with the complementary contact element of the complementary device, said axial contact element having a forwardly facing shoulder;

insulating means surrounding the axial contact element and formed with an inner rearwardly facing shoulder and an outer forwardly facing shoulder, said inner rearwardly facing shoulder engaging the forwardly facing shoulder of the axial contact element;

an inner conductive sleeve having its rear end telescoped into the end of the outer conductor of the coaxial cable between the outer conductor and the inner dielectric of the cable at a position beyond the outer insulating jacket of the cable, the forward end of said sleeve being enlarged in inside diameter; an outer conductive sleeve telescoped over the end of the outer conductor of the coaxial cable and over the inner conductive sleeve at a position beyond the outer insulating jacket of the cable;

an insulating bushing telescoped into said enlarged end of the inner sleeve in abutment with said insulating means for retention thereby;

an insulating sleeve having a tapered configuration and having compressible properties and disposed on the outer insulating jacket of the cable in contiguous relationship to the outer conductive sleeve; and

a housing shell confining said insulating means and having a particular rearwardly facing inner shoulder engaging said outer forwardly facing shoulder of the insulating means, said housing shell having a particular portion embracing said outer conductive sleeve and said insulating sleeve, said particular portion of the housing shell and said outer conductive sleeve being both crimped in the axial region of the inner conductive sleeve to clamp the outer conductor of the coaxial cable between the outer and inner conductive sleeves and to connect the housing shell to the outer conductive sleeve to interlock said axial contact and said insulating means with the cable and said particular portion of the housing shell being crimped to compress the insulative sleeve into contact with the particular portion of the housing shell and the outer insulating jacket of the cable.

11. In a connector assembly on the end of a coaxial cable for mating with a complementary connector device, the combination of:

an axial contact element on the end of the inner conductor of the coaxial cable to mate with a complementary contact element of the complementary device;

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insulating means surrounding the axial contact element;

an inner sleeve having its rear end telescoped into the end of the outer conductor of the coaxial cable between the outer conductor and the inner dielectric of the cable, the forward end of said sleeve being enlarged and forming a rearwardly facing outer circumferential shoulder, said insulating means abutting said inner sleeve;

an outer conductive sleeve telescoped over the end of the outer conductor of the coaxial cable in abutment with said rearwardly facing outer circumferential shoulder of the inner sleeve; and

a housing shell confining and abutting said insulating means for retention thereof, said housing shell having a portion embracing said outer sleeve, said portion being crimped against the outer sleeve and the outer sleeve being crimped against the outer con-

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ductor of the coaxial cable thereby clamping the outer conductor against the inner sleeve.

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