

Feb. 18, 1958

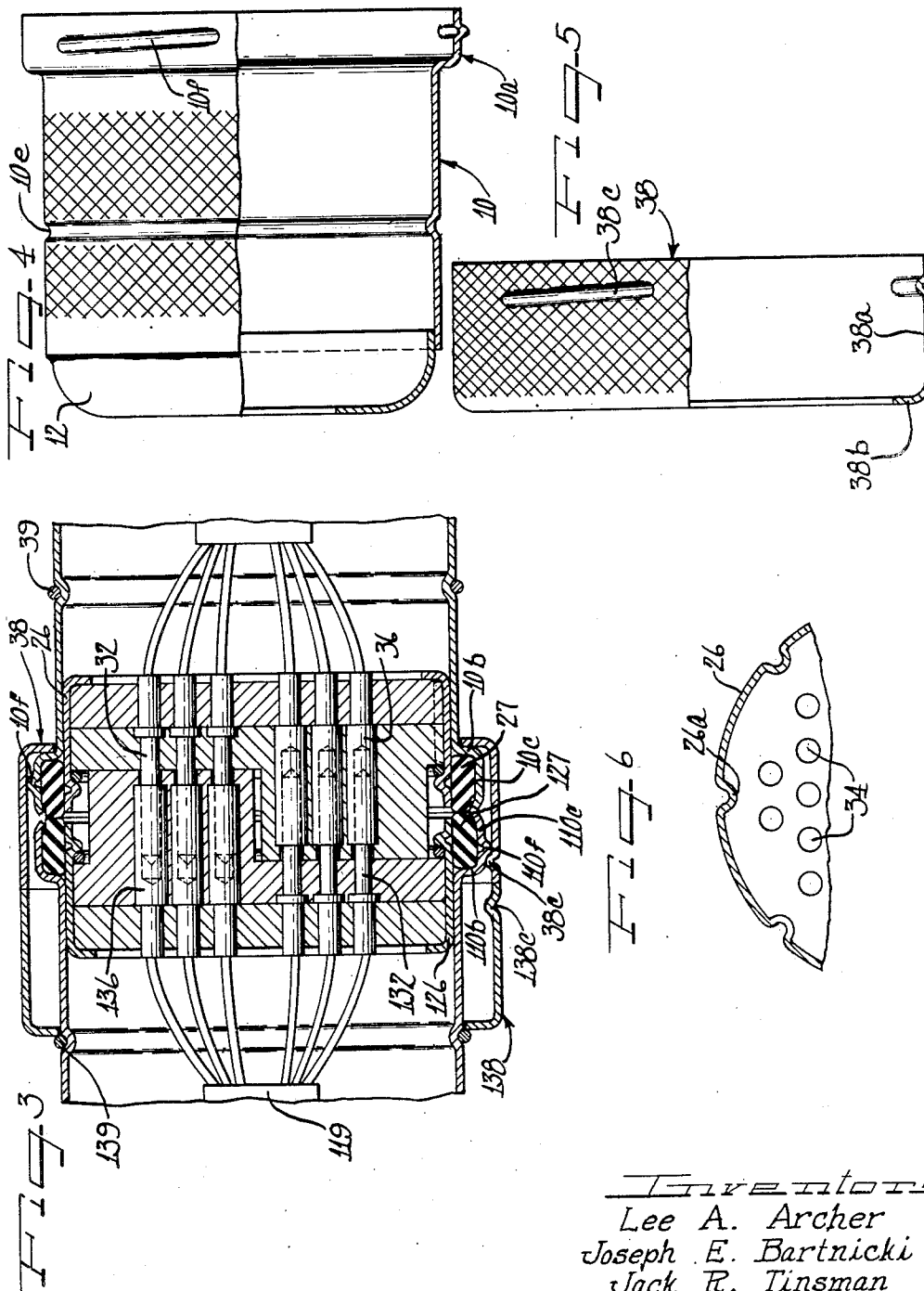
L. A. ARCHER ET AL

2,824,290

MULTI-CONTACT DUPLICATE ENGAGING CONNECTOR

Filed Sept. 23, 1954

3 Sheets-Sheet 2



Inventors
 Lee A. Archer
 Joseph E. Bartnicki
 Jack R. Tinsman
 George H. Feustel

Attorneys
 Sherman, Morris, Chase & Vining

Feb. 18, 1958

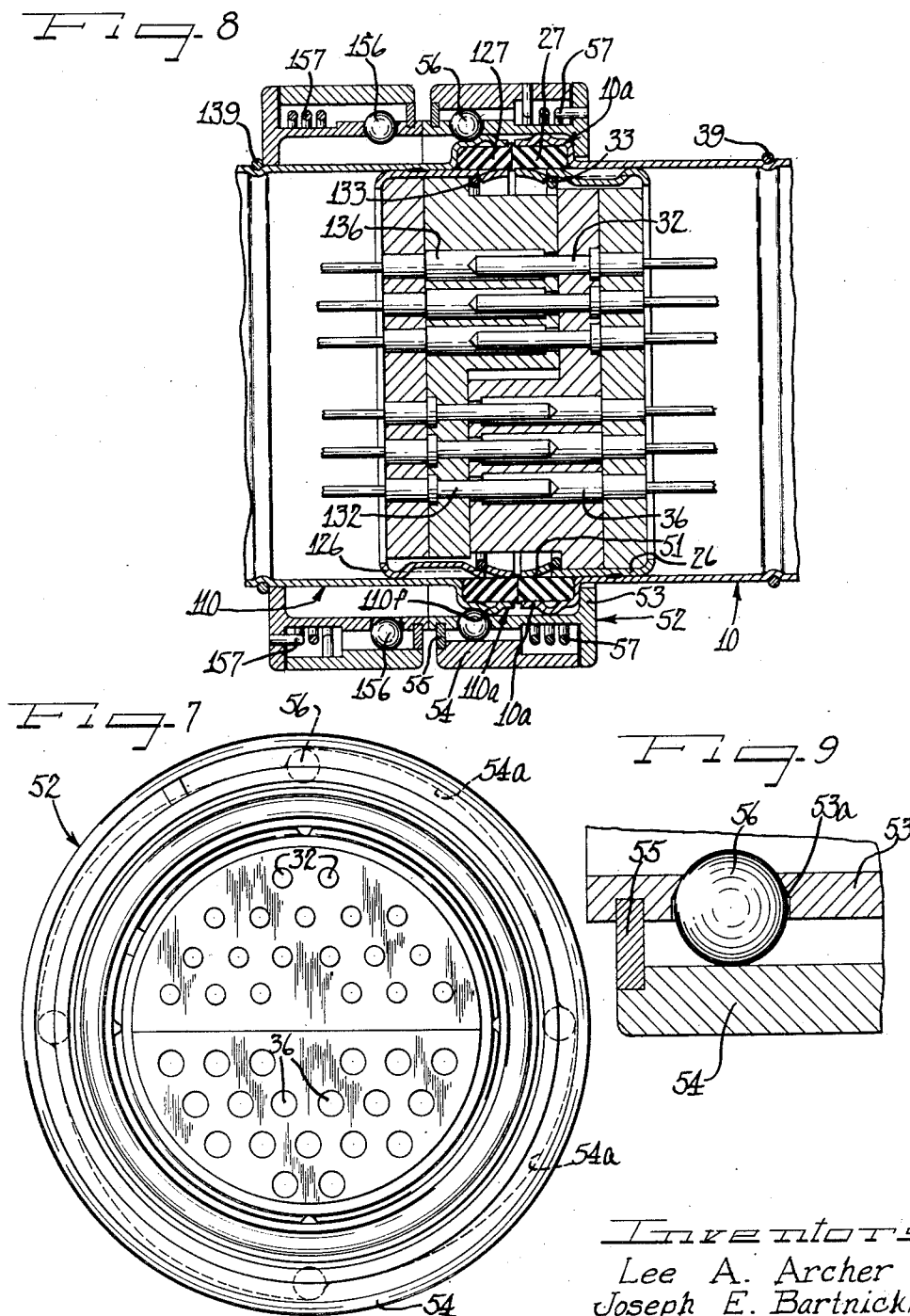
L. A. ARCHER ET AL

2,824,290

MULTI-CONTACT DUPLICATE ENGAGING CONNECTOR

Filed Sept. 23, 1954

3 Sheets-Sheet 3



Inventors
 Lee A. Archer
 Joseph E. Bartnicki
 Jack R. Tinsman
 George H. Feustel

Attorneys
 Hill, Sherman, Mason, & Associates

1

2,824,290

MULTI-CONTACT DUPLICATE ENGAGING CONNECTOR

Lee A. Archer, Wheaton, Joseph E. Bartnicki, Chicago, Jack R. Tinsman, Park Ridge, and George H. Feustel, Chicago, Ill., assignors to The Pyle-National Company, Chicago, Ill., a corporation of Illinois

Application September 23, 1954, Serial No. 457,937

4 Claims. (Cl. 339-49)

The present invention relates particularly to a separable quick-acting electrical connector for a multi-conductor cable, the separable parts of the connector being identical in construction and being of the duplicate type which include both male and female contact members.

It has long been considered desirable to provide multi-contact connectors of the duplicate type whereby the supplier as well as the user of the connectors would be able to stock just one type of connector and would not be required to stock equal numbers of the male and female contact members. Prior attempts to produce such connectors have not been successful in all respects. In some cases, the structure of the connectors was quite intricate with the result that the connectors were difficult to engage and disengage and the cost of manufacturing was prohibitively high. In those instances where simplified, less expensive types of connectors were employed, such connectors frequently provided insufficient seals between the two elements of the connector with the result that the connector was accessible to damage by dirt, moisture, and the like.

In view of the foregoing, there is still a definite need for an inexpensive, easily operable multi-contact connector of the duplicate type. The satisfaction of that need is one of the primary objects of the present invention.

Another object of the invention is to provide an improved multi-contact connector composed of two inter-engaging connectors which may be identical in construction.

A further object of the invention is to provide an electrical connector which can be easily and inexpensively manufactured from sheet metal stamping and other conveniently available parts.

A still further object of the invention is to provide an electrical connector which can be joined to another electrical connector of the same type to provide not only a good electrical connection but also a substantially dust and moisture proof connection.

Yet another object of the present invention is to provide a connector having separable duplicate parts joined together by quick acting coupling connections and having abutting resilient sealings which operate to resiliently load the coupling connections.

Other objects and features of the present invention will become apparent to those skilled in the art from the following description of the attached sheets of drawings which illustrate the principles of the present invention as they are applied to two specific embodiments thereof.

In the drawings:

Figure 1 is an end view of the connector, with parts in elevation;

Figure 2 is a cross-sectional view of the connector shown in Figure 1 taken substantially along the vertical center line in Figure 1 but with parts shown in elevation and with parts removed for the sake of clarity;

Figure 3 is a fragmentary view, partially in cross-section, illustrating the manner in which two separable

2

connector parts or connectors of the type shown in Figures 1 and 2 are engaged;

Figure 4 is a view in elevation, partially broken away, to illustrate additional details of construction of the outer body member of the connector;

Figure 5 is a view in elevation, partially broken away, to illustrate details of the sleeve member of the connector structure;

Figure 6 is a fragmentary cross-sectional view on an enlarged scale of the inner body member;

Figure 7 is a face view, with parts in elevation, of a modified form of the present invention;

Figure 8 is a cross-sectional view with parts in elevation, taken substantially on the vertical center line of Figure 7; and

Figure 9 is a fragmentary, greatly enlarged view illustrating the manner in which one of the ball elements of the structure shown in Figures 8 and 9 is received and retained within the connector.

As shown on the drawings:

In Figures 1 and 2, reference numeral 10 indicates generally a shell-like outer body member which may be composed of sheet metal or similar material, for example, a sheet-form stamping. The outer body member 10 may consist of a cylindrical central portion 11 and a hollow end shell 12 secured in telescoping relationship within the central portion 11, although it will be realized that the entire outer body member 10 can be composed of a single piece of sheet metal. Secured to the outer body member 10 is a threaded nipple 13, which, at one end, carries a resilient grommet 14. The latter urges a cupped washer 16 against the inner face of a follower 17 in threaded engagement with the nipple 13. A friction lock ring 18 is received within the follower 17 and is in threaded engagement with the nipple 13 to lock the follower 17 in a selected position along the nipple 13.

The grommet 14 is also arranged to engage a multi-conductor insulated cable 19 having a plurality of individually insulated strands 21 extending therefrom. A helical spring 22 surrounds a portion of the cable 19, and has one end received within the hollow interior of the follower 17, to provide a measure of strain relief for the connector assembly. A protective ferrule 23 receives the opposite end of the spring 22 to prevent the end of the spring 22 from becoming snagged.

The outer body member 10 is radially outwardly offset at one end to form an enlarged annular flange portion 10a, including a vertical side wall 10b, and an axially extending side wall 10c. The walls 10b and 10c cooperate with the axially extending walls of an inner, shell-like body member 26 to grip firmly a resilient seal ring 27 disposed between the inner body member 26 and the side wall 10c, as best seen in Figure 2. The extreme marginal edge of the side wall 10c may conveniently be provided with radially inwardly offset lugs, dimples or depressions 10d to aid in locking the seal ring 27 in position. In order to provide the maximum sealing effectiveness, the seal ring 27 projects axially or longitudinally slightly beyond the marginal edges of both the inner body member 26 and the outer body member 10.

The inner body member 26 carries a first disk shaped cap 29 composed of insulating material and having a plurality of axially extending through holes each having a contact terminal 31 therein arranged to be connected to a corresponding individual strand 21 in the cable 19, as shown in Figure 2. A second disk shaped cap 32 also made of a suitable electrically non-conductive material is held seated against the cap 29 by virtue of the engagement of a retaining ring 33 which is snapped into position behind a plurality of circumferentially spaced radially

3

inwardly offset lugs or depressions 26a located in the surface of the inner body member 26.

The cap 32 has a corresponding plurality of through holes formed therein each having a connector terminal 31 extending therethrough. Each terminal 31 formed as a male connector element and providing a prong 34 has a medial shoulder 34a abutting the cap 29 and received in a recess of the cap 32. Each terminal 31 formed as a female connector has a connector socket 36 abutting against the cap 29 and received in a recess of the cap 32, the arrangement of the female elements 36 being the mirror image of the arrangement of the prongs 34 so that when two of the connectors confront one another axially, the male elements 34 from one of the connectors will register with and engage the female elements 36 of the other, and vice versa. The particular connector shown in Figure 1 has nineteen male prongs 34 and nineteen female elements 36, but it will be appreciated that any number of male and female elements can be provided in the connector as desired.

In the assembling the terminals and the disk retainers, the terminals 31 are inserted into the openings of the cap 29 and the bared wire ends of the cable strands 21 are soldered thereto. The cap 32 is then inserted in place and the sub-assembly is inserted as a unit into the inner housing where it is retained by the snap ring 33.

From Figure 2 it will be apparent that the cap 32 has a female portion or recessed portion 32a of sufficient depth to receive tightly the corresponding male portion or enlarged portion 32b of a mating connector member containing the female elements 36 of an identical connector when two such connectors are engaged. It will also be apparent that the outer ends of the prongs 34 extend beyond the face of the recessed portion 32a and the entry ends of the female elements 36 are substantially coplanar therewith to facilitate a tight engagement.

Loosely mounted over the outer body member 10 is a shell-like flanged sheet-form sleeve 38 having an axially extending wall 38a and a radially extending wall 38b positioned for sliding movement along the outer surface of the outer body member 10. One limit for the axial movement of the sleeve 38 is provided by the position of the side wall 10b, and the other is provided by a stop ring 39 which is tightly received within a depression 10e encircling the outer body member 10. The distance between these two points of travel should be at least twice the axial length of the annular flange portion 10a, for a reason which will become apparent in a succeeding portion of this description.

To provide a quick acting, but positive means for connecting and disconnecting the two connectors, the sleeve 38 is provided with a plurality of spaced, inwardly extending, helical segmental ribs 38c. The ribs 38c are helical in the sense that if they were continued about the surface of the sleeve 38, they would form a helical thread about that surface. The inwardly extending ribs 38c are arranged to cooperate with another set of outwardly extending, segmental helical ribs 10f formed on the annular flange portion 10a of the outer body member 10 (see Figures 3, 4 and 5).

Two identical connectors in their engaged position are illustrated in Figure 3 of the drawings. To avoid repetition, the same numerals have been employed for one of the connectors as were employed in Figure 2, but the identifying numerals for the same parts of the other connector have been given numerals exactly one hundred higher than the corresponding numerals of the first connector.

One of the features of the present invention resides in the fact that the two connectors can be joined and locked in two positions. As apparent from Figure 3, when two of the connectors are joined together with the male prongs 32 received within the female sockets 136 of the other connector, and the male prongs 132 of the other connector being received in the female sockets 36 of the first connector, the two connectors will be locked when the ribs

4

38c engage the ribs 110f of the mating connector. In this position, the two seal rings 127 and 27 are firmly urged together to not only provide an effective seal for the connector against the action of dirt and moisture, but also to provide a resilient biasing means which holds the two connectors in their locked position.

The two connectors shown in Figure 3 could also be releasably locked in the other direction, i. e. by moving the sleeves 38 and 138 jointly to the right as viewed in Figure 3 so that the ribs 138c engage behind the ribs 10f of the right hand connector in abutting engagement.

To open the connector, it is merely necessary to rotate the sleeve 38 until the rib 38c is out of axial alignment with the rib 110f so that the sleeve is released from engagement with the annular flange portion on the other connector, and the male prongs may be separated from their engagement with the female members of the opposite connector.

A modified form of the invention is illustrated in Figures 7, 8 and 9 of the drawings. Where appropriate, reference numerals have been taken from the preceding figures to identify the same parts.

The electrical connector illustrated in this modified forms of the invention is substantially identical to that previously described.

The embodiment shown in Figures 7 to 9, inclusive, provides an axially slidable sleeve 52 consisting of an inner sleeve 53 and an outer sleeve 54 separated by means of a retaining ring 55. As best seen in Figure 7, the outer sleeve 54 is provided with a series of grooves 54a of gradually varying depth, each of the grooves 54a cooperating with the inner sleeve member 53 to provide the inner and outer race for shiftable elements conveniently comprising a plurality of rotatable ball bearings 56. As best shown in Figure 9, the ball bearings 56 are normally loosely received but confined within a tapered seating aperture 53a formed in the inner sleeve 53.

Joining the inner sleeve 53 and the outer sleeve 54 together is a torsion spring 57 having one end bottomed in the inner sleeve 53, and its other end bottomed in the outer sleeve 54. The spring 57 normally urges the outer sleeve 54 into a position in which the balls 56 are tight in their sockets. However, upon rotation of the outer sleeve member 54, against the action of the spring 57, the sleeve 54 will be rotated into a position in which the thickness of the grooves 54a becomes great enough to free the ball 54 for radial movement in its socket 53a. For example, as illustrated in Figure 8 (right hand side), the balls 54 are locked behind the ribs 110f to prevent axial disengagement of the two connectors but upon selectively turning the outer sleeve 54 (left hand side of Fig. 8) the balls may be readily released from their wedged engagement against the ribs 110f and the two connectors can be easily separated.

From the foregoing, it will be appreciated that the connectors of the present invention provide a quick acting electrical connection. The connector is economical and simple to manufacture, since it is capable of being assembled, for the most part, from sheet metal. At the same time, the connector has a positive locking action and seals the electrical terminals from the effects of dust and moisture.

It will be evident that various modifications can be made to the embodiments described without departing from the scope of the present invention.

We claim as our invention:

1. An electrical connector comprising a shell-like outer body member composed of sheet metal, at least one male contact and at least one female contact member carried within said outer body member, the outer ends of the male members and the entry ends of said female members being substantially coplanar, said outer body member having an integral outwardly extending annular flange portion of increased diameter, an inner shell-like body member secured in telescoping relation within said outer

5

body member, means holding said contact members in position within said inner body member, a resilient ring received in tight engagement between said inner body member and said annular flange portion, a sleeve movable axially of said outer body portion and having an end portion adapted to engage said annular flange portion to thereby limit the extent of its axial movement in one direction, a stop ring on said outer body member, the axial distance between said annular flange portion and said stop ring being at least twice the axial length of said annular flange portion, a plurality of spaced inwardly extending helical ribs formed in said sleeve, and a plurality of spaced outwardly extending helical ribs on said annular flange portion, said ribs being arranged to abut each other when said connector is engaged with another connector of identical configuration to provide an adjustable locking means for a pair of said connectors.

2. An electrical connector comprising a shell-like outer body member, at least one male contact and at least one female contact member carried within said outer body member, said outer body member having an outwardly extending annular flange portion of greater diameter than the remainder of said outer body member, a sleeve axially movable along said outer body member, means on said outer body member limiting axial movement of said sleeve in one direction and locking means including a plurality of ball bearings disposed between said sleeve and said annular flange portion, whereby a pair of connectors of identical construction can be engaged with the sleeve on one of said connectors cooperating with both the annular flange portion on the other of said connectors and one of said locking means to lock said connectors against axial disengagement.

3. A separable electrical connection comprising a pair of substantially identical connectors, each of said connectors including an outer shell-like body member, an insulator carried within said outer body member, at least one male contact member and at least one female contact member mounted on said insulator, said male contact members being disposed in a recessed portion of said insulator so that the tips of said male contact members and the entry ends of said female contact members are substantially coplanar, an outwardly extending end portion of greater diameter than the remainder of said outer body member, an inner body member secured to said outer body member, a resilient sealing ring disposed between said inner body member and said end portion, a sleeve movable axially along said outer body member, means on said sleeve arranged to engage said

6

end portion to provide a stop for limiting the axial movement of said sleeve in one direction, and means including a plurality of spaced rotatable balls associated with said sleeve and arranged to engage a series of spaced segmental outwardly extending ribs on the outwardly extending end portion of the other of said connectors to releasably lock said connectors together with their respective sealing rings in firmly abutting engagement.

4. A separable electrical connection comprising a pair of substantially identical connectors, each of said connectors including an outer shell-like body member, an insulator carried within said outer body member, at least one male contact member and at least one female contact member mounted on said insulator, said male contact members being disposed in a recessed portion of said insulator so that the tips of said male contact members and the entry ends of said female contact members are substantially coplanar, an outwardly extending end portion of greater diameter than the remainder of said outer body member, an inner body member secured to said outer body member, a resilient sealing ring disposed between said inner body member and said end portion, a sleeve movable axially along said outer body member, means on said sleeve arranged to engage said end portion to provide a stop for limiting the axial movement of said sleeve in one direction, and means including a plurality of spaced, rotatable balls associated with said sleeve, means on said sleeve providing a race for receiving said balls in an adjustable position axially within said sleeve, a torsion spring urging said sleeve into a position in which said balls are tightly received within said sleeve, said balls engaging a series of spaced, segmental outwardly extending ribs on the outwardly extending end portion of the other of said connectors to releasably lock said connectors together.

References Cited in the file of this patent

UNITED STATES PATENTS

2,386,177	Andersen	Oct. 9, 1945
2,414,106	Kelly	Jan. 14, 1947
2,521,822	Boswell	Sept. 12, 1950
2,572,448	Child	Oct. 23, 1951
2,606,224	Modrey	Aug. 5, 1952
2,739,290	Child	Mar. 20, 1956

FOREIGN PATENTS

156,450	Germany	June 26, 1939
---------	---------	---------------