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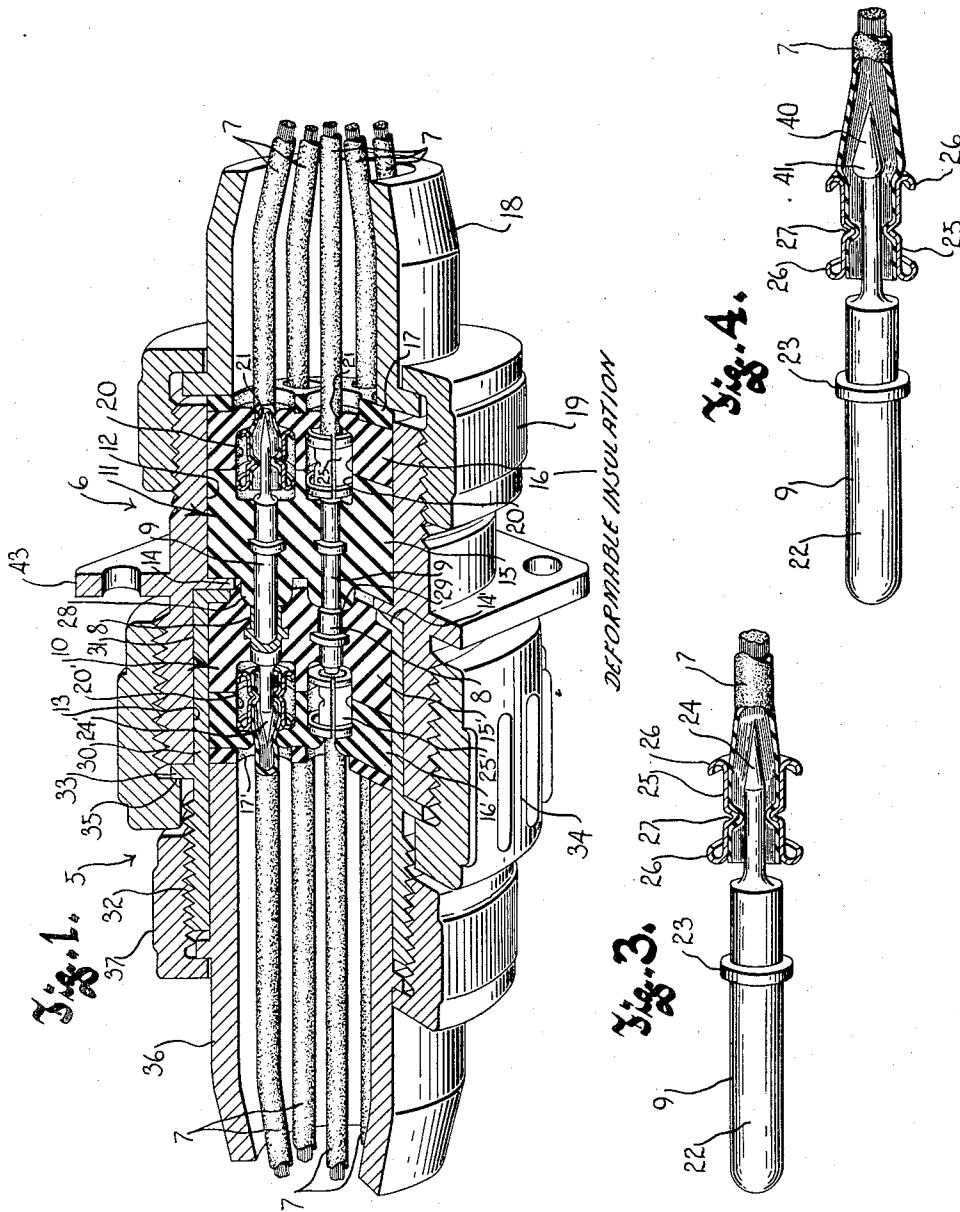
R. M. HÄRDMARK

2,896,186

HERMETICALLY SEALED ELECTRIC CABLE CONNECTOR

Filed Aug. 23, 1956

2 Sheets-Sheet 1



Invention
Ragnar M. Härdmark
by *Stratton Jones*
Attorney

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R. M. HÄRDMARK

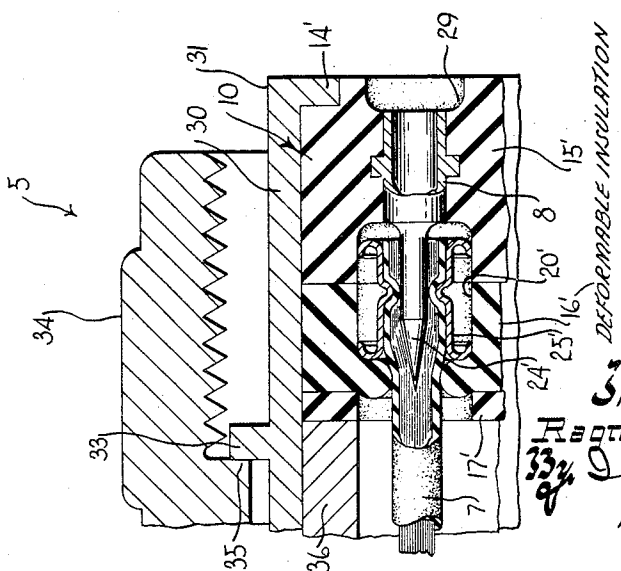
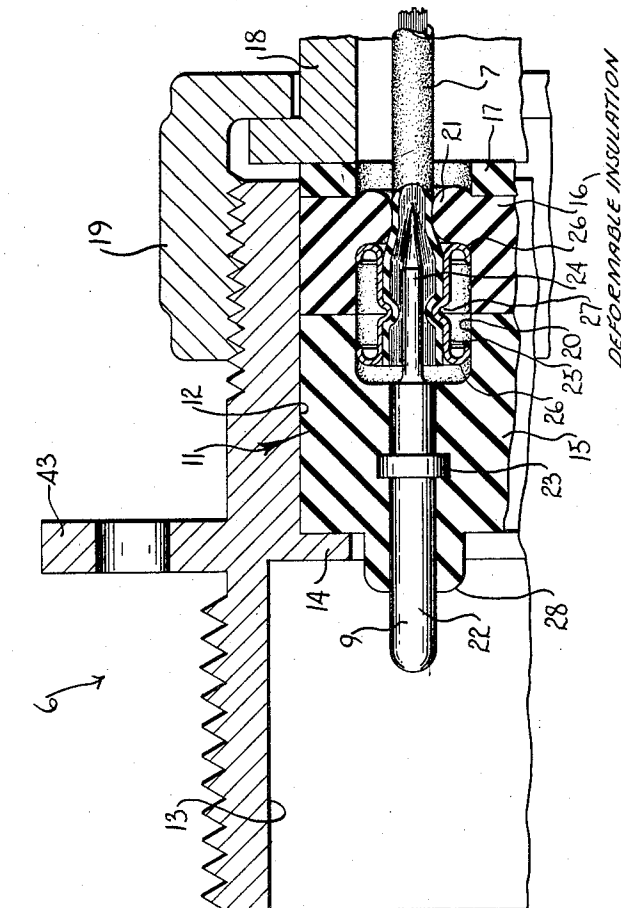
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2 Sheets-Sheet 2

Fig. 2.



Invention
Ragnar M. Härdmark
33%
Dr. Milton Jones
Attorney

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HERMETICALLY SEALED ELECTRIC CABLE CONNECTOR

Ragnar M. Hårdmark, Linköping, Sweden, assignor to Svenska Aeroplan Aktiebolaget, Linköping, Sweden, a corporation of Sweden

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5 Claims. (Cl. 339—100)

This invention relates to electric cable connectors and has as its object to provide an improved connector especially adapted to connect a plurality of multi-strand electric cables.

One of the features and objects of the invention resides in the way in which the individual cables are connected to their respective terminal members.

Another object of the invention is to provide a connector which is so designed and constructed that upon connection of the coupling parts the grip between the terminal members and their respective cables is tightened.

Still another object and feature of this invention resides in the fact that the connector is so constructed that when its complementary coupling members are connected their respective electric cables are not only electrically connected to one another but the entire coupling structure is hermetically sealed.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best mode so far devised for the practical application of the principles thereof and in which:

Figure 1 is a perspective view partially in longitudinal section and partially in side elevation of an electric cable connector embodying this invention, said view showing the coupling in its connected operative condition;

Figure 2 is a view upon a larger scale and in longitudinal section of a sufficient portion of the entire coupling to illustrate how the coupling members separate;

Figure 3 is a perspective view partly in section and partly in side elevation of one of the terminal members to show how it is attached to its cable; and

Figure 4 is a view similar to Figure 3 but illustrating a slightly modified way of connecting the terminal members to their respective cables.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts, the numerals 5 and 6 designate generally the two main elements or coupling members of the connector, each of which has a group of multi-strand electric cables 7 anchored thereto and provision for electrically connecting the cables to one another as the coupling members 5 and 6 are joined. To this end the cables 7 anchored to the coupling member 5 have female terminals 8 on the ends thereof while the cables 7 of the coupling member 6 have male terminals 9 secured thereto. Upon connection of the coupling members 5 and 6 to one another, the male terminal members 9 enter the female terminal members and thus electrically connect the respective cables to one another.

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The manner in which the electric cables 7 are anchored to their respective coupling members and the way in which the terminals 8 and 9 are electrically connected to their respective cables and anchored in place, constitutes one of the main features of the invention and gives it advantages not enjoyed by previous cable connectors. This will appear from the following more detailed description.

Each of the coupling members 5 and 6 is tubular and has a core of insulating material 10—11 mounted therein. The electric cables enter the remote ends of these cores and inside the cores they are joined to their respective terminals 8—9, the terminals being exposed at the contiguous ends of the cores to interengage when the coupling members are connected.

It will be noted that the bore of the coupling member 6 has a small diameter portion 12 and a larger diameter portion 13 with an inwardly directed annular flange 14 therebetween and providing oppositely facing shoulders. The smaller diameter bore 12 has the insulated core 11 received therein; and this core consists of a body 15 of insulating material which may be rubber or any other suitable material having high dielectric strength, and a collar 16 of elastically compressible material, preferably rubber. The body 15 bears against the flange 14 so that its outer end is contiguous to the adjacent outer end of the core 10 of the other coupling member; and the collar 16 lies between the body 15 and a washer 17 preferably formed of incompressible material such as hard rubber.

A muff 18 encircling the electric cables 7 which are anchored to the coupling member 6, bears against the washer 17 where it is held by a nut 19 threaded onto the coupling member 6. This nut and the muff have abutting flanges so that tightening of the nut draws the muff axially toward the coupling member to thereby place the core 11 under compression.

The core 11, composed of the body 15 and the collar 16, has a plurality of cylindrical wells 20 opening to the inner end of the core and hence facing the interior of the muff 18. These wells are formed partly in the body 15 and partly in the collar 16, and encircling the mouth of each of these wells is an inwardly directed lip 21. To permit access to the mouths of the wells the washer 17 has holes therein in line with the wells; and one of the male terminal members 9 is axially aligned with each well.

Each terminal member 9, as best illustrated in Figure 3, consists of a cylindrical stem 22 having a flange 23 encircling it medially of its ends, and a pointed pin 24 projecting from one end of the stem. These terminal members are anchored in place in the core 11 preferably by being molded into the body 15, with the stem 22 protruding from the outer end of the core and the pointed pin 24 projecting into its respective well from the bottom thereof. Obviously, the flange 23 secures the terminal member against endwise displacement with respect to the core.

The pointed pin 24 axially penetrates into or in other words, has the end portion of one of the cables 7 impaled thereon. A ferrule 25 in each well embraces the impaled end portion of the cable therein. The ferrule is of a size to be snugly received in the well and has outwardly curled opposite ends 26 which engage the side walls of the well and a cylindrical medial portion which is crimped or clinched in as at 27 during the attachment of the terminal to the cable. Preferably also the ferrule is split longitudinally so that it is radially deformable to enable the same to be more readily clamped about the cable end portion which it embraces.

In assembling the individual cables 7 to their respective terminals, the cable ends with the ferrules already in gripping engagement therewith are inserted into the

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mouths of the wells at a time when the collar 16 is free from endwise compression so that the ferrules may be snapped past the lips 21 and into the wells. When all of the cables are thus inserted and impaled upon the pointed pins of their respective terminals, the nut 19 is tightened and thereupon the collar 16 is compressed to apply a radially inward compressive force upon the individual ferrules which increases the grip of the ferrules upon their cable ends. The tightening of the nut 19 also causes the lips 21 to tightly grip the cables.

Preferably the outer end of the body 16 has a protuberance 28 encircling the stem 22 of each of the several male terminal members, and to accommodate these protuberances appropriately shaped sockets 29 are formed in the outer end of the core 10 of the other coupling member 5.

The coupling member 5 comprises a tubular sleeve 30 having a smooth walled end portion 31, which may be provided at its outer end with an inwardly directed annular flange 14' as shown in Fig. 2 and an externally threaded end portion 32 lying at opposite sides of an annular outwardly projecting flange 33. The smooth walled end portion 31 telescopes into the large diameter bore 13 of the coupling member 6, and is of a length to have its end bear against the flange 14 when the flange 33 bears against the end of the coupling member 6. A main coupling nut 34 threaded onto the coupling member 6 and provided with an inwardly directed flange 35 to bear against the flange 33, serves to detachably connect the two coupling members to one another.

The core 10 of the coupling member 5 is similar to the core 11, and hence consists of a body 15' in which the female terminals 8 are anchored with their mouths opening to the sockets 29 in the outer end of the body, and a collar 16' of elastically deformable material. The pointed ends 24' of the female terminal members 8 project into wells 20' to enter the ends of the cables received in the wells as described in connection with the coupling member 6. Also, the impaled end portions of the cables are embraced by ferrules 25', which ferrules are clamped solidly onto their respective cable ends by endwise compression of the core 10.

To enable endwise compression of the core 10, it is located in the outer smooth-walled end portion of the sleeve 30 between the flange 14 and the end of a muff 36 received in the other end portion of the sleeve with a washer 17' interposed between the muff and the collar 16'. A nut 37 on the threaded end portion 32 of the sleeve provides means for drawing the muff 36 axially against the washer 17' to thereby apply the desired compressive force upon the core.

From the foregoing description taken with the accompanying drawings it will be readily apparent that this invention provides a cable connector especially adapted to use in situations where hermetically sealed, well insulated electrical connections between a plurality of individual multi-strand cables is required. The manner in which the elements of the two cores 10 and 11 and especially their collars 16 and 16' are placed in endwise compression, assures the desired hermetically sealed condition, and also makes certain that the individual cables are solidly anchored and well connected to their respective terminals; and the penetration of the pointed pins of the terminal members into the end portions of the cables achieves an excellent electrical connection between the cables and their terminals.

If desired the attachment of the terminals to their respective cables may be made even more secure by using the slightly modified construction of Figure 4, wherein the pointed pins of the terminals have somewhat enlarged end portions 40, of such proportions that the base 41 of the enlargement lies just beyond the adjacent end of the ferrule embracing the impaled end of the cable.

Also, as shown, the coupling member 6 may be provided with a mounting flange 43 by which the member

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6 may be secured to a supporting wall or panel (not shown). Again, if desired, the cable may be encased in protective hoses (not shown) which would enter the muffs 18 and 36.

What is claimed as my invention is:

1. An electric cable connector comprising: a pair of tubular coupling members; a core of insulating material in each of said coupling members, the outer ends of said cores being contiguous to one another when the coupling members are connected, and each of said cores having a resiliently deformable portion defining a well opening to the inner end of the core; a female terminal member secured in the core of one of the coupling members with its mouth opening to the outer end of said core; a male terminal member secured in the core of the other coupling member with a part thereof protruding from the outer end of said core to enter the female terminal member upon connection of the coupling members; a pointed pin on each of said terminal members projecting axially into the well of its respective core with the point thereof adjacent to the mouth of the well; an electric cable entering the mouth of each well and having an end portion thereof received in the well and impaled axially upon the adjacent pointed pin; a radially deformable ferrule in each well encircling the impaled end portion of the cable therein, said ferrules gripping the cables and securely holding them to the pointed pins; a deformable lip at the mouth of each well confining the adjacent ferrule in the well and snugly embracing the adjacent electric cable; means maintaining said deformable lips under axial compression, said means including a compression member cooperating with each of the coupling members to embrace the core therein, and means cooperating with each coupling member and its compression member to hold the compression and coupling members connected and in compressive engagement with the core; and means for readily detachably connecting the coupling members to one another.

2. In an electric cable connector of the character described: a body of insulating material having a well with a restricted mouth opening to one end thereof, the portion of the body defining the outer end portion of the well and the restricted mouth of the well being resiliently deformable; a metal terminal member secured in said body of insulating material and having a pointed pin extending axially into the well from the bottom thereof with the point of said pin disposed adjacent to the mouth of the well; a radially deformable ferrule seated in the well, inwardly of said restricted mouth thereof so as to be confined thereby against axial displacement out of the well, said ferrule encircling the pointed pin to embrace the end portion of an electric cable inserted into the mouth of the well and axially impaled upon the pointed pin; a plurality of shell members cooperating to embrace said body of insulating material; and means on the shell members for holding the shell members in compressive engagement with the resiliently deformable portion of the body so that the shell members apply radially inward compressive force to the ferrule and to said portion of the body defining the restricted mouth of the well, to cause the ferrule and said portion of the body to cooperate in gripping a cable so inserted into the well.

3. In an electric cable connection of the character described: a terminal having a pointed end portion adapted to be axially impaled in an end portion of an electric cable; a body of insulative material in which another portion of said terminal is embedded, said body having a well opening to one side thereof, into which well the pointed end portion of the terminal projects a substantial distance axially from the bottom of the well; a ferrule adapted to be snugly seated in said well in the body and to clampingly embrace the end portion of an electric cable impaled on the terminal; and resiliently deformable means on the body defining a restricted mouth for said well, past which the ferrule may be inserted into the well

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and by which it is confined against axial displacement out of the well, and which snugly embraces an electrical cable having its end portion embraced by the ferrule.

4. In an electric cable connector of the character described: a body of insulating material having a well opening to one end thereof, the portion of the body defining the outer end portion of the well being resiliently deformable; a metal terminal member secured in said body of insulating material and having a pointed pin extending axially into the well from the bottom thereof with the point of said pin disposed adjacent to the mouth of the well; a radially deformable ferrule seated in the well encircling the pointed pin to embrace the end portion of an electric cable inserted into the mouth of the well and axially impaled upon the pointed pin; a plurality of shell members cooperating to embrace said body of insulating material; and means on the shell members for holding the shell members in compressive engagement with the resiliently deformable portion of the body so

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that the shell members apply radially inward compressive force to the ferrule through said resiliently deformable portion of the body to thus cause the ferrule to grip a cable so inserted into the well.

5. In an electric cable connector the terminal member of claim 4 further characterized by: an enlargement on the outer end portion of the pointed pin, the base of which enlargement provides a shoulder with which the ferrule cooperates to better grip an electric cable impaled upon the pointed pin.

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