April 27, 1948. J. S. LARKINS, JR 2,440,279

CABLE CONNECTOR

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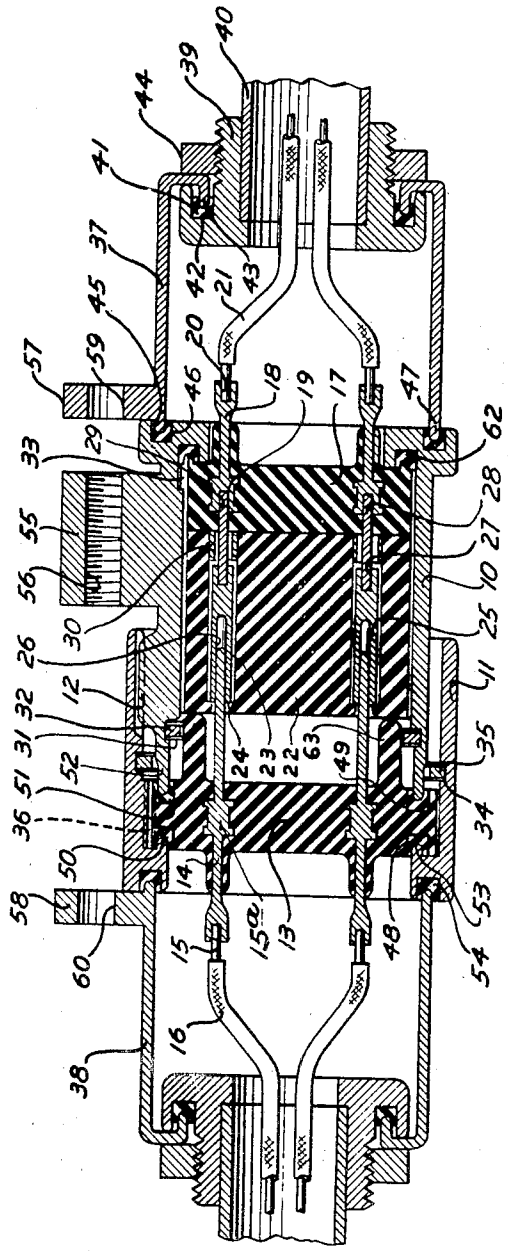


Fig. 1

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CABLE CONNECTOR

Filed Nov. 6, 1944 6 Sheets-Sheet 2

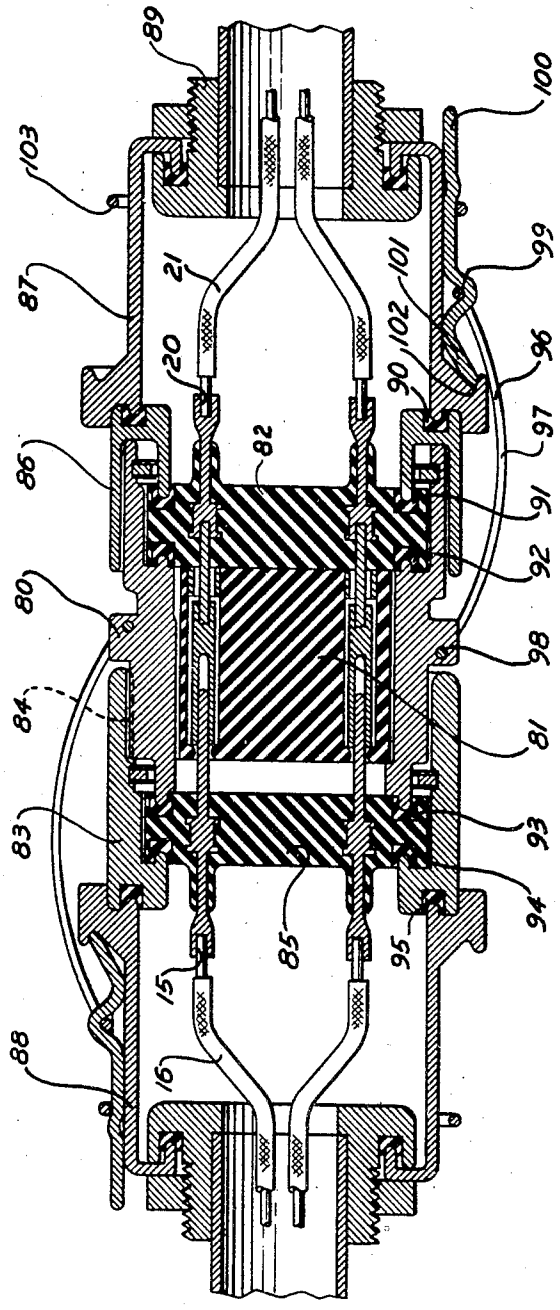


Fig. 2

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CABLE CONNECTOR

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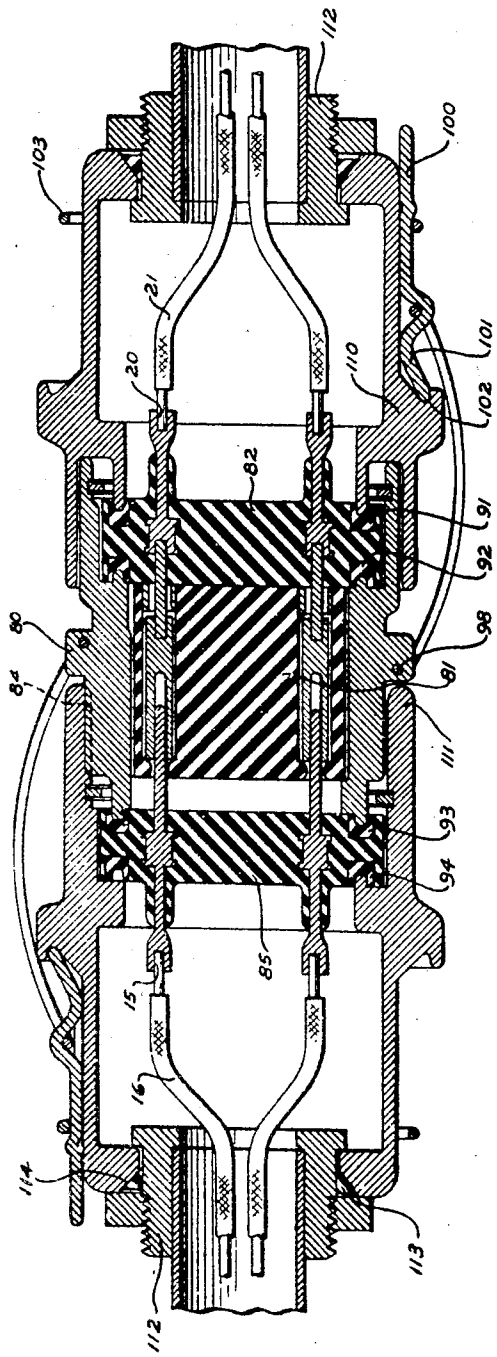


Fig. 3

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April 27, 1948. J. S. LARKINS, JR 2,440,279

CABLE CONNECTOR

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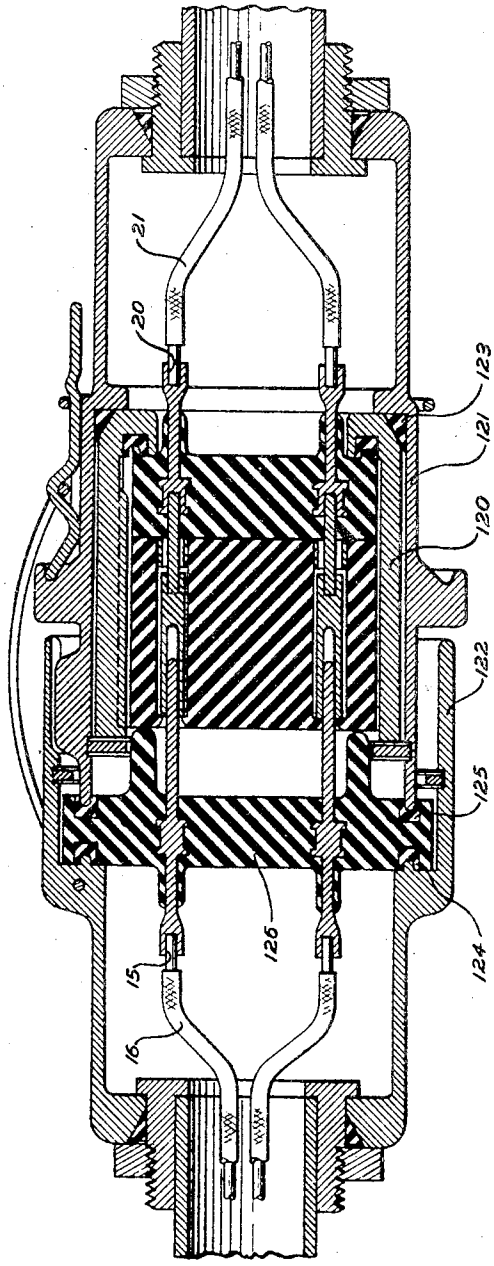


Fig. 4

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CABLE CONNECTOR

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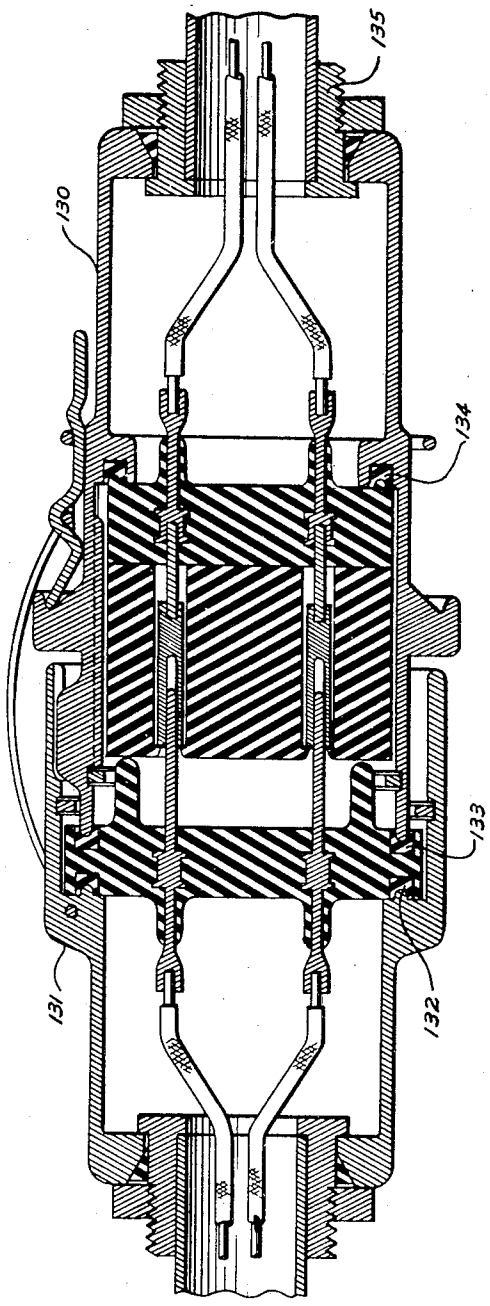


Fig. 5

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CABLE CONNECTOR

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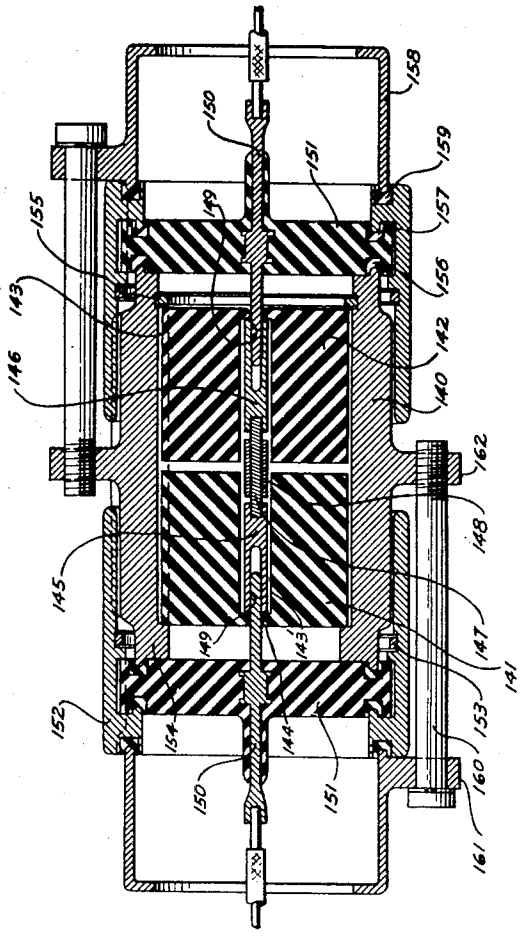


Fig. 6

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Patented Apr. 27, 1948

2,440,279

UNITED STATES PATENT OFFICE

2,440,279

CABLE CONNECTOR

John S. Larkins, Jr., Scotia, N. Y.

Application November 6, 1944, Serial No. 562,151

6 Claims. (Cl. 173—328)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates generally to cable connectors and more particularly to a detachable water-proof connector for electric cables.

An object of the present invention is to provide a cable connector which may be readily severed, yet which is water-proof when connected.

Another object of the invention is to provide a cable connector in which novel floating means are provided to enable the conductors to be automatically aligned with each other so that the separable parts of the connector can be readily joined together.

Numerous uses exist for water-proof cable connectors of the type disclosed in this invention. For example, they are essential in motor driven vehicles likely to be used in amphibious military operation. For service purposes, cable connectors must be provided on such vehicles and they must be water-proof without being permanently sealed so that they may be readily disconnected when desired. Water-proof cable connectors are also advantageous in aircraft and in other installations in which condensation may occur due to change in altitude or in which there is substantial change in humidity.

One of the difficulties encountered in cable connectors, and particularly in cable connectors which must be sealed against moisture, arises from the necessity of providing means for aligning the conductors which are to be connected to each other. Inasmuch as the connector includes a plurality of electrical conductors, it is necessary to provide some type of floating means between the corresponding conductors so that upon attachment they will automatically become aligned with each other. In the present invention, this is accomplished by providing not only a floating sleeve which is formed with a socket therein for the insertion of a conductor, but also by means of a flexible member interconnecting the sleeve and the other electrical conductor.

Other objects and advantages of the present invention will be made more apparent as this description proceeds, particularly when considered in connection with the accompanying drawings, in which:

Figure 1 is a longitudinal cross sectional view of a cable connector embodying the present invention.

Figures 2, 3, 4, 5, and 6 are longitudinal cross

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sectional views of modifications of the construction shown in Figure 1.

Referring now to the drawings and more particularly to Figure 1, it will be noted that I have illustrated an embodiment of the present invention in which the reference character 10 indicates an inner housing of generally cylindrical configuration telescopically engaged by an outer housing 11 which is keyed to the inner housing 10 by means of the key 12, thereby permitting relative axial movement between the housings but preventing rotation therebetween. Within the outer housing 11 is a connector block 13 suitably constructed of an electrically insulating material. The block 13 carries a plurality of pins 14 provided with enlargements 15a intermediate their ends and anchored in the block 13. The outer end of each pin 14 is provided with a socket 15 into which is soldered an electrical conductor 16.

Within the inner housing 10 is another connector block 17 also constructed of an electrically insulating material. A plurality of pins 18 are carried by the block 17 and are provided at one end with enlargements 19 anchored in the block 17 and at the opposite end with sockets 20 to receive one end of the conductors 21. The pins 14 and 18 in the blocks 13 and 17 are aligned with each other, and the number of pins in each block corresponds with the number of conductors in the electric cable.

Between the blocks 13 and 17 and within the inner housing 10 is another block 22 provided with a plurality of passages 23 extending therethrough and of circular cross section. At one end of each passage 23 an inturned annular lip 24 is provided forming a shoulder in the passage. Positioned within each passage and adapted to abut the shoulder is a sleeve 25. The sleeve 25 is cylindrical in cross section and is somewhat smaller in diameter than the inner diameter of the passage 23, thus permitting the sleeve to float in the passage.

A socket 26 is provided at one end of the sleeve 25 and is adapted to receive and tightly engage the forward end of the pin 14. The opposite end of the sleeve 25 is provided with a socket 27 into which is soldered a flexible joint 28, the opposite end of which extends into the connector block 17 and is soldered in a socket 29 provided in the enlargement 19 on the pin 18. Surrounding the flexible joint 28 intermediate the sleeve 25 and the connector block 17 is a spacer 30.

From the foregoing description, it will be noted that I have provided means for detachably con-

necting an electric cable which includes a floating and flexible joint adapted to automatically align the parts of the cable to be connected. Not only does the sleeve 25 float in the passage 23 in the block 22, but the flexible connector 28, which may be constructed of any suitable flexible conducting material such as braided copper wire, permits the sleeve 25 to be readily moveable within the passage relative to the pin 18 in the connector block 17.

The inner housing 10 is provided with an annular groove 31 into which is seated an annular retaining ring 32 adapted to abut the end of the block 22, the latter being keyed to the inner housing 10 by means of the key 33. In a similar manner, the outer housing 11 is provided with an annular groove 34 receiving an annular retaining ring 35 adapted to abut one end of the connector block 13, the latter being keyed to the outer housing by means of the key 36. Upon separation of the cable connector, the inner housings 10 and 11 are moved axially with respect to each other, the connector block 13 being carried with the outer housing by means of the retaining ring 35 while the blocks 22 and 17 are carried with the inner housing by means of the retaining ring 32. The sleeve 25 abuts the shoulders formed by the lips 24, and the pins 14 are accordingly withdrawn from the sockets 26 in the sleeves. When the separated parts of the connector are reconnected, the keys 36, 33 and 12 must be aligned with their respective keyways so that the parts of the connector are assembled in the proper relation in order that the corresponding conductors can be connected. Any irregularities or misalignment of the pins 14 and the sleeves 25 is taken care of by the floating of the sleeves within the passage 23 and the flexible joints 28 as previously described.

End housings 37 and 38 are provided and form extensions of the inner and outer housings 10 and 11 respectively. The housings 37 and 38 are adapted to be connected to ferrules 39 into which the conduits 40 are assembled, in a manner to be more fully described hereinafter.

Means are provided to affect a water-proof seal between the various parts of the cable connector. The joints between the ferrules 39 and the end housings 37 and 38 respectively, are sealed by means of annular sealing gaskets 41 seated within annular channel-shaped grooves 42 provided in the ferrules 39. The end housings 37 and 38 are provided with return bend portions 43 adapted to engage the sealing gaskets 41. Locking nuts 44 threaded upon the ferrules 39 clamp the sealing rings 41 between the ferrules and the portions 43 of the end housings.

A similar sealing gasket 45 is positioned in an annular groove 46 provided at one end of the inner housing 10 and is engaged by the adjacent end 47 of the end housing 37. Channel shaped annular grooves 48 and 49 are provided upon opposite sides of the connector block 13 and annular sealing gaskets 50 and 51 are seated therein. The gasket 51 is engaged by the end 52 of the inner housing 10 and the gasket 50 is engaged by the inturned lip 53 of the outer housing 11. The seal between the outer housing 11 and the end housing 38 comprises the gasket 54 mounted in a manner similar to the gasket 45 forming the seal between the inner housing 10 and the end housing 37.

In order to place the various sealing gaskets under compression and to effectively seal the joints between the parts of the cable connector,

I have provided a plurality of flanges 55 extending radially outwardly from the inner housing 10 and spaced around a periphery of the latter. The flanges 55 are provided with axially extending threaded bores 56. Radially outwardly extending flanges 57 and 58 are provided upon the end housings 37 and 38 respectively, in alignment with the flanges 55 and are formed with apertures 59 and 60 in alignment with the threaded bores 56. Suitable bolts (not shown) connect the flanges 57 and 58 respectively to the flanges 55 and when tightened place the sealing gaskets 45, 50, 51 and 54 under compression, thus sealing the joints therebetween.

An additional seal is provided between the connector block 17 and the inner housing 10 by means of a sealing gasket 62. The connector block 13 is formed with a collar 63 engaging the end of the block 22 to produce pressure on both sides of the block 17.

Referring now to the modification shown in Figure 2, it will be noted that this construction is the same as the construction shown in Figure 1 with the exception of certain changes in the housing members and in the sealing means as hereinafter described. A central housing 80 is provided within which are assembled the insulating blocks 81 and 82. An outer housing 83 telescopically engages the inner housing 80 and is keyed thereto by the key 84. The housing 83 carries the connector block 85 therein. Another outer housing 86 is provided, telescopically engaging the opposite end of the inner housing 80. End housings 87 and 88 form extensions of the outer housings 86 and 83 respectively, and are suitably connected to the ferrules 89. The sealing means include the gasket 90 sealing the joint between the outer housing 86 and the end housing 87, the gasket 91 between the outer housing 86 and the insulating block 82, the gasket 92 between the block 82 and the inner housing 80, the gasket 93 between the inner housing 80 and the block 85, the gasket 94 between the block 85 and the outer housing 83 and the gasket 95 between the outer housing 83 and the end housing 88.

The clamps 96 are provided for placing the aforementioned sealing gaskets under compression and for clamping the various parts of the cable connector together. These clamps comprise spring loops 97 having one end thereof pivotally mounted in the apertures 98 provided in the inner housing 80 and having their opposite ends positioned in the annular grooves 99 provided in the levers 100. The levers 100 each have one end 101 fulcrumed in annular grooves 102 provided in the end housings 87 and 88. The clamps 96 are shown in their clamped position at which time split retaining rings 103 are positioned over the levers 100 to prevent accidental disengagement. To release the parts of the cable connector, the rings 103 are removed and the levers 100 are swung outwardly.

The modification shown in Figure 3 is identical to that of Figure 2 with the exception of the one piece end housings 110 and 111. The housing 110 replaces the end housing 87 and the outer housing 86 of Figure 2 and eliminates necessity of a seal therebetween, and the end housing 111 replaces the end housing 88 and the outer housing 83 of Figure 2. Slightly different sealing means are also provided between the housings 110 and 111 and the ferrules 112. This sealing means comprises wedge shaped annular sealing gaskets 113 positioned between the fer-

rules 112 and the cone shaped surfaces 114 provided at the end of the housings 110 and 111.

In the construction shown in Figure 4 an inner housing 120 is positioned within an outer housing 121 which telescopically engages the housing 122. The wedge shaped sealing ring 123 is provided between the housings 120 and 121 and annular sealing rings 124 and 125 are provided in the connector block 126 and respectively seal the joint between the block 126 and the housings 122 and 121. It will be noted that this construction simplifies the general housing structure and eliminates the necessity for some of the sealing gaskets required in the constructions previously described. The outer housings 121 and 122 are clamped together by any suitable means such as shown in Figures 1 or 2.

The structure shown in Figure 5 is further simplified in that the housing comprises only two members, namely the housing 130 and the housing 131 telescopically engaging each other. Only three sealing gaskets 132, 133 and 134 are required in addition to the gaskets provided between the housings 130 and 131 and the ferrules 135.

Figure 6 shows a construction permitting separation at two points. The inner housing 140 receives a pair of insulating blocks 141 and 142 keyed to the housing at 143. Each of the insulating blocks is provided with a passage 143' for each conductor of the cable. Lips 144 at opposite ends of the blocks form shoulders providing stops for the sleeves 145 and 146 which are loosely received therein. The adjacent ends of the sleeves 145 and 146 are connected by means of the flexible connector 147 which is partly encased within a spacer 148. The opposite ends of the sleeves are provided with sockets 149 adapted to receive pins 150 anchored in the connector blocks 151. The connector blocks 151 are positioned within outer housing members 152 and are carried therewith by means of the annular retaining rings 153 seated in annular grooves in the housings. The blocks 141 and 142 are retained in the inner housing 140 by means of the shoulder 154 formed at one end of the inner housing and the retaining ring 155 seated within an annular groove at the opposite end of the housing.

From the foregoing, it will be seen that either of the outer housings 152 can be separated from the inner housing 140 thereby affecting the disconnecting of the electric cable. Suitable annular sealing gaskets 156 and 157 provide seals between the inner and outer housing members and the connector blocks 151. End housings 158 form extensions of the outer housing members and are sealed to the latter by means of the annular gaskets 159. Clamping means for clamping the parts of the connector in sealing engagement with each other include bolts 160 extending through flanges 161 and 162 on the end housings 158 and the inner housing 140 respectively.

Although I have shown and described certain embodiments of my invention, it will be understood that I do not wish to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of my invention as defined in the appended claims.

What I claim is:

1. A cable connector comprising insulating means having a passage therein, a conducting element loosely received in said passage, said element having a contact member at one end thereof, a conductor anchored in said insulating means in line with said conducting element and flexibly connected at one end to the other end of said conducting element to permit transverse play of the element in its passage, the other end of said anchored member protruding through said insulating means to provide a terminal for attachment of a wire thereto.

2. A cable connector comprising an insulating block having a plurality of passages therein, a conducting sleeve loosely received in each of said passages, each said sleeve having a socket in one end thereof, a second insulating block, a plurality of conductors anchored therein, each of said conductors being flexibly connected at one end thereof to a corresponding said sleeve at the other end of the latter to permit transverse play of the sleeve in its passage.

3. A cable connector comprising an insulating block having a plurality of passages therein, a conducting sleeve loosely received in each of said passages, each said sleeve having a socket in one end thereof, a pair of insulating blocks disposed at the ends of the first named block, a plurality of conductors carried by each of said pair of blocks, each of said conductors carried by one of said pair of blocks being received at one end thereof within the socket of a corresponding said sleeve, and each of said conductors carried by the other of said pair of blocks being connected at one end thereof to a corresponding said sleeve at the other end of the latter by a flexible lead whereby the sleeve is permitted transverse play in its passage.

4. A cable connector comprising an insulating block having a plurality of passages therethrough, a shoulder in said block at one end of each of said passages, a conducting sleeve loosely received in each of said passages and adapted to abut said shoulder, said sleeve having a socket in one end thereof, a second insulating block at the end of the first named block remote from said shoulder, a plurality of conductors anchored in said last named block and extending therefrom, a third insulating block at the opposite end of the first named block, a plurality of conductors anchored in said third block and extending therefrom, each of said conductors in said third block being received at one end thereof within the socket in the corresponding said sleeve, and each of said conductors in said second block being flexibly connected to a corresponding said sleeve at the other end of the latter to permit transverse play of the sleeve in its passage.

5. In a waterproof cable connector having telescopically related housing shells relatively movable axially and sealingly joinable alignedly in telescoped abutting relationship, an insulating block within one of said shells and connectedly movable axially therewith, said block having a plurality of passages therein, a conducting sleeve loosely received in each of said passages, said sleeve having a socket in one end thereof, a second insulating block within another of said shells and connectedly movable axially therewith, a plurality of conductors anchored in said second block, each of said conductors being received at one end thereof in a corresponding said socket, and a second plurality of conductors each flexibly connected to a corresponding said sleeve at the other end of the latter to permit transverse play of the sleeve in its passage.

6. In a waterproof cable connector having a

housing including two telesccpically related shells relatively movable axially and sealingly joinable alignedly, in telescoped abutting relationship, an insulating block within one of said shells and connectedly movable axially therewith, said block having a plurality of passages therein, a conducting sleeve loosely received in each of said passages, said sleeve having a socket in one end thereof, a second insulating block disposed at one end of the first named block within the other of said shells and connectedly movable axially with the latter, a plurality of conductors carried by said second block, each of said conductors being received at one end thereof within a corresponding said socket, a third insulating block disposed at the other end of the first named block within said one of said shells and connectedly movable axially with the latter, and a second plurality of conductors carried by said third block, each of said second plurality of conductors being connected to a corresponding said sleeve at the other end of the latter by a flexible lead to permit play of the sleeve in its passage.

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