

Feb. 6, 1962

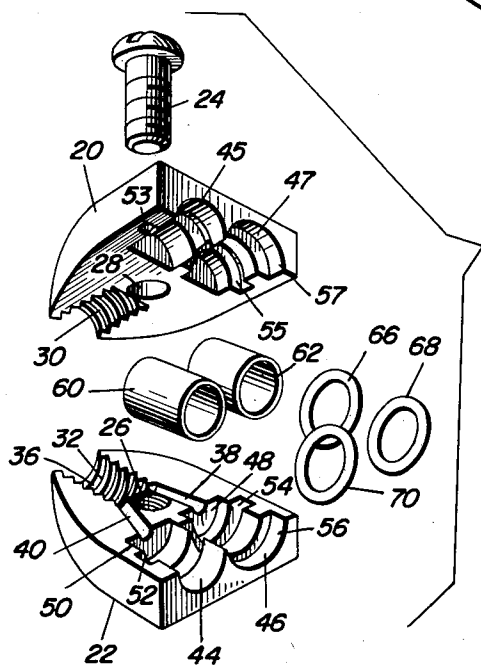
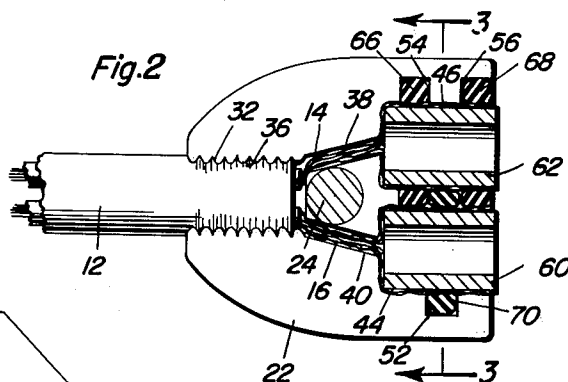
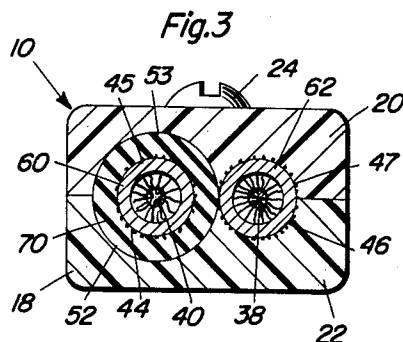
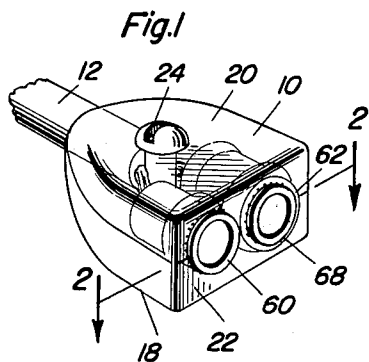
R. CAMPING ETAL

3,020,518

SOLDERLESS ELECTRICAL CONNECTORS

Filed March 5, 1959

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

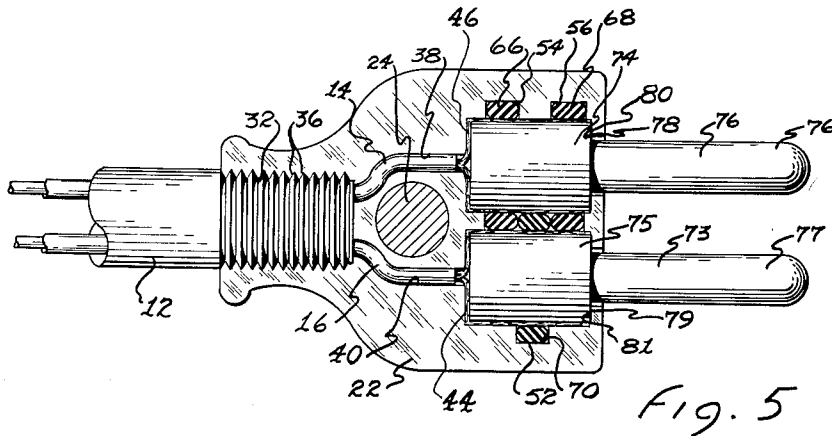


Fig. 5

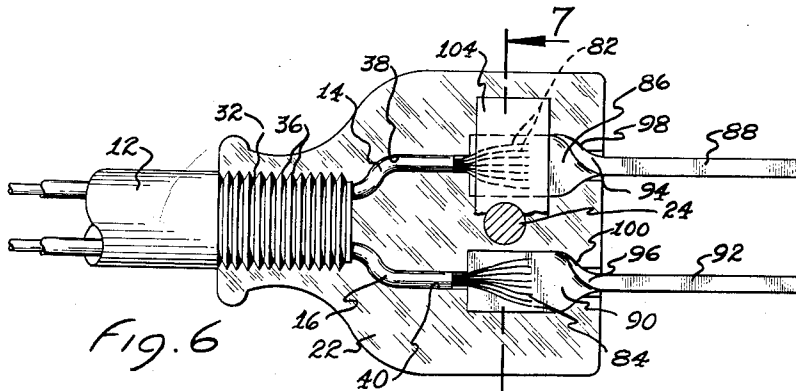


Fig. 6

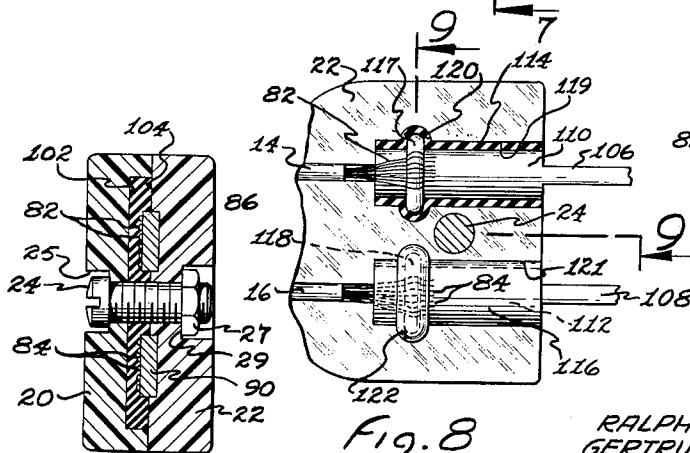


Fig. 7

Fig. 8

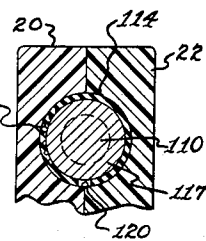


Fig. 9

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3,020,518

SOLDERLESS ELECTRICAL CONNECTORS

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3 Claims. (Cl. 339-191)

This invention relates to connectors and more particularly to a solderless electrical connector.

This application is a continuation in part of our patent application, Serial No. 767,385, now abandoned, filed October 15, 1958, for Solderless Connector.

An object of the invention is to provide a connector for improving, simplifying and facilitating the connection between stranded electrical conductors and a plug or socket, and at the same time enabling the contact areas to be viewed, and also reducing electrical failure. One of the important features of the invention is the ease of making repairs on flash camera solenoid cord connectors. A repair may be made very simply and at once as soon as failure is detected. In this way no time is lost, this being especially important for professional photographers.

A further object of the invention is to provide a solderless connector, for instance a socket-type connector, wherein the stranded conductors are simply placed on a pair of conductive sleeves with elastic rings then rolled onto the outer surface of the strands of the conductors and the sleeves. By merely placing these sub-assemblies, composed of conductive sleeves, strands of wire and rings, in one of the connector casing sections and placing the other casing section thereon, the original assembly or repair, especially the latter, are complete.

Another important feature of the invention is the adoption of a transparent substance from which the connector casing is made. This enables the user of the connector to inspect the condition of the wire terminals at all times. Often poor connections or broken connections may be detected by mere inspection. After detection they are easily repaired in the manner described previously.

A further object of the invention is to provide a connector structure which is readily adapted for use as a male or female electrical connection for any and all appropriate purposes including electrical equipment used in photography as well as household extension cords and other connection or disconnection devices manually operable for the connection or disconnection of electrical circuits.

Another object of the invention is to provide a connector wherein a pair of electrical conductors are frictionally engaged by and forced securely together by a resilient element held under compression between a pair of casing members in which the conductors are coupled to each other.

Another object of the invention is to provide a connector wherein a resilient member, having a high coefficient of friction, such as rubber, is compressed between a pair of casing members and is thereby caused frictionally to engage and exert force on a pair of coupled electrical conductors between said casing members whereby, the resilient member, under compression exerts force on said conductors to hold them together and also retains the conductors in a desired juxtaposition due to a high coefficient of friction existing between the compressed resilient member and the conductors.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, where-

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in like numerals refer to like parts throughout, and in which:

FIGURE 1 is a perspective view of a typical solderless connector constructed in accordance with the invention.

FIGURE 2 is a sectional view taken on the line 2-2 of FIGURE 1.

FIGURES 3 is a sectional view taken on the line 3-3 of FIGURE 2.

FIGURE 4 is an exploded perspective view of the connector in FIGURE 1 with the cable omitted.

FIGURE 5 is a sectional view similar to that of FIGURE 2 but showing a modification of the present invention wherein male conductors are substituted for female sleeves.

FIGURE 6 is a sectional view similar to FIGURE 2 of the drawing showing a modification of the present invention and showing parts and portions in elevation and fragmentarily to amplify the illustration.

FIGURE 7 is a sectional view taken from the line 7-7 of FIGURE 6.

FIGURE 8 is a fragmentary sectional view similar to that as shown in FIGURE 6 of the drawings but showing a further modification of the invention; and

FIGURE 9 is a fragmentary sectional view taken from the line 9-9 of FIGURE 8.

In the accompanying drawings there is a solderless connector 10. Since one of the important uses of the invention is in connection with photographic equipment, connector 10 represents a flash camera solenoid cord connector. It is attached to the end of cable 12 having two stranded wires 14 and 16 therein. The connector has a casing 18 made in two sections 20 and 22, each of which is constructed almost the same. The sections are preferably made of translucent or transparent insulating material, for instance, one of a large number of commercially available plastics. The sections longitudinally divide the casing and are held together by means of a bolt 24 which passes through a smooth bore opening 28 in section 20 and which is threaded into a tapped opening 26 in section 22 (FIGURE 4). The section 22 has a semi-circular bore 32 which is adapted to confront semi-circular bore 30 in order to constitute a circular bore within which cable 12 is gripped. To enhance the gripping action on the cable there are a plurality of ridges 36 or the like in the bore. Section 22 has two grooves 38 and 40 which commence at the inner end of bore 32 and which diverge as they approach the semi-cylindrical pockets 44 and 46 respectively. These semi-cylindrical pockets have inner walls 48 and 50. Pocket 44 is provided with a semi-circular groove 52, while pocket 46 has a semi-circular groove 54 longitudinally spaced from groove 52, and an outwardly opening semi-circular recess 56 which is also longitudinally spaced from groove 52. The groove 52 is in a transverse plane located between groove 54 and recess 56.

Section 20 has two semi-cylindrical pockets 45 and 47 respectively which are adapted to register with pockets 44 and 46 in order to form full cylindrical pockets. There is a semi-circular groove 53 in pocket 45, and it aligns with groove 52 to form a full cylindrical groove when the sections are brought together in assembled relation. Semi-cylindrical pocket 47 has a semi-circular groove 55 and spaced therefrom, there is a semi-circular recess 57. Groove 55 registers with groove 54, and recess 57 registers with recess 56 when the sections are assembled, thereby forming circular grooves and recesses respectively which are each longitudinally spaced from grooves 52 and 53. As shown in FIGURE 2 the grooves and recesses are staggered.

A pair of conductive sleeves 60 and 62 are adapted to fit in the cylindrical pockets. When fitted in the cylindrical

pockets the inner extremities of the sleeves 60 and 62 abut strands of the stranded conductors 14 and 16, holding them pressed firm against the end walls 50 and 48 of the cylindrical pockets. A pair of elastic rings 66 and 68 constitute means for fastening strands of the stranded conductor 14 onto the outer surface of sleeve 62. A circular elastic ring 70 constitutes means by which to fasten the strands of stranded conductor 16 on the outer surface of sleeve 60. The sleeves function as sockets in the connector 10.

In assembly, either original or subsequent assembly when repairs are required, the cable is placed in the semi-cylindrical bore 32 and the stranded conductors placed on the outside surface of the two sleeves 60 and 62. Portions of the stranded conductor are routed in grooves 38 and 40, after the elastic rings 66, 68 and 70 are placed on the two sleeves 62 and 60. Two rings 66 and 68 are placed on sleeve 62 and a single ring 70 is placed on sleeve 60, making sure that the stranded conductors are between the surface of the rings and the outer surfaces of the sleeves.

Then the elastic rings are placed in the grooves and recesses of section 22, and the other section 20 is juxtaposed thereover. Bolt 24 is then tightened and the connector is completely assembled.

It is noted that elastic rings are to be made of rubber or some other elastomeric non-conductive material. Therefore, they will be squeezed tightly by having the sections 20 and 22 brought against each other in the manner described. Further, as shown in FIGURE 2 elastic ring 70 is staggered between the two elastic rings 66 and 68 thereby forming an interlock between the elastic rings. At the places adjacent to each other, the material of the sections is undercut sufficiently so that the adjacent parts of the ring contact the strands of both conductors 14 and 16 (FIGURE 2) and thereby further aiding in the clamping action necessary to retain the strands of stranded conductors 14 and 16 firmly attached to the two sleeves 62 and 60.

With reference to the modified construction of the invention as shown in FIGURE 5 of the drawings it will be seen that male prong members 72 and 73 are substituted in place of the sleeves 62 and 60. These male prongs 72 and 73 are engaged by the elastic rings 66, 68 and 70 in a similar fashion to the engagement therewith with the sleeves 62 and 60 as shown in FIGURE 2 of the drawings. The prong members 72 and 73 are provided with body portions 74 and 75 respectively which are integral with reduced prong portions 76 and 77 respectively thereof. These reduced prong portions 76 and 77 are of cross section similar to the portions 74 and 75 and are adapted to be engaged in electrical conductor sockets of conventional female electrical outlets.

At the transitions of the portions 74 and 75 with the reduced prong portions 76 and 77 are shoulders 78 and 79 which are abutted to retaining shoulder portions 80 and 81 of the casing members 20 and 22. Thus, the casing members 20 and 22 are otherwise similar to the configuration as shown in FIGURE 2 of the drawings.

In operation the male prongs 76 and 77 when inserted into a female electrical outlet may be very snugly fitted so that during retraction thereof from the female outlet the shoulder portions 78, 79, 80 and 81 will prevent the male prong member 76 and 77 from being pulled out of the casing members 20 and 22.

It will be appreciated that in the structure disclosed in FIGURE 5 of the drawings the elastic rings firmly and compressively hold the wires 44 and 46 in firm conductive relationship with the outer sides of the enlarged portions 74 and 75 of the prong members 72 and 73. This function being similar to that of the structure disclosed in FIGURE 2 of the drawings as hereinbefore described.

In the modification of the invention as disclosed in FIGURE 6 of the drawings the casing members 20 and 22 are similar in that they utilize ridges 36 to hold the cord 12.

This cord is branched into conductors 14 and 16 which have conventional insulation thereon and which extend through channels 38 and 40 in the casing members 20 and 22. These channels in the mating sides of the casing members 20 and 22 coincide with each other.

The conductors 14 and 16 are conventional conductors provided with stranded wire which is spread apart into a plurality of wires 82 and 84 respectively. The stranded wires 82 being engaged with a flat surface 86 of a prong conductor member 88 which is of conventional twisted bar configuration. The stranded wires 84 are engaged with a flat side 90 of another prong member 92 having twisted bar configuration.

These bars 88 and 92 are twisted at 94 and 96 which twisted portions are internally of conforming recesses 98 and 100 in the casing members 20 and 22 respectively. These recesses are common to both casing members and corresponding recesses coincide with each other to contain the flat portions and twisted portions of the conductors 88 and 92.

The casing member 20 is provided with a recess 102 which extends transversely of the flat portions 86 and 90 of the prong members 88 and 92. Positioned in the recess 102 as shown in FIG. 7 is a strip of resilient material 104. This strip of resilient material is maintained captive in the recess 102 and is confined therein throughout its entire edge area. This resilient strip 104 may be made of rubber or any material having resilient character and disposed to be compressed around the stranded wire portions 82 and 84 of the conductors 14 and 16. It will be noted that the strip 104 as shown in FIGURE 7 of the drawings is compressed around the stranded wires 84 in such a way that they are frictionally held in place while firmly forced into electrical conductive relationship with the flat portions 86 and 90 of the prong members 88 and 92.

It will be understood that these stranded wires 82 and 84 may be of any configuration assumed by electrical conductors which may be laid in overlapped relationship to the flat portions 86 and 90. Compression of the strip 104 between the casing members 20 and 22 causes the resilient strip 104 to flow around the overlapping conductors and hold them in securely engaged electrical conducting relationship to each other.

As shown in FIGURE 7 of the drawings the bolt 24 is provided with a head disposed in a recess 25 in the casing 20 and is provided with a screw threaded nut 27 which is abutted in a recess 29 of the casing 22 thereby providing a means to clamp the casing members 20 and 22 tightly together. Thus they compress the resilient member 104 intimately around and in frictional engagement with the stranded wire conductor elements 82 and 84 of the conductors 14 and 16 respectively thereby holding them securely in connection with the flat conductor portions 86 and 90 as hereinbefore described.

In the modification as shown in FIGURE 8 of the drawings a pair of conductor members 106 and 108 are provided with integral cylindrical portions 110 and 112 which are surrounded by cover members 114 and 116 which are made of resilient material. These cover members 114 and 116 are disposed in cylindrical recesses 119 and 121 respectively. This material may be a strip of conventional rubber tape or other suitable material.

The cylindrical portions 110 and 112 are provided with increased diameter annular bead portions 117 and 118 which are interlocked in arcuate conforming groove portions 120 and 122 in the casing members 20 and 22. These groove portions provide axial abutments for the conductor members 106 and 108. The arcuate grooves 120 and 122 are sufficiently large to admit a layer of the covering members 114 and 116 to be placed in surrounding relationship with the annular beads 117 and 118.

Before the covering members 114 and 116 are placed over the cylindrical portions 110 and 112 the stranded wires 82 and 84 of the conductors 14 and 16 are placed over the annular beads 117 and 118. The cover members

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114 and 116 when wrapped thereover cause the stranded wires 82 and 84 to be bent over and interlock with the annular bead portions 117 and 118 whereupon compression of the resilient covers 114 and 116 firmly attach the stranded wires 82 and 84 in conductive relationship with the cylindrical portions 110 and 112 of the conductor members 106 and 108.

Due to the projection of the annular bead portions 117 and 118 into the groove portions 120 and 122 the conductor members 106 and 108 are longitudinally retained or abutted in the casing members 20 and 22 and thereby prevent them from being pulled out of the casing members 20 and 22 when the conductor members tend to stick in a female electrical outlet device.

The generic invention as disclosed herein comprises a pair of casing members which are clamped together around a pair of conductors which are clamped together by resilient means compressed between the casing members. Thus, the invention relates broadly to the use of a resilient member under compression between two clamped parts and wherein the resilient member is compressed against a pair of conductors to hold them firmly and securely in fixed position and in electrically conductive relationship to each other.

It will be obvious to those skilled in the art that various modifications of the present invention may be resorted to in a manner limited only by a just interpretation of the following claims.

We claim:

1. A solderless connector comprising a pair of casing sections, each section having a bore portion within which to embrace an electrical cable having a pair of stranded conductors, a pair of semi-cylindrical pockets which form cylindrical pockets when said sections are assembled, one of said cylindrical pockets having a cylindrical groove, the other of said cylindrical pockets having a pair of cylindrical grooves, a conductive sleeve in each cylindrical pocket, elastic rings adapted to be rolled onto the sleeves with the strands of said stranded conductors respectively on said sleeves and held fastened in place by said rings, there being a single ring on one sleeve and located in the pocket having one groove, there being a pair of spaced rings on the other sleeve and located in the pocket that has spaced cylindrical grooves therein.

2. A solderless connector comprising a pair of casing sections, each section having a bore portion within which

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to embrace an electrical cable having a pair of stranded conductors, a pair of semi-cylindrical pockets which form cylindrical pockets when said sections are assembled, one of said cylindrical pockets having a cylindrical groove, the other of said cylindrical pockets having a pair of cylindrical grooves, a conductive sleeve in each cylindrical pocket, elastic rings adapted to be rolled onto the sleeves with the strands of said stranded conductors respectively on said sleeves and held fastened in place by said rings, there being a single ring on one sleeve and located in the pocket having one groove, there being a pair of spaced rings on the other sleeve and located in the pocket that has spaced cylindrical grooves therein, the ring on said one sleeve located between a pair of spaced rings on the other of said sleeves to form therewith an interlock for said rings.

3. A solderless connector comprising a pair of casing sections, each section having a bore portion within which to embrace an electrical cable having a pair of stranded conductors, a pair of semi-cylindrical pockets which form cylindrical pockets when said sections are assembled, one of said cylindrical pockets having a cylindrical groove, the other of said cylindrical pockets having a pair of cylindrical grooves, a conductive sleeve in each cylindrical pocket, elastic rings adapted to be rolled onto the sleeves with the strands of said stranded conductors respectively on said sleeves and held fastened in place by said rings, there being a single ring on one sleeve and located in the pocket having one groove, there being a pair of spaced rings on the other sleeve and located in the pocket that has spaced cylindrical grooves therein, the ring on said one sleeve located between a pair of spaced rings on the other of said sleeves to form therewith an interlock for said rings, said sections constructed of light transmissive substance so that said sleeves, rings and stranded conductors may be inspected to detect poor connections.

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