

May 11, 1943.

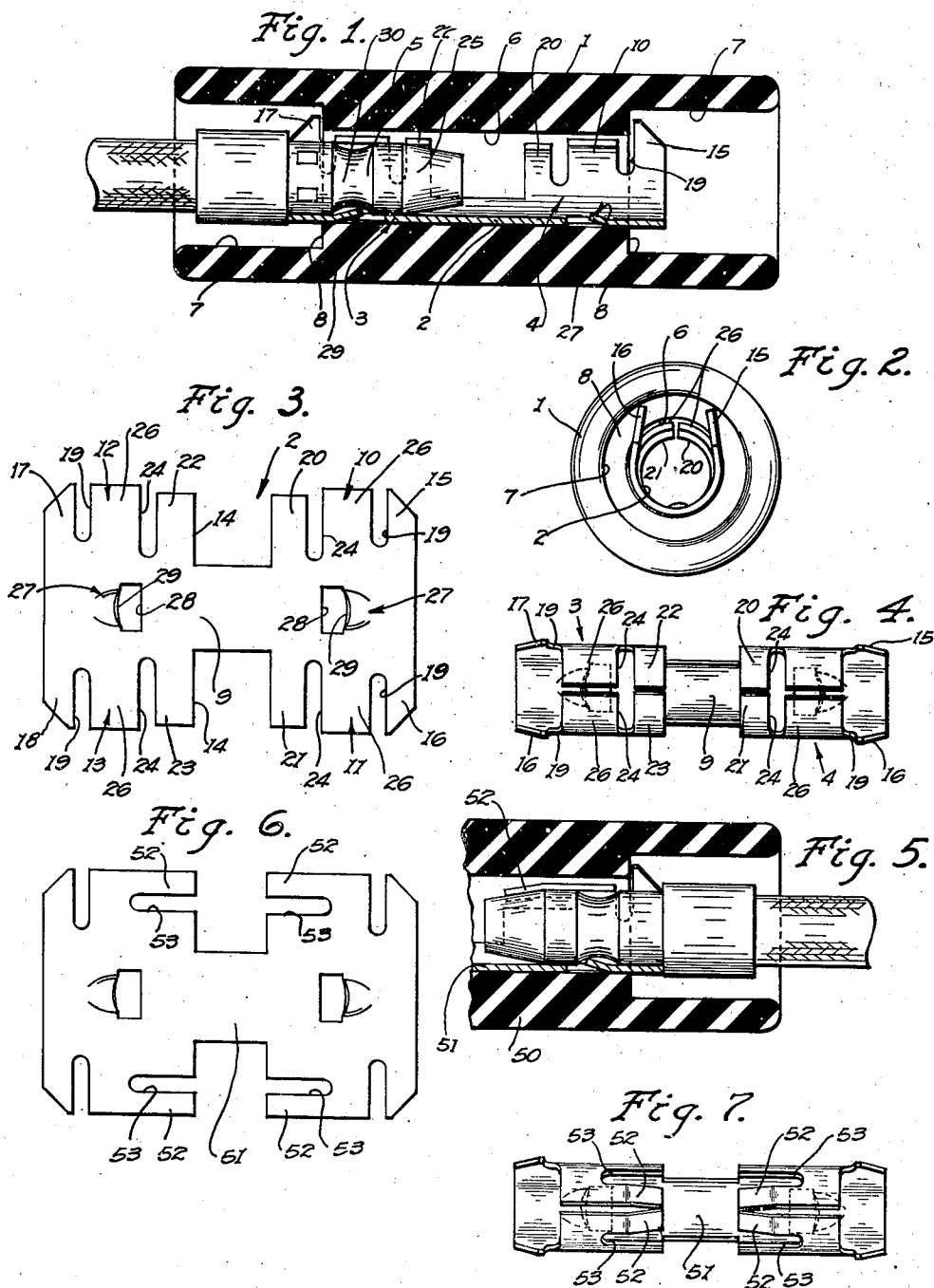
C. S. PENFOLD

2,318,651

ELECTRICAL CONNECTION MEANS

Filed Oct. 11, 1941

2 Sheets-Sheet 1



INVENTOR.

Charles S. Penfold

May 11, 1943.

C. S. PENFOLD

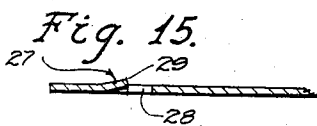
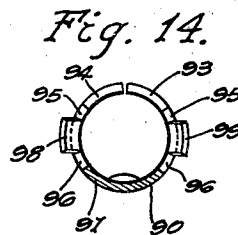
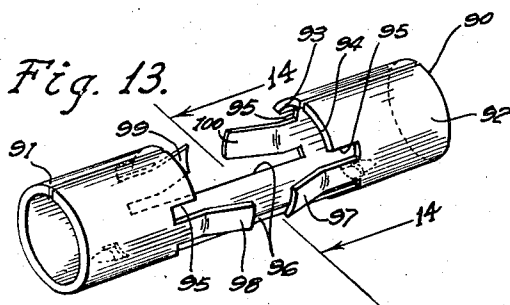
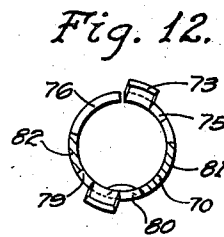
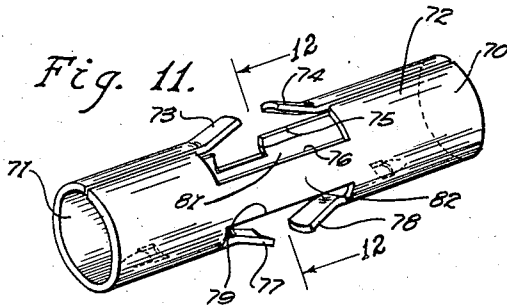
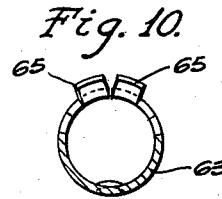
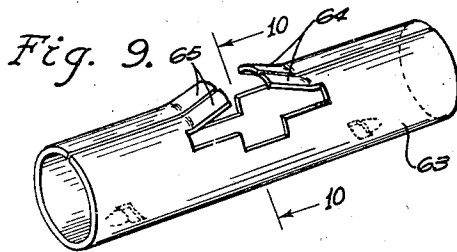
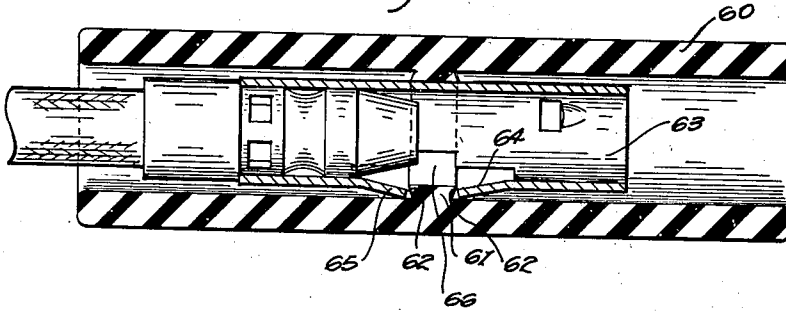
2,318,651

ELECTRICAL CONNECTION MEANS

Filed Oct. 11, 1941

2 Sheets-Sheet 2

Fig. 8.



INVENTOR.

Charles S. Penfold

UNITED STATES PATENT OFFICE

2,318,651

ELECTRICAL CONNECTION MEANS

Charles S. Penfold, Bronson, Mich., assignor to
H. A. Douglas Mfg. Co., Bronson, Mich., a corporation of Michigan

Application October 11, 1941, Serial No. 414,572

7 Claims. (Cl. 173-328)

This invention relates generally to electrical connectors known in the trade as line connectors for establishing a connection between two or more circuits, and more particularly has to do with connectors which are adapted to receive plug conductor terminals of the snap type.

One important object of the invention is to provide an improved connector consisting preferably of two members, one of which is in the form of a tubular sleeve of insulating material, and the other in the form of a metallic circuit continuing member or insert which is secured within the sleeve.

One particular object of the invention is to provide a connector of this general character, in which improved means are provided whereby to connect the two members together, this being preferably accomplished by the provision of a plurality of longitudinally spaced apart resilient or yieldable portions on the insert which are adapted to cooperate with shoulders or abutments provided within the sleeve.

Another object is to provide a better gripping action upon the plug conductor terminals, and at the same time increase the contact area between the terminals and insert.

A further object of the invention is to provide a connector in which either end of the insert may be inserted into either end of the sleeve to a predetermined position whereupon the insert will snap into place.

Other objects and advantages of the invention will appear hereinafter.

This application is a continuation in part of my application, Serial No. 253,698, filed January 30, 1939.

In the drawings accompanying this specification and forming a part of this application, there is shown for the purposes of illustration several forms or modifications to which the present invention is susceptible and referring briefly thereto:

Figure 1 is a longitudinal sectional view of the first embodiment of the invention, illustrating an assembly, including a circuit continuing member or insert disposed within a sleeve;

Figure 2 is an end view of the assembly illustrated in Figure 1;

Figure 3 is a surface development of the insert shown in Figure 1;

Figure 4 is the insert shown in Figure 3, fashioned to the desired shape for entry into the insulating sleeve;

Figure 5 is a partial longitudinal sectional view of the second embodiment of the invention,

showing an improved type of insert disposed within a sleeve of the character illustrated in Figure 1;

Figure 6 is a surface development of the insert shown in Figure 5;

Figure 7 shows the insert of Figure 6 rolled up into the desired shape for entry into the sleeve;

Figure 8 is a third modification of the invention, illustrating a longitudinal sectional view of another form of insert secured within an improved type of sleeve of insulating material;

Figure 9 is a perspective view of the insert shown in Figure 8;

Figure 10 is a sectional view of the insert taken substantially on line 10-10 of Figure 9;

Figure 11 is a fourth embodiment of the invention showing a perspective view of a further form of insert adapted for assembly with the sleeve shown in Figure 8;

Figure 12 is a transverse section of the insert taken substantially on line 12-12 of Figure 11;

Figure 13 is a perspective view showing a fifth modification of the invention, of a still further form of insert adapted for assembly with the sleeve in Figure 8;

Figure 14 is a transverse section taken substantially on line 14-14 of Figure 13; and

Figure 15 illustrates a detail respecting the details associated with the inserts above referred to.

Referring to Figures 1 through 4 of the drawings wherein the first embodiment of the invention is clearly illustrated, numeral 1 represents an outer tubular body or sleeve member constructed of some suitable insulating material and 2 represents a metallic circuit continuing member or insert which is also preferably tubular in form.

The insert is provided with resilient portions forming generally tubular receptacles generally designated 3 and 4, adjacent its extremities whereby to receive and resiliently retain plug conductors of the snap type such as 5, one of which is secured to the receptacle 3 as depicted in Figure 1. It is to be particularly noted that when terminals are properly secured to the circuit continuing member or insert member 2 that the ends of the sleeve member project beyond the plug conductor terminals so as to prevent the terminals from coming into contact with some metallic object to cause a short circuit.

The sleeve 1 of insulating material is preferably rigid in character and provided with an elongated generally cylindrical aperture or opening 6. Each extremity of the sleeve is prefer-

ably provided with an inwardly extending generally cylindrical recess or countersink 7 which communicates with the aperture 6. The recesses 7 are preferably of a size greater than the diameter of the opening 6 whereby to provide a pair of abutments or shoulders 8 for a purpose which will be described later. Insofar as this invention is concerned, it is to be distinctly understood that it is immaterial whether or not the members 1 and 2 are cylindrical, or the aperture 6 and recesses 7 are of the particular shape illustrated.

As disclosed in the surface development of Figure 3 the insert 2 is generally rectangular in shape, and among other things, preferably includes an elongated central body portion 9, having a pair of corresponding substantially rectangular resilient wing sections 10 and 11 at one extremity, and a pair of similar wing sections 12 and 13 at its other extremity. All of the wing sections extend outwardly in a direction transverse to the longitudinal axis of the insert, and are formed by the cut-outs or notches 14 provided substantially midway in the longitudinally extending marginal edges of the insert. It is of course immaterial whether the notches 14 are of the particular character shown since the respective pairs of sections might be separated by real narrow slits or kerfs. Each of the wing sections is preferably divided into a plurality of portions, and these will be described in detail later.

When the development in Figure 3 is fashioned or formed into the desired shape as illustrated in Figure 4, the pair of wing sections 10 and 11 form the terminal receptacle generally designated 4, and the sections 12 and 13 the terminal receptacle generally designated 3.

The improved means for locking the circuit continuing member or insert with respect to the outer body or sleeve of insulating material will now be considered. Each of the wing sections 10 through 13 is preferably provided with a locking portion or finger which is adapted to cooperate with or otherwise engage one of the abutments or shoulders 8 provided in the sleeve 1. The wing sections 10 and 11 are provided with oppositely disposed locking portions or fingers 15 and 16, respectively, and the sections 12 and 13, with locking portions 17 and 18, respectively. More specifically, each extremity of the insert is provided with a pair of yieldable portions or fingers which project outwardly in a direction transverse with respect to the longitudinal axis of the insert. These fingers are formed by the provision of slots 19 which extend inwardly from the marginal sides of the wing sections. When the metal insert of Figure 3 is fashioned to the desired shape as illustrated in Figure 4, the locking portions 15 through 18 are preferably allowed to remain in an extended or lateral position with respect to the terminal receptacles 3 and 4. The locking portions are preferably of a length so that same may yield or flex independently of each other, including the receptacles 3 and 4, and the portions are preferably tapered to some extent as illustrated so as to assist in piloting the insert into the sleeve. The grain of the metal preferably runs transverse to the longitudinal axis of the insert and consequently the insert is very durable, there being very little likelihood that the locking portions or other portions of the receptacles will break off.

To assemble the insert with the sleeve, it is merely necessary to insert either end of the in-

sert into either end of the sleeve so that the locking portions adjacent the extremity of the insert that is being inserted are contracted as the insert is pushed into the opening 6, and when the locking portions at the other extremity engage one of the shoulders 8, the contracted portions will expand or snap outwardly to substantially engage the other shoulder 8 whereby to lock the members together, without the assistance of special tools. Due to the fact that the locking portions are preferably tapered the insert may be easily piloted into the sleeve, because the tapers assist in gradually compressing or contracting either pair of locking portions or fingers. It will be apparent, therefore, that the pairs of locking tongues 15 and 16, and 17 and 18 straddle the restricted part of the insulator sleeve disposed between the shoulders or abutments 8, and that the recesses 7 in addition to providing clearance for the locking portions, permit the insert to be held or tilted at an angle with the sleeve in order to permit the operator to more easily pilot and force the insert into the sleeve to compress the locking portions. It will also be appreciated that the provision of a pair of resilient locking portions or fingers adjacent each of the receptacles 3 and 4 is more advantageous than the provision of a single tongue adjacent each receptacle, for the reason that if one tongue adjacent each receptacle should become damaged or accidentally broken off, there is still left an auxiliary finger on each receptacle for locking the insert and sleeve together. It is to be distinctly understood that the locking tongues 15 through 18 which act to hold the insert within the sleeve 1 of insulating material may be designed and constructed in a manner whereby either of the pair of locking tongues may be pressed outwardly to lock the insert in place in lieu of providing a snap-in construction.

As mentioned above, one object of the above invention is to provide improved means for increasing the contact area between the plug conductor terminals and the insert, and this is preferably accomplished by providing each of the receptacles 3 and 4 with a plurality of yieldable more or less independently operable terminal bearing portions which are adapted to cooperate with and engage the plug conductor terminals. As clearly illustrated in Figure 3, the wing sections 10 and 11 are provided with oppositely disposed tongue portions 20 and 21, respectively, and the sections 12 and 13, with similar tongue portions 22 and 23, respectively. These portions 20 through 23, are formed by the slots 24 which extend inwardly similar to the slot 19, but preferably to a greater extent. The portions 20 through 23 are preferably interned so as to bear against the nose of frusto-conical entrance portions 25 of the terminals 5, as clearly illustrated in Figure 1. In view of the fact that the terminal bearing portions 20 through 23 are interned, sufficient clearance must be provided, and accordingly these portions are preferably of a length somewhat less than the length of the locking fingers 15 through 18.

In view of the foregoing, it will be evident that by reason of the slots or kerfs 19 and 24, a yieldable terminal bearing portion 25 is provided intermediate the locking finger and terminal bearing portion formed on each of the wing sections 10 through 13. The bearing portions 25 are designed to bear against the central portion of the plug conductor terminals, as evidenced in Figure 1, and constitute the major parts of the recepta-

cles 3 and 4. In other words, the bearing portions 20 through 23 are auxiliary or supplemental to the main portions 26 of the receptacles. Thus, the insert is provided with at least four resilient terminal bearing portions adjacent each extremity. Obviously, if found desirable, some of these portions may be omitted, or additional portions may be provided.

Means are provided assisting to retain the plug conductor terminals to the receptacles. This in part, is preferably accomplished by a pair of detents generally designated 27 provided on the insert 2. Each detent is preferably formed by first striking out of the central body portion 9, an aperture 28 preferably rectangular in shape, and then deforming a marginal edge thereof to provide a convex tapered projection or arris extending into each of the receptacles. The detents are preferably located between the terminal bearing portions 26 on the marginal edges of the apertures 28 which face each other, and as clearly illustrated in Figures 1 and 15 the arris 29 of each projection or detent is adapted to cooperate with the wall defining the cove or detent groove 30 provided in the terminal 5. Obviously, the detents may be otherwise disposed.

Referring now to the second embodiment of the invention disclosed in Figures 5 through 7 of the drawings, it will be apparent that the sleeve 50 of insulating material and the insert 51 are constructed substantially the same as the sleeve and insert illustrated in Figures 1 through 4 of the drawings, except that the insert is provided with a plurality of longitudinally extending terminal bearing tongues in lieu of the plurality of transverse tongues 20 through 23 employed in the first embodiment of the invention. More specifically, each of the wing sections is provided with a longitudinally extending flexible tongue 52 adjacent its longitudinal marginal edge. The tongues are defined by suitable cut-outs including the longitudinally extending slots 53. The tongues on the respective plug conductor receptacles of the insert project toward each other and are interned as clearly illustrated in Figures 5 and 7 for the purpose of engaging the frusto-conical entrance portions of the plug conductor terminals. Obviously, if found desirable one of the tongues 52 may be omitted from each receptacle of the insert, or additional tongues may be provided.

Referring to Figures 8 through 10, which disclose the third embodiment or construction to which the invention is susceptible, it will be apparent that the connector includes a sleeve member 60 which is of a rigid character and substantially corresponds to the sleeve member of the first two embodiments of the invention, except that the longitudinal aperture is restricted more or less directly at the center by an annular rib 61 which projects into the aperture to provide a pair of abutments or shoulders 62. The shoulders 62 are preferably arranged at an angle in order to provide inset seats which will better receive the locking portions provided on the insert. The insert 63 is generally cylindrical and tubular in form and is provided with plug conductor receptacles. It will be noted that the receptacles of this embodiment are not independently movable with respect to each other to the extent that the receptacles are operable in the first two embodiments, but of course, they may be modified as desired. The insert is locked in the sleeve 60 by means of a plurality of longi-

tudinally extending yieldable locking fingers 64 disposed at a predetermined location on the insert and a plurality of yieldable locking fingers 65 at another predetermined location, in spaced apart relation with respect to the plurality of fingers 64. These fingers are preferably located along the longitudinal marginal edges of the insert as clearly illustrated, and are formed by suitable cut-outs. These locking fingers project outwardly with reference to the remainder of the insert and converge toward each other.

The insert 63 may be assembled with the sleeve 60 by inserting either end of the insert into either end of the aperture in the sleeve to the position illustrated in Figure 8. If, for instance, the insert is inserted from the right to the left into the sleeve the fingers 65 will be contracted or pressed inwardly of the insert as the insert is passed through the restricted opening 66 defined by the rib 61, and when the free extremities of the locking fingers 64 engage the seat formed by the rib, the locking fingers 65 will snap outwardly to substantially engage the other abutment or seat. It will be noted that the portions of the insert opposite the locking fingers are pressed against the rib so that there is no likelihood of vibration between the insert and sleeve, and at the same time the plug conductor terminal receptacles are arranged substantially in concentric relation with respect to the aperture in the sleeve. This fact is rather important for the reason that the insert may float sufficiently to better accommodate the plug conductor terminals.

Moreover, it is to be particularly noted that the locking fingers 64 and 65 are slightly curved transversely, on a radius substantially corresponding to the radius of the insert. This strengthens the fingers and causes the extremities of the fingers to more or less take the curvature of the aperture in the sleeve 60 and thereby better cooperate with the inset seats 62. Obviously, any number of locking fingers may be provided on the insert, and if found desirable the locking fingers may be bent manually outwardly by the application of suitable tools into engagement with the abutments provided in the sleeve, instead of making the fingers of a character whereby the insert may be snapped into assembly with the sleeve or insulator.

The fourth embodiment of the invention disclosed in Figures 11 and 12, includes an insert 70 adapted for connection with a sleeve of the character illustrated in Figure 8. The insert 70 is somewhat similar to the inserts above described, and is provided with plug conductor terminal receptacles 71 and 72. The receptacle 71 is provided with a longitudinally extending continuation adjacent its inner extremity to form a locking finger 73, and the receptacle 72 is provided with a similar finger 74. These fingers are provided adjacent one of the longitudinal marginal edges of the insert and project outwardly in converging relation, in substantially the same manner as the locking fingers 64 and 65 in the third embodiment of the invention. These fingers are formed as a result of the cut-outs 75. The insert is also provided with a cut-out 76 along the longitudinal marginal edge of the insert opposite the locking fingers 73 and 74 whereby to assist in making the receptacles more yieldable. The central part of the insert apart from its longitudinal meeting edges, and substantially directly opposite to the locking fingers 73 and 74 is

provided with locking fingers 77 and 78, formed by the cut-outs 79 and 80. The locking fingers 77 and 78 project outwardly in converging relation, substantially in the same manner as the locking fingers 73 and 74. The receptacles 71 and 72 are tied together by more or less oppositely disposed narrow connecting portions 81 and 82. The insert 70 is adapted to be snapped into the insulating sleeve 60 in substantially the same manner as the other insert, so that the locking fingers 74 and 78 will engage one of the annular seats 62, and fingers 73 and 77 will engage the other annular seat. More specifically, it is to be noted in this embodiment that a space or recess is formed between the extremities of the locking fingers 73 and 74, and between the locking fingers 77 and 78, and that the recesses formed thereby are adapted to receive the rib 61. In other words, at least one side of the insert is provided with a recess which receives the rib, and a plurality of yieldable locking fingers press the insert in a direction whereby to maintain the rib seated within the recess. This embodiment of the invention is deemed very satisfactory for the reason that locking fingers in addition to locking the insert to the sleeve 60, assist in piloting the insert into the sleeve. In other words, the tongues assist in predetermining or centering the position of either of the receptacles 71 and 72 with respect to the aperture 66 defined by the rib 61, when the insert is being inserted into place.

In the fifth embodiment of the invention illustrated in Figures 13 and 14, the insert 90 is provided with receptacles 91 and 92. Near the center of the insert and intersecting one of its longitudinal marginal edges there is provided a cut-out 93, and its other longitudinal edge opposite the cut-out 93 is provided with a cut-out 94. The cut-outs 93 and 94 include the relief notches 95. The insert is also provided with longitudinally extending narrow cut-outs 96, spaced circumferentially and parallel with respect to the cut-outs 93 and 94, the material between the cut-outs being fashioned to provide outwardly extending yieldable locking fingers 97 and 98, adjacent one side of the insert, and similar locking fingers 99 and 100 adjacent the other side of the insert. These fingers are spaced apart and their extremities are adapted to cooperate with the seats 62 in the insulator 60 substantially in the same manner as the fingers in the third and fourth embodiments of the invention. Attention is directed to the fact that the locking fingers 97 through 100 are spaced predetermined distances from the longitudinal marginal meeting edges of the insert, or more specifically, at the sides of each terminal receptacle. By this arrangement, the yieldable locking tongues function to press the side walls of the receptacles toward each other, to thereby better grip the plug conductor terminals.

In view of the foregoing description, it will be evident that improved means have been provided whereby an insert member may be easily and quickly connected to an insulator member.

Having thus described my invention, it is obvious that various modifications may be made in the same without departing from the spirit of the invention; and, therefore, I do not wish to be understood as limiting myself to the exact forms, constructions, arrangements, and combinations of parts herein shown and described.

I claim:

1. Electrical connection means including, an insulator having a hole therein, a lug on the insulator projecting into the hole, insert means insertable into either end of the hole and disposed in the hole providing means to which a conductor may be secured, said insert means being provided with a pair of longitudinally extending yieldable portions projecting at an angle with reference to the axis of the member cooperating with and pressing against one side of said lug, and a pair of similar portions cooperating with the other side of said lug for holding the insulator and insert means assembled.

2. An electrical connector comprising a housing of insulating material provided with an opening extending therethrough, said opening being enlarged at its ends to form recesses joined by an intermediate restricted portion, the base of each recess forming with the restricted portion a shoulder means, insert means disposed substantially entirely within the confines of said opening and said recesses, spaced apart means provided on said insert means for receiving conductor means, one of said spaced apart means being generally of split tubular form, and the other spaced apart means being comprised of flexible portions between which a plug conductor terminal is adapted to be projected, a pair of yieldable portions provided adjacent the sides of said generally tubular conductor receiving means projecting into one recess whereby to engage one of said shoulder means for holding the insert means against movement in one direction and functioning to urge the sides of the tubular part toward each other, and a yieldable portion provided adjacent one of said flexible portions of said plug conductor terminal receiving means projecting into the other recess and engaging the other shoulder means whereby to lock the insert means in place and against movement in another direction, at least one of the said yieldable portions being adapted to snap into position when the insert means is inserted into the housing.

3. An electrical connector comprising a housing of insulating material provided with an opening extending therethrough, said opening being enlarged at its ends to provide recesses joined by an intermediate restricted portion, the base of each recess forming with the restricted portion a shoulder means, an insert disposed in said opening and recesses, spaced apart means provided on the insert for receiving conductor terminals, each of said spaced apart means comprising a pair of walls which walls are engaged by the terminals, a first pair of longitudinally extending resilient portions of said insert disposed adjacent marginal edges of said spaced apart means and operable independently thereof of projecting into one recess to engage one of said shoulder means, and a second similar pair of similarly disposed portions adjacent the other receiving means projecting into the other recess and engaging the other shoulder means whereby to lock the insert in place, at least one of said resilient portions being so constructed and arranged that the same is caused to snap into cooperation with said other shoulder means when the insert is inserted into the housing.

4. Electrical connection means including, a generally tubular insulator provided with abutment means therein, an insert means insertable into either end of the insulator and providing means to which a conductor may be secured thereto disposed in said insulator, said insert

means also having a cutout receiving said abutment means, and yieldable means provided on said insert means functioning to hold said abutment means within said cutout for locking the insert within the insulator, said yieldable means being so constructed and arranged that said insert means may be snapped into said insulator.

5. The structure set forth in claim 4 in which: the insert means is generally of a split tubular character to form at least a pair of longitudinally extending wall portions which are adapted to receive between them plug conductor terminals of the snap type; and the yieldable means is fashioned to leave a space therebetween which space constitutes the cutout in the insert means.

6. The structure set forth in claim 4 in which: the insert means is generally of a split tubular character to form at least a pair of longitudinally extending wall portions which are adapted to receive between them plug conductor terminals of the snap type; the yieldable means includes a first pair of spaced apart longitudinally extending locking portions disposed adjacent one

marginal edge defining the split in the insert means and a second pair of corresponding locking portions adjacent the other marginal edge defining the split; and the said locking portions are disposed to engage the said abutment means.

7. The structure set forth in claim 4 in which: the insert means is generally of a split tubular character to form at least a pair of longitudinally extending wall portions which are adapted to receive between them plug conductor terminals of the snap type; the yieldable means includes a first pair of longitudinally spaced apart locking portions and a second pair of locking portions corresponding to and disposed substantially diametrically opposite said first pair in the sides of the said walls apart from the marginal edges defining the split; and the locking portions are engageable with the insulator in a manner whereby the said walls are caused to be urged toward each other to increase the clamping action upon the plug conductor terminals when they are introduced between the said walls.

CHARLES S. PENFOLD.