May 9, 1939. H. A. DOUGLAS 2,158,003

ELECTRICAL CONNECTION MEANS

Filed Jan. 4, 1936

Fig. 1

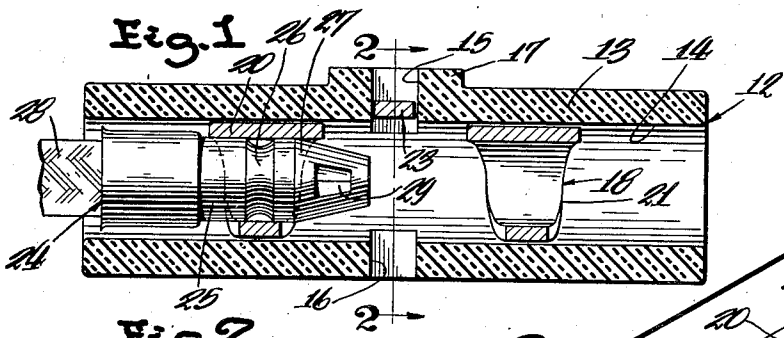


Fig. 2

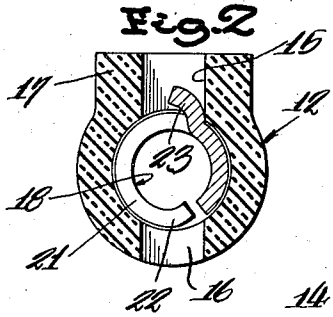
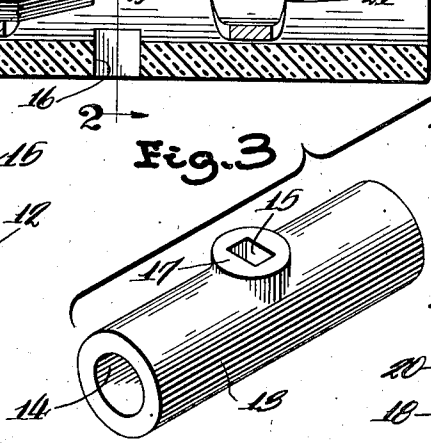


Fig. 3



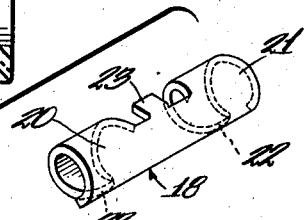


Fig. 4

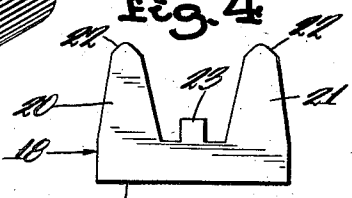
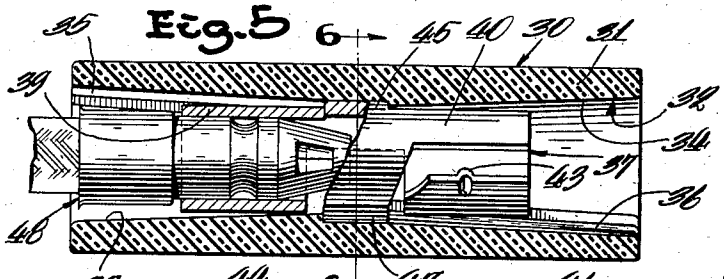


Fig. 5



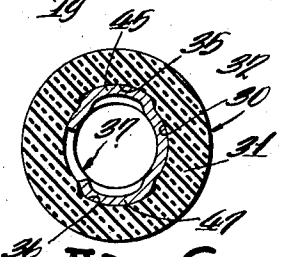


Fig. 6

Fig. 7

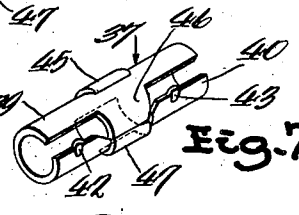


Fig. 8

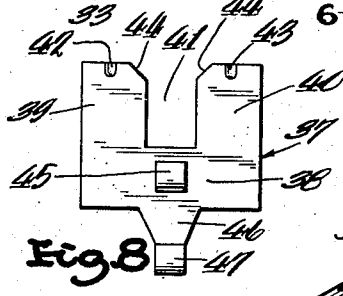
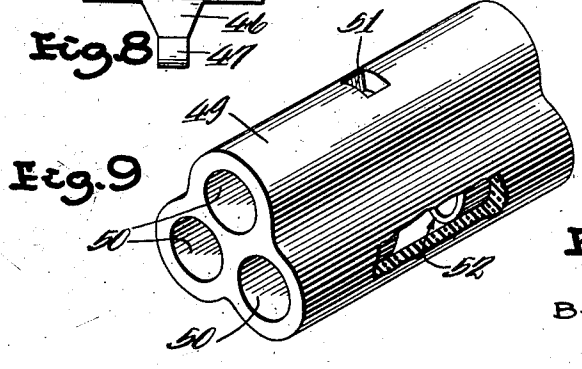




Fig. 10

Fig. 9



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UNITED STATES PATENT OFFICE

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ELECTRICAL CONNECTION MEANS

Harry A. Douglas, Bronson, Mich., assignor to Kingston Products Corporation, a corporation of Indiana

Application January 4, 1936, Serial No. 57,620

20 Claims. (Cl. 173—328)

My invention relates to electrical connection means, and more particularly, to electrical connection means adapted for the reception of plug conductor terminals of the snap type. The principal object of my invention is to provide new and improved electrical connection means of these types.

This application is a continuation in part of my prior application Serial Number 714,080 filed March 5, 1934, a continuation in part of my earlier application Serial Number 574,271, filed November 11, 1931, and issued April 3, 1934, Patent 1,953,593.

In the drawing accompanying this specification and forming a part of this application, I have shown for purposes of illustration, several forms which my invention may assume, and in this drawing:

Figure 1 is a longitudinal sectional view of one embodiment of my invention, showing in addition, a conductor terminal plug, in elevation, cooperating with a part of the embodiment,

Figure 2 is a section corresponding to the line 2—2 of Figure 1,

Figure 3 is a perspective view of the embodiment shown in Figures 1 and 2, showing the parts thereof in disassembled relation and drawn to a reduced scale,

Figure 4 is a development of the conducting means forming part of the embodiment shown in Figures 1, 2 and 3,

Figure 5 is a longitudinal sectional view of a different embodiment of my invention, with parts fragmentarily shown in elevation, and including, in addition, a conductor terminal plug cooperating with a part of the embodiment,

Figure 6 is a section corresponding to the line 6—6 of Figure 5,

Figure 7 is a perspective view, drawn to a reduced scale, of the conducting means forming part of the embodiment shown in Figures 5 and 6,

Figure 8 is a development of the conducting means,

Figure 9 is a perspective view, broken away in parts, of another embodiment of my invention, and

Figure 10 is a transverse sectional view taken centrally of the embodiment shown in Figure 9.

Referring particularly to Figures 1 through 4, the embodiment of the invention disclosed therein comprises a receiving means, designated generally by the numeral 12. The receiving means 12 includes a tubular member 13, here shown to be of cylindrical form, and preferably made of suitable electrical insulating material. The member 13 is provided with a longitudinal aperture 14, and intermediate its ends, the member 13 is formed with a pair of apertures 15 and 16, desirably oppositely disposed as shown. The apertures 15 and 16 are preferably of rectangular shape, for a purpose that will presently appear. Surrounding the aperture 15 is a boss 17 formed integrally with the member 13 and projecting laterally therefrom.

Disposable within the member 13 is an electrical current conducting means 18, here shown to be of generally tubular form, and having an outside dimension substantially equal to the diameter of the longitudinal aperture 14. As best shown in development in Figure 4, the conducting means 18 is preferably formed of a flat piece of resilient electric-current conducting material, having a longitudinal margin 19, and laterally projecting portions 20 and 21, each portion tapering toward the center thereof, and adjacent their extremities, the portions 20 and 21 taper rather abruptly toward their respective centers, as shown at 22. Intermediate the portions 20 and 21, the conducting means 18 is provided with a tongue 23 of less lateral extent than the portions 20 and 21. The flat piece of metal may be formed by a suitable forming or stamping operation, and the metal is then shaped to substantially cylindrical form, as best shown in Figure 3. In the cylindrical form, the portions 20 and 21 are substantially circular in transverse cross-section, with the extremities thereof disposed adjacent the longitudinal margin 19, and the portion of the conducting means 18 intermediate the portions 20 and 21 being bent to arcuate shape generally concentric with the circularly shaped portions. As shown in Figure 2, the extremities of the portions 20 and 21 adjacent the abruptly tapering parts 22 are bent radially inwardly.

To assemble the conducting means 18 with the tubular member 13, the conducting means 18, after being properly formed, is inserted into the longitudinal aperture 14 of the member 13, from either end, until the tongue 23 is disposed adjacent the aperture 15. A suitable tool (not shown) may be inserted through the oppositely disposed aperture 16, or through either open end of the tubular member, and the tongue 23 may be pressed or struck inwardly of the aperture 15, as shown in Figure 2. The tongue 23 engages the margins of the rectangular aperture 15 to prevent relative movement of the conducting means with respect to the tubular member 13. Although the tongue 23 does not engage all four

margins of the aperture 15, as shown in Figure 2, it will be evident that the tongue may be proportioned, if desired, so as to abut all of the margins of the aperture 15. Also, it is possible to dispose the tongue 23 in the aperture 16, or to provide the conducting member 18 with two tongues and dispose one in each of the apertures 15 and 16.

In Figure 1 is shown an electrical conductor terminal plug 24, in cooperative relation with the cylindrical portion 20. The terminal plug 24 is formed with a generally cylindrical portion 25 having an annular furrow 26 formed therein, and terminating in a frusto-conical end 27. An electric conductor 28, disposed within the terminal plug 24, may have its bared end swedged to the terminal plug as suggested by the swedge indentations 29 in the frusto-conical end 27.

Assuming that it is desired to electrically connect an electrical conductor to the conductor 28, the former conductor, which is preferably also provided with a terminal plug similar to the terminal plug 24, is inserted into the loop formed by the circular portion 21, the frustro-conical end of the terminal plug bearing against the radially inwardly bent extremity of the portion 21, and further insertion causes this extremity to be cammed outwardly until the annular furrow of the terminal plug is disposed adjacent the abruptly tapered part 22 of the portion 21, whereupon the part 22 will snap into the annular furrow and mechanically and electrically hold the terminal plug in assembled relation. Removal of the electrical conductor 28, or the electrical conductor engageable with the portion 21, may be effected by pulling on the respective electrical conductor, such pulling force causing the annular furrow to cam the radially inwardly bent part to permit the withdrawal of the terminal plug. It will be appreciated that the conducting means 18 is proportioned to fit within the tubular member 13 so that the portions 20 and 21 may be properly cammed to permit the insertion and removal of the terminal plugs.

Referring to Figures 5 through 8, the embodiment of the invention therein disclosed, comprises a conductor terminal receiving means 30, including a tubular member 31, preferably formed of insulating material. In this instance, the member 31 is provided with a longitudinal aperture 32, tapering from the opposite ends of the member 31, as shown at 33 and 34, to a reduced diameter at the central portion thereof. Each of the tapered portions 33 and 34 is provided with a longitudinal recess, here shown to be arcuate grooves 35 and 36 respectively formed on diametrically opposite portions of the longitudinal aperture 32, and each groove extends beyond the central portion of the member 31, as shown in Figure 5.

Disposable within the tubular member 31 is an electrical current conducting means 37, here shown to be of generally tubular form, and having an outside diameter substantially equal to the smallest diameter of the longitudinal aperture 32. As best shown in development in Figure 8, the conducting means 37 is preferably formed of a flat piece of resilient electric-current conducting material. The flat piece of material has a substantially elongated part 38, and projecting from one side of the elongated part 38 are portions 39 and 40, the inwardly directed margins of which are spaced apart to provide a recess 41. Adjacent their extremities, each portion is formed with detent elements 42 and 43, displaced from the surface of the respective portions, and here shown to be pressed into arcuate shape. The inner margins of the portions 39 and 40 are preferably beveled, as shown at 44.

Intermediate the elongated part 38, the flat piece is formed with an abutment 45 displaced from the surface in a direction opposite to that of the detent elements 42 and 43, and shown to be pressed into arcuate shape to conform substantially to the shape of the grooves 35, 36. Projecting from the side of the elongated part opposite to that of the portions 39 and 40, is a centrally disposed tail-piece 46, having its margins converging to a reduced portion 47, here shown to be displaced from the surface in the same direction as the abutment 45, and shaped to conform substantially to the shape of the grooves 35, 36. In this form, the portion 47 is adapted to operate as an abutment.

The flat piece may be formed as hereinbefore just described, as by a suitable forming or stamping operation, and the piece is then shaped to generally cylindrical form, as best shown in Figure 7, the end portions 39 and 40 being shaped to generally circular form in transverse section, with the adjacent terminal margins stopping short of abutment, and the portion of the elongated part 38 intermediate the portions 39 and 40 being bent to arcuate shape generally concentric with the portions 39 and 40. As shown, the abutments 45, 47 extend from the transverse outline of the conducting means 37.

The conducting means 37 may be inserted into the aperture 32 of the tubular member 31, and from either end thereof. One of the abutments, for instance the abutment 45 may be aligned with the groove 35, and relative axial movement between the member 31 and the conducting means 37 will cause the abutment 45 to longitudinally traverse the groove 35, and the opposite abutment 47 to bear against the tapering wall of the aperture 32 and be moved radially inwardly, until the abutment 47 is moved adjacent the central portion of the tubular member 31, whereupon the abutment 47 will snap into the groove 36, and the abutments 45 and 47 will cooperate with the grooves 35 and 36 to prevent axial movement between the tubular member 31 and the conducting means 37. It will be appreciated that the width of the abutments 45 47 is substantially equal to the overlap of the longitudinal grooves 35, 36.

A terminal plug 48, similar to the terminal plug 24, may be assembled with either end of the conducting member 37, or plugs may be inserted in both ends. As shown in Figure 5, the terminal plug 48 is already assembled with the portion 39, and to electrically and mechanically connect the electrical conductor of this plug with an electrical conductor of another similar plug, the latter plug may be inserted into the loop formed by the circular end 0, the detent element 43 bearing against the frustro-conical end of the plug, and relative inserting movement will cause the free end of the portion to be moved radially outwardly to provide for the passage of the circular portion of the terminal plug, the detent element 43 snapping into the annular furrow formed in the terminal plug. Withdrawal of the terminal plugs may be effected by pulling on the electrical conductor, such pulling force causing the annular furrow of the plug being withdrawn to cam the adjacent detent element outwardly to permit removal of the plug.

Referring to Figures 9 and 10, the embodiment

of the invention therein disclosed comprises an electrical insulating member 49, having a plurality of longitudinal apertures formed therein. In this instance, three longitudinal apertures 50 are shown, the apertures being spaced centrally of the member and generally 120 degrees apart. Each of the apertures 50 communicates with a centrally located transverse aperture 51 leading to the outer surface of the member 49.

Disposable in each aperture 50 is an electrical conductor means 52, here shown to be similar to the conducting means 18 disclosed in Figures 1 through 4. As before, each of the conducting means 52 is formed with a tongue 53 adapted to be pressed into abutting relation with the margins of the transverse apertures 51 to hold the respective conducting means 52 in position in its aperture 50. It will be understood that in place of the conducting means 52, a conducting means similar to the conducting means 31 may be used, in which case the longitudinal apertures 50 will be formed in a manner similar to the aperture 32 shown in Figures 5 through 8. This embodiment of the invention is preferable when it is desirable to connect a plurality of pairs of conductors, the conductors, as before, being preferably provided with terminal plugs cooperable with the conducting means 52.

From the foregoing it will be apparent to those skilled in the art that the illustrated embodiments of my invention provide a new and improved electrical connection means, economical in construction and assembly, and accordingly, accomplish at least the principal object of my invention. It further will be obvious to those skilled in the art that the illustrated embodiments of my invention may be variously changed and modified without departing from the spirit of my invention, or sacrificing all of the advantages thereof, and that accordingly, the disclosure herein is illustrative only, and my invention is not limited thereto.

I claim:

1. Connecting means for electrical conductors, comprising: a member, having a generally longitudinal aperture, and also having a generally transverse recess; and current conducting means disposed within said longitudinal aperture, and having an intermediate transverse portion partially interrupted; a tongue formed at said interrupted portion, adapted to be bent into said transverse recess, and when so bent, being engageable with the margins of said recess to hold said member and said conducting means in assembled relation; and end portions, formed by said interrupted portions, said end portions being transversely curved, and providing means to yieldably engage and hold a conductor terminal.

2. Connecting means for electrical conductors, comprising: a member, having a generally longitudinal aperture formed with radially spaced longitudinal grooves extending inwardly from opposite ends of said member, each terminating intermediate the ends of said member; and current conducting means disposed within said longitudinal aperture, and having abutments constructed and arranged to engage the terminating margins of said grooves, thereby to hold said member and said conducting means in assembled relation.

3. Connecting means for electrical conductors, comprising: a body having a chamber having an entrance opening; a generally tubular current-conducting member so constructed and arranged and so disposed in said chamber that it forms a jack adapted to yieldably grip a conductor terminal thrust thereinto through said entrance opening, said member having at least a portion longitudinally split, said portion being transversely expansible and contractable by flexure of said portion changing the relative position of the margins of the split; and means, interlocking said body and said member, comprising cooperating abutment surfaces of said chamber and of said member extending transversely of said tubular member and so constructed and arranged that by telescoping movement of said member and said chamber while at least said portion of said member is so contracted, said member and said body are brought into assembled position in which such expansion of at least said portion causes interlocking of said member and said body, and when in interlocking relation said member is positively held interlocked with said body by said cooperating surfaces against forces due to insertion or withdrawal of a conductor terminal into or from said jack.

4. Connecting means for electrical conductors, comprising: a body having a chamber having an entrance opening; a generally tubular current-conducting member so constructed and arranged and so disposed in said chamber that it forms a jack adapted to yieldably grip a conductor terminal thrust thereinto through said entrance opening, said member having at least a portion longitudinally split, said portion being transversely expansible and contractable by flexure of said portion changing the relative position of the margins of said split; and means, interlocking said body and said member, spaced from said entrance opening and disposed at a place where said body is imperforate, and comprising cooperating abutment surfaces of said chamber and said member extending transversely of said tubular member and so constructed and arranged that by telescoping movement of said member and said chamber while at least said portion of said member is contracted, said member and said body are brought into assembled position in which such expansion of at least said portion causes interlocking of said member and said body, and when in interlocking relation said member is positively held interlocked with said body by said cooperating surfaces against forces due to insertion or withdrawal of a conductor terminal into or from said jack.

5. Connecting means for electrical conductors, comprising: a body having a chamber having entrance openings at opposite ends of said body; a generally tubular current-conducting member so constructed and arranged and so disposed in said chamber that said member forms oppositely-directed jacks adapted to yieldably grip conductor terminals thrust thereinto through said entrance openings, said member having at least a portion longitudinally split, said portion being transversely expansible and contractable by flexure of said portion changing the relative position of the margins of said split; and means, interlocking said body and said member, disposed intermediate said entrance openings at a place where said body is imperforate, and comprising cooperating abutment surfaces of said chamber and said member extending transversely of said tubular member and so constructed and arranged that by telescoping movement of said member and said chamber while at least said portion of said member is so contracted, said member and said body are brought into assembled position in which such expansion of at least

said portion causes interlocking of said member and said body, and when in interlocking relation said member is positively held interlocked with said body by said cooperating surfaces against forces due to insertion or withdrawal of conductor terminals into or from said jacks.

6. Connecting means for electrical conductors, comprising: a body having a chamber having an entrance opening; a generally tubular current-conducting member disposed in said chamber and having two pairs of portions longitudinally split, at least one pair providing a jack adapted to yieldably grip a conductor terminal thrust thereinto through said entrance opening; at least a plurality of said portions being transversely expansible and contractable by flexure of said portions changing the relative position of the margins of a split; and means, interlocking said body and said member, comprising cooperating abutment surfaces of said chamber and of said member extending transversely of said tubular member and so constructed and arranged that by telescoping movement of said member and said chamber while at least one of said portions of said member are so contracted, said member and said body are brought into assembled position in which such expansion of at least a plurality of said portions causes interlocking of said member and said body, and when in interlocking relation said member is positively held interlocked with said body by said cooperating surfaces against forces due to insertion or withdrawal of a conductor terminal into or from said jack.

7. Connecting means for electrical conductors, comprising: a member, having an aperture preformed with longitudinal grooves in its walls extending inwardly from opposite ends of said aperture; said grooves terminating in shoulders within said member; and current conducting means disposed within said aperture, having means adjacent its extremities for receiving and resiliently retaining conductor terminal means, said conducting means being provided with oppositely disposed yieldable abutments cooperable with said shoulders whereby to hold said member and said conducting means in assembled relation.

8. Connecting means for electrical conductors, comprising: a rigid one piece body of insulating material having a chamber having entrance openings at opposite ends of said body, said chamber being formed with abutment surfaces intermediate its ends; and a generally tubular current-conducting member substantially cylindrical throughout its length, disposed within said chamber, and having its end portions constructed and arranged to form oppositely-directed jacks each adapted to receive and yieldably hold conductor terminals independently of the other, and said member being provided with integral abutment surfaces adjacent the inner extremities of said jacks constructed and arranged to engage said chamber abutment surfaces providing the sole means to positively hold said member against axial movement within said chamber in either direction.

9. Connecting means for electrical conductors, comprising: a one piece body of insulating material having a chamber having entrance openings at opposite ends of said body; a generally tubular current-conducting member insertable through either of said entrance openings so constructed and arranged and so disposed in said chamber that said member forms oppositely-directed jacks adapted to independently yieldably grip conductor terminals thrust thereinto through said entrance openings; and means, interlocking said body and said member, comprising cooperating abutment surfaces, which are respectively integral portions of said chamber and of said member, extending transversely of said tubular member between said jacks and so constructed and arranged that by telescoping movement of said member and said chamber, said member and said body are brought into interlocking relation, and when in interlocking relation said member is positively held interlocked with said body by said cooperating surfaces against forces due to insertion or withdrawal of conductor terminals into or from said jacks.

10. Connecting means for electrical conductors, comprising: a member, having a generally longitudinal aperture, and also having a generally transverse abutment; and a one piece current conducting means disposed within said longitudinal aperture,, and having an intermediate transverse portion partially interrupted; integral means formed adjacent said interrupted portion, adapted to be pressed to interlock with said transverse abutment, and when so pressed, being engageable with the walls of said abutment to hold said member and said conducting means in assembled relation; and resilient end portions formed by said interrupted portions, said end portions being transversely curved, and providing the sole means to yieldably engage and hold a conductor terminal.

11. Connecting means for electrical conductors, comprising: a one piece body, having a chamber having entrance openings at opposite ends of said body, said chamber being formed with abutment means intermediate its ends; and a one piece generally tubular current-conducting member, disposed entirely within said chamber, and having its end portions so constructed and arranged that they are individually resiliently radially movable, said end portions being adapted to engage and yieldably hold conductor terminals in said chamber, the intermediate portion of said member being provided with integral abutment means bent to engage said chamber abutment means to hold said member in predetermined assembled relation with respect to said body against axial movement in either direction.

12. Connecting means for electrical conductors, comprising: a body having a chamber having an entrance opening; a generally tubular current-conducting member so constructed and arranged and so disposed in said chamber that it forms a jack adapted to yieldably grip a conductor terminal thrust thereinto through said entrance opening, said member having at least a portion longitudinally split, said portion being expansible by flexure of said portion changing the relative position of the margins of said split; and means, interlocking said body and said member, spaced from said entrance opening, comprising cooperating abutment surfaces of said chamber and said member extending transversely of said tubular member and so constructed and arranged that by telescoping movement of said member and said chamber said member and said body are brought into assembled position in which expansion of at least said portion causes interlocking of said member and said body, and when in interlocking relation said member is positively held interlocked with said body by said, cooperating surfaces

against forces due to insertion or withdrawal of a conductor terminal into or from said jack.

13. An electrical connecting device consisting of two members; one being a generally tubular open ended body of insulating material; the other being a circuit continuing member insertable through either end of said body to a predetermined position entirely therewithin, and having an integral resilient portion adapted to hold a conductor terminal to said body; a recess provided intermediate the extremities of one of said members; and short means integral with and projecting from a side of the other whereby said means may be distorted into said recess to positively and permanently lock said members together.

14. An electrical connecting device consisting of two members of generally tubular formation adapted to be inseparably connected; one being an open ended body of insulation; the other being a circuit continuing member insertable through either end of the body to a predetermined position entirely therewithin; and means for locking the members in permanent assembly, including cooperative means provided on one member, and short means integral with and projecting from a side of the other member into permanent interlocking relation with said cooperating means; both of said means being substantially incapable of movement with respect to each other and to the members once the parts are locked in assembly.

15. An electric connector comprising a single piece of insulating material provided with an aperture extending therethrough, the material intermediate the extremities of said aperture being constructed to provide substantially rigid shoulders, an insert of generally cylindrical tubular formation disposed entirely within said aperture, said insert being formed with resilient portions adjacent each extremity providing a receptacle for receiving a plug conductor having a groove therein, and a detent arranged in each receptacle whereby said resilient portions cooperate to press said detent into said terminal groove, and oppositely disposed spaced apart integral portions provided on said insert engageable with said shoulders whereby to hold said piece and said insert in assembly.

16. An electric connector comprising a single piece of insulating material provided with an aperture extending therethrough, said aperture being enlarged at its ends to form recesses joined by an intermediate portion to provide shoulders, an insert of generally cylindrical tubular formation disposed in said aperture, said insert being formed with at least one resilient portion adjacent each extremity providing a receptacle for receiving a plug conductor terminal having a groove threin, and a detent arranged in each receptacle whereby said resilient portions cooperate to press said detents into said terminal grooves, at least a pair of spaced apart integral portions of said insert projecting into engagement with said shoulders whereby to hold said piece and said insert in assembly.

17. An electric connector comprising a single piece of insulating material provided with an aperture extending therethrough, said aperture being enlarged at its ends to form recesses joined by the intermediate portion of said material, the inner extremity of each recess forming with said intermediate portion a shoulder, an insert of generally cylindrical tubular formation disposed in said aperture, said insert being provided with at least a pair of resilient portions at least one of which provides a receptacle for receiving a plug conductor terminal having a groove therein, and a detent arranged in said receptacle whereby said resilient portion is adapted to press said detent into said terminal groove, an integral portion of said insert adjacent one end of said resilient portions projecting into engagement with one of said shoulders, and another integral portion of said insert located near one of the ends of the other resilient portion adjacent the other extremity projecting into engagement with the other shoulder whereby said integral portions hold said piece and said insert in assembly.

18. An electrical connector comprising a single piece of insulating material provided with an aperture extending therethrough, a pair of spaced apart shoulders arranged intermediate the ends of said piece within its confines, an insert of generally cylindrical tubular formation disposed in said aperture, said insert being formed with portions adjacent each extremity providing a receptacle for receiving and yieldably retaining a conductor terminal having a groove therein, a detent arranged in each receptacle with at least one of said portions acting to press said detent and said groove into cooperation, a pair of oppositely disposed spaced apart projection means formed on said insert projecting substantially in engagement with said shoulders whereby to hold said piece and said insert in assembly.

19. An electrical connection comprising a single piece of insulating material provided with an aperture extending therethrough, said aperture being enlarged at its ends to form recesses, the material between said recesses forming a pair of shoulders, an insert of generally cylindrical tubular formation disposed in said piece of insulating material, said insert being formed with a resilient portion at each extremity thereof, said resilient portions providing receptacles for receiving a plug conductor terminal having a groove therein, and a detent arranged in each receptacle to cooperate with said terminal groove, portions of said insert engaging said shoulders, whereby to hold said piece of insulating material and said insert in assembled relation.

20. An electrical connector comprising a single piece of insulating material provided with an aperture extending therethrough, said aperture being enlarged at its ends to form recesses, the material between said recesses forming a pair of shoulders, an insert of generally tubular formation disposed in said piece of insulating material, and insertable through either end of said aperture to a predetermined position, said insert being provided with means to which a conductor may be secured, and spaced apart resilient means provided on said insert engageable with said shoulders when said insert is moved to said predetermined position within said piece of insulating material.

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