

May 11, 1943.

C. S. PENFOLD

2,318,649

ELECTRICAL CONNECTION MEANS

Filed March 29, 1939

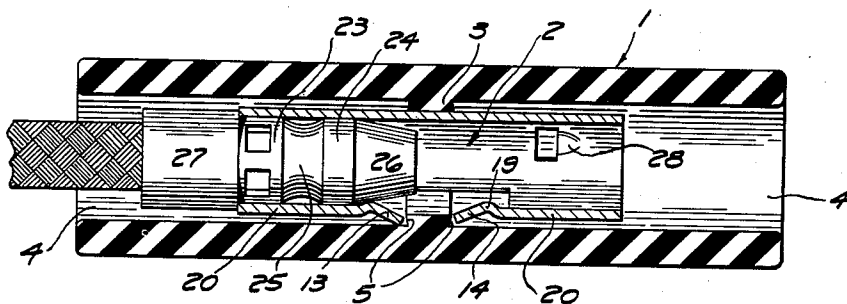


FIG. 1

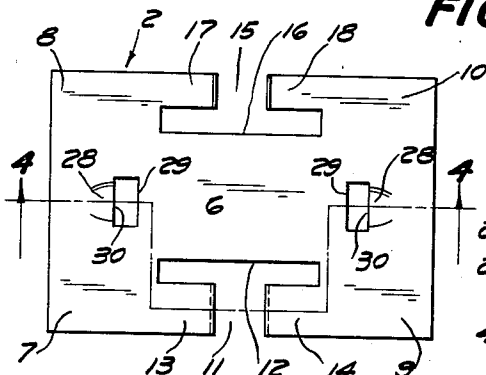


FIG. 3

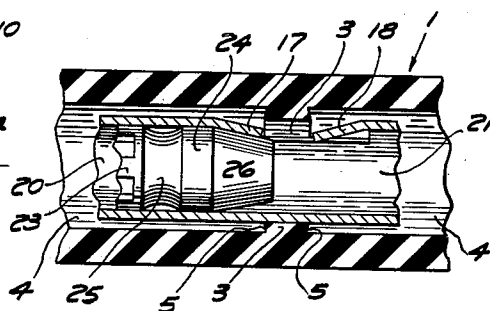


FIG. 2

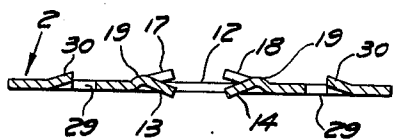


FIG. 4

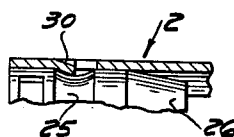


FIG. 5

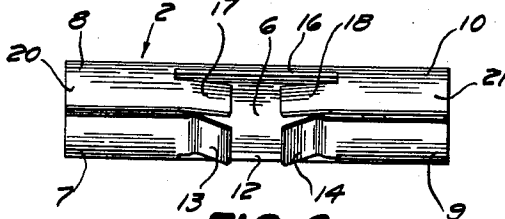


FIG. 6

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2,318,649

ELECTRICAL CONNECTION MEANS

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Application March 29, 1939, Serial No. 264,830

16 Claims. (Cl. 173—328)

This invention relates generally to electrical connection means, known in the trade as line connectors, which are adapted to receive conductor terminals.

The principal object of this invention is to provide improved electrical connection means, and more particularly a connector which is preferably comprised of two members, an outer tubular sleeve of insulating material, and an inner metallic insert or circuit continuing member adapted to receive the conductor terminals.

One particular object is to provide a connector in which the parts thereof may be easily and quickly assembled without the aid of special tools.

Another object is to provide improved means whereby to lock the insert in place within the sleeve of insulating material, and the permanency of the locking action is more completely established or assured when terminals are associated with the metal insert.

A still further object of the invention is to provide resilient extensions on the insert member whereby to increase the contact surface or area between the insert and the terminals so as to avoid as much as possible the millivolt drop.

Other objects and advantages of the invention will appear hereinafter.

In the drawing accompanying this specification and forming a part of this application, there is shown for the purposes of illustration, one of the many forms which the invention may assume, and in the drawing:

Figure 1 is an enlarged longitudinal sectional view of the invention, clearly showing the parts of the connector assembled;

Figure 2 is a partial sectional view of a part of the assembly shown in Figure 1;

Figure 3 is a surface development, showing more in detail the design and construction of the insert or circuit continuing member;

Figure 4 is a sectional view taken substantially on line 4—4 of Figure 3, showing certain details;

Figure 5 is a partial sectional view of the connector, showing certain details;

Figure 6 is a view of the development shown in Figure 3, formed into tubular shape for entry into the sleeve member.

Referring to the drawing, numeral 1 represents the outer tubular sleeve member, constructed of some suitable insulating material, such as phenolic condensate, and 2 represents the insert or metallic circuit continuing member, which is also preferably tubular in form.

The sleeve is preferably made cylindrical in

form, and provided with an internal annular portion 3 intermediate its extremities, and a cylindrical recess 4 adjacent each side of the annular portion. Said portion 3 is provided with a circular aperture of a diameter slightly less than the diameters of the recesses 4, and communicates with the latter. The arrangement is such that a pair of spaced apart shoulders or abutments 5 are provided. In other words, the base of each recess 4 is provided with a shoulder, and communication between said recesses is established by the provision of an aperture extending through a restricted portion or partial partition between said recesses.

As clearly shown, the diameter of the aperture in the portion 3 is preferably slightly greater than the diameter of the insert, so as to more or less snugly receive the intermediate central portion of the insert, and the recesses are of such a size to permit free action or movement of the opposite substantially free extremities of the insert.

Referring particularly to the development and section shown in Figures 3 and 4, the insert is preferably made rectangular in shape and includes a central body portion 6. A pair of oppositely disposed laterally projecting wing portions or blade-like legs 7 and 8 are provided adjacent one extremity or end of portion 6, and a pair of wing portions 9 and 10 corresponding to the portions 7 and 8, respectively, are provided adjacent its other extremity. Adjacent each side of the insert, there is preferably provided a substantially T-shaped opening in order that each extremity of the insert takes substantially the form of a letter T.

The T-shaped opening, adjacent one side of the insert, includes a transverse recess 11 which intersects the side margin and a substantially rectangular slot 12, which slot extends substantially parallel to the longitudinal axis of the insert. As a result of this opening, the wing portion 7 is provided with a substantially rectangular continuation, extension, or tongue 13, and the wing portion 9 with a similar tongue 14. The continuations or tongues 13 and 14, as clearly shown, lie opposite and extend outwardly and angularly toward each other, and provide means whereby to lock the insert within the sleeve. The base of each tongue is preferably provided with a projection or cam 15, which extends inwardly of the insert in a direction opposite to that of the free extremities of the tongues. The purpose of the cams 15, and function of the tongues, will be described later.

The other or opposite side of the insert, is preferably provided with a T-shaped opening, including a recess 15 and a slot 16, which substantially correspond in shape and size to the recess 11 and slot 12, respectively, above referred to, and as a result, the wing portions 8 and 10 are provided with continuations or tongues 17 and 18, respectively. These tongues are preferably bent inwardly in a direction opposite to that of the tongues 13 and 14, and the purpose of these tongues will be described later. The tongues 17 and 18 herein shown, are of a width slightly less than the width of the tongues 13 and 14, but it is to be distinctly understood that they may be of the same or of a greater width than the tongues 13 and 14, and the same applies to the latter tongues. Since the metal insert is preferably constructed of some desirable resilient material, it is obvious that all of the continuations or tongues 13, 14, 17, and 18, are of a resilient character; and in any event, the shape and size of the various tongues are of such a character that they perform the functions intended.

When the insert is rolled up into substantially tubular cylindrical form, as shown in Figure 6, the portions 7 and 8 provide a receptacle 20, and the portions 9 and 10, a receptacle 21. Each receptacle is adapted to preferably resiliently receive and retain a conductor terminal of the plug conductor type, such as 23, located in receptacle 20, as shown in Figure 1. In view of the fact that certain portions of the insert are interrupted by the T-shaped openings, the receptacles 20 and 21 are normally operable independently of each other so that insertion or withdrawal of a terminal with respect to one receptacle will not, in any way, substantially effect the insertion or release of a terminal with respect to the other receptacles. Also, the recesses 4 above referred to, provide sufficient clearance to permit the receptacles to expand without interference.

The plug conductor 23 is provided with a cylindrical portion 24, having a detent groove or cove 25 intermediate its extremities. The entrance end 26 of each terminal is preferably frusto-conical, and the opposite end or skirt 27 is substantially cylindrical, and of a diameter slightly greater than the remaining portions of the terminal, so as to provide among other things, a sleeve to receive the insulation on the conductor.

A pair of inwardly extending detents 28 are provided on the insert for cooperation with the detent, coves or grooves of the terminals. Each detent 28 is preferably formed by cutting out a portion of the insert as at 29, and thereafter deforming a margin of the aperture so as to provide a lip 30, which is adapted to bite into the groove 25 of a terminal. Obviously, detents of a character different than those just described may be employed, and may be otherwise disposed, for example, adjacent the marginal side edges of the insert, but in any event, it is desirable that each detent be located at a point to engage the groove in a terminal when the terminal is moved to its innermost position within the insert, such position being predetermined by the skirt portion 27 of each terminal engaging an end of the insert. In other words, the skirt provides a stop to predetermine the position of the groove with respect to a detent.

As above referred to, one object of the invention is to provide improved means whereby the sleeve and insert may be easily and quickly assembled without the aid of special tools, and such

assembly is accomplished by first inserting one extremity of the insert into one of the recesses 4 of the sleeve and the aperture provided in the annular or restricted portion 3. Further insertion will cause one of the preformed resilient tongues, for example 13, to be contracted by engaging and riding over the annular portion 3, until the extremity of the tongue passes the shoulder or abutment 5, whereupon said tongue 13 will snap outwardly substantially into engagement with said abutment. Each abutment is preferably undercut as shown, in order to more fully insure that the extremities of the locking tongues will be caught in place. The other tongue 14 is adapted to substantially engage the other abutment to provide a stop in order to predetermine the location of the tongue 13, with respect to the abutment it is adapted to engage. As clearly shown, the space between the free extremities of the tongues 13 and 14 is slightly greater than the longitudinal extent of the annular portion 3 of the sleeve; and the tongues and the restricted portion 3 are so constructed and arranged with respect to each other that the tongues securely lock the insert in place and prevent vibration between the sleeve and the insert. Also, it is apparent that either extremity of the insert may be inserted into either of the recesses 4 for assembly with the sleeve, and that in either event one or the other of the tongues 13 and 14 is adapted to provide a stop to predetermine the position of the tongue that happens to be contracted and expanded.

In order to further insure an improved lock or positive connection between the sleeve and insert members, it has been found desirable to provide each of the continuations or tongues 13 and 14 with the projection or cam 19, above referred to, so that when a terminal is inserted into each of the receptacles 20 and 21, the frusto-conical or tapered portion 26 of each terminal will engage a cam and urge the tongue outwardly into engagement with the inner wall of a recess 4 for better engagement with one of the abutments 5, as shown in Figure 1. In other words, the cams 19 provide additional or auxiliary means for supplementing the locking action first established. This figure also shows the position of tongue 14 before it is depressed by a terminal.

As previously mentioned, each of the receptacles 20 and 21 is preferably of tubular cylindrical form, and adapted to resiliently engage the cylindrical portion of the terminal, but in order to obtain additional contact area between the terminals and the insert, or in other words decrease the millivolt drop, the continuations or tongues 17 and 18 are provided and adapted to resiliently engage the portion 26 of the terminals, as clearly shown in Figure 2. Obviously, the insert might well be provided with resilient portions other than the tongues 17 and 18 for increasing the contact area; also, if found desirable, the tongues 17 and 18 may be entirely omitted, especially in view of the fact that the projections or cams 19 on the tongues 13 and 14 assist to increase the contact area between the terminals and insert to materially reduce the millivolt drop.

It should also be noted that all of the tongues above referred to also assist to press the coves or grooves of the terminals into cooperation with the detents 28 provided in the base portion 6 of the insert.

In view of the foregoing, it is apparent that improved means are provided whereby the electrical connection means of the character above re-

ferred to, may be easily and quickly assembled together without the use of special tools; that means are provided whereby to increase the contact area between the terminals and insert, and means whereby to more completely establish a satisfactory lock or connection for securing the insert and sleeve together. Moreover, it is evident that the receptacles of the insert are substantially operable independently of each other, and that the length of the outer sleeve of insulating material is of such a length that its extremities project beyond the skirt portions of the terminals, in order to prevent the skirt portions of the terminals from coming in contact with some metal object and avoid a possible short circuit.

Having thus described my invention, it is obvious that various immaterial 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 form, construction, arrangement, and combination of parts herein shown and described.

I claim:

1. Electrical connection means, including a tubular member of insulating material, an abutment provided within the confines of said member, an insert member arranged within said tubular member, the opposite extremities of said insert member providing receptacles adapted to engage conductor terminals, oppositely disposed resilient portions provided on said insert engaging said abutment for locking said members together, means projecting from said resilient portions adapted to engage portions of said terminals, and additional resilient portions projecting laterally of said insert also engaging portions of said terminals.

2. Electrical connection means, including a one piece tubular open ended member of insulating material having a restricted intermediate inner portion, an insert member having tubular receptacles for receiving conductor terminals insertable through either end of said member to a predetermined position therewithin, projecting resilient means extending from each receptacle toward each other provided adjacent one side of said insert engaging said inner portion for locking said members together, and angular resilient means provided adjacent the other side of said insert for resiliently engaging said conductor terminals.

3. Electrical connection means, including a one piece tubular member of insulating material having a restricted intermediate inner portion, an insert member having split cylindrical tubular portions for receiving and resiliently retaining conductor terminals arranged within said tubular member, tongue means provided on said insert engageable with said inner portion for locking said members together, and cam means provided on said tongue means engageable by said terminals providing additional means supplementing the locking action produced by said locking means.

4. Electrical connection means, including a tubular member of insulating material having an abutment disposed therein, an insert member having curved movable portions for receiving and resiliently retaining conductor terminals arranged within said tubular member, resilient means provided on said insert engaging said abutment for locking said members together, and angular resilient means provided on said insert, said locking means and said last angular resilient means being constructed and arranged to engage

portions of said terminals not engaged by the said curved portions of said insert.

5. A split tubular current conducting member, and a slot and a recess interrupting one side of said member to provide a pair of spaced apart resilient tongues projecting laterally from one side of the material from which the tongues are formed and angularly toward each other for locking the member with respect to a support.

6. Electrical connection means, including a tubular member of insulating material, an abutment provided within the confines of said member, a split tubular insert member adapted to receive conductor terminals arranged within said tubular member of insulating material, means provided on said insert engaging said abutment for locking said members together, detents provided on said insert adapted to cooperate with said terminals assisting to hold the terminals in place, and cam means on said insert which when engaged by said terminals tend to expand said insert member.

7. In an electrical connector for association with a conductor having a terminal, the combination of an outer body having an opening therein, a contact adapted to be received in said opening and to interlockingly receive said terminal, said contact being of split-tubular form, means including a bendable finger adjacent one meeting edge of said contact for cooperating with said terminal, and means including a second bendable finger adjacent the other meeting edge of said contact for interlocking with said outer body to hold said contact in place therein, said outer body having a holding part extending laterally inwardly into said opening for interlocking with said second mentioned bendable finger, and said second bendable finger being adapted to snap past and into interlocking engagement with said holding part during movement of said contact into said body.

8. In an electrical connector for association with a pair of terminals, the combination of an outer body having a bore extending therethrough, said body having a holding part extending radially into said bore intermediate the ends thereof and defining axially spaced shoulders, a contact of split tubular form received in said bore, said contact having a plurality of bendable fingers arranged in axially spaced relation adjacent the respectively opposite meeting edges of said contact, certain of said fingers being disposed to interlock behind said shoulders to hold said contact in place within said body, and others of said fingers being disposed to yieldingly engage said terminals when the latter are projected into said contact.

9. In an electrical connector for association with a pair of terminals, the combination of an outer body having a bore extending therethrough, said body having a holding part extending radially into said bore intermediate the ends thereof and defining axially spaced shoulders, a contact of split tubular form received in said bore, said contact having a pair of axially spaced bendable fingers adjacent each meeting edge thereof, two of said bendable fingers being arranged to interlock behind the respective said shoulders so as to hold said contact in place, and the other two said fingers being arranged to yieldingly engage said terminals when the latter are introduced into said contact.

10. In a device of the class described, the combination of an insulating body having an opening therein, a contact adapted to be received sub-

stantially entirely within said opening, and having a conductor engaging part adapted for connection to a conductor and having spreadable portions adapted to receive a plug conductor terminal between them, said part and spreadable portions being so disposed that the conductor and plug adapted to be connected thereto enter the opening, said opening having shoulder means formed therein, said contact having an abutment formed on at least one of said portions and adapted to snap past and engage behind said shoulder means during insertion of said contact into said opening, said contact being adapted to be sprung by the introduction of a plug terminal between said spreadable portion so as to augment the holding relation between said abutment and said shoulder means, and said contact having means between said part and said portions and engageable with said shoulder means to limit movement of the contact into the body.

11. In a device of the class described, the combination of an insulating body having a pair of spaced contact receiving openings formed therein and connected together by a recessed saddle portion having shoulder means adjacent thereto and spaced inwardly from outer faces of the body, a contact adapted to be received substantially entirely within said openings and having spaced terminal receiving and conductor receiving portions connected together by a bridge portion and disposed respectively in said openings, said terminal and conductor receiving portions being so disposed that the terminal and conductor adapted to be connected thereto enter the openings, said terminal receiving portion being constituted by a pair of spreadable blade-like legs, one end whereof is outwardly turned to form a resilient finger which engages the wall of a corresponding opening, said conductor receiving portion being provided with a stop projecting therefrom cooperating with one of the shoulder means adjacent the saddle portion to limit movement of the contact inwardly of the body, and said finger cooperating with the other shoulder means with which the corresponding opening is provided to prevent movement of the contact outwardly of the body.

12. In a device of the class described, the combination of an insulating body member recessed to accommodate a contact and having a shoulder formed within said recess, a terminal engaging contact positioned substantially entirely in said recess, said contact having a terminal receptacle portion and a conductor engaging portion joined together by an intermediate connecting portion, said receptacle and said conductor engaging portion being so disposed that the terminal and conductor adapted to be connected thereto enter the recess, a stop provided adjacent said intermediate connecting portion between said conductor engaging portion and said receptacle, said receptacle portion being constituted by spreadable blade-like legs formed to receive a plug-like terminal between them, said connecting portion being seated upon said shoulder with the stop engaging same to limit movement of the contact into said body, and means carried by one of said legs and engaging shoulder means with which said recess is provided to permit a snap entry of the contact into the body but to prevent movement of the contact out of the body.

13. In a device of the class described, the combination of an insulating body having a pocket therein, and a contact received substantially entirely in said pocket, said contact having conductor holding and terminal receiving portions arranged within said pocket, said conductor holding portion being arranged to receive an end of a conductor projecting into said pocket so that said conductor end lies wholly within and is substantially concealed by said pocket and said terminal portion being constituted by a pair of spreadable blade-like legs arranged to receive a terminal member projected into said pocket between said legs, said contact having a stop part between said portions and said pocket having a shoulder against which said stop part seats to limit movement of the contact into the body, at least one of said legs having an abutment part thereon which seats against a shoulder with which the body is provided to limit movement of the contact out of the body, said contact being yieldable to permit at least one of said parts to snap past its cooperating shoulder during an entering movement of the contact into the body.

14. The structure defined in claim 3, in which: the tubular member is split and the longitudinally extending marginal edges defined by the split are arranged in generally parallel relation; the means projecting from said resilient portions are disposed adjacent one of the longitudinal marginal edges of the insert member; and the additional resilient portions projecting laterally of the insert are disposed adjacent the other longitudinal marginal edge of said insert member.

15. The structure defined in claim 4, in which: additional means are provided adjacent said one side of said insert member for resiliently engaging said conductor terminals.

16. The structure defined in claim 15 in which: the shoulder means provide holding surfaces; the contact includes a single piece of metal folded back upon itself so that it defines the conductor engaging part and the spreadable portions form a receptacle adapted to receive the plug conductor terminal; the spreadable portions have corresponding portions which are integrally joined together and which receive the plug conductor terminal between them; the spreadable portions extend from the conductor engaging part and have areas intermediate the ends thereof for engagement by said terminal; at least one of said spreadable portions has at an end thereof remote from its junction with the other spreadable portion an outwardly turned portion which constitutes the means engageable with one of the said holding surfaces constituting the shoulder means to limit movement of the contact relative to the body in one direction; the contact further includes a portion constituting the abutment engageable with another holding surface of the shoulder means to limit movement of the contact relative to the body in another direction; and at least one of said last two mentioned portions are yieldable so as to enable said contact to be inserted into said body with a snap action during which insertion said one portion snaps over and behind its said holding surface.

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CERTIFICATE OF CORRECTION.

Patent No. 2,318,649.

May 11, 1943.

CHARLES S. PENFOLD.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, second column, line 25, for "claim 3" read --claim 1--; line 35, for "claim 4" read --claim 2--; line 39, for "claim 15" read --claim 10--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of August, A. D. 1943.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.