July 28, 1953 C. E. GILBERT 2,647,245

READILY ATTACHABLE ELECTRICAL CONNECTOR

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Fig. 1.

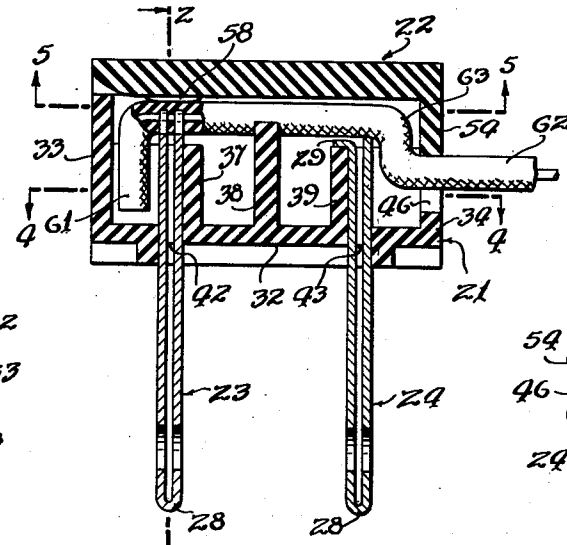


Fig. 6.

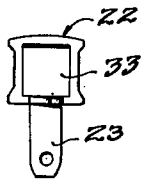
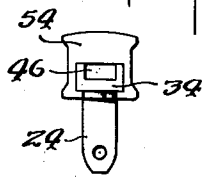


Fig. 7.



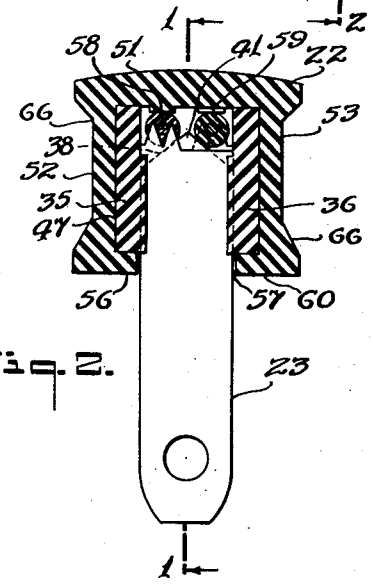


Fig. 2.

Fig. 3.

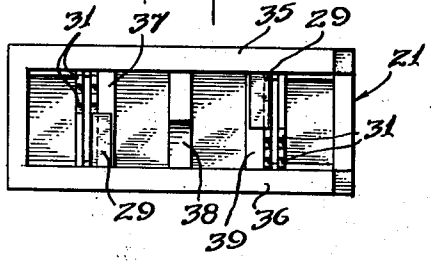
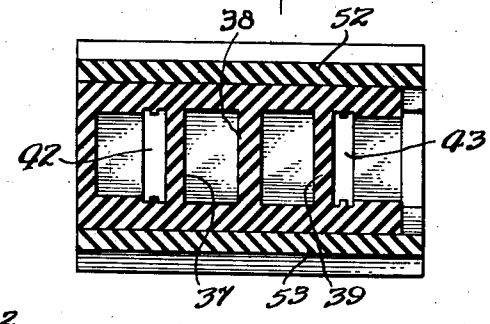


Fig. 4.



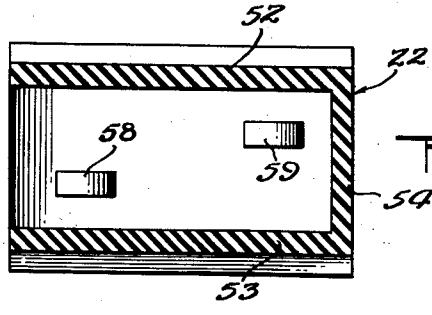


Fig. 5.

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Fig. 8.

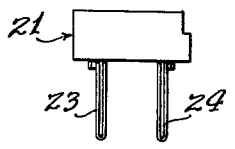
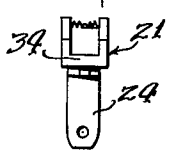


Fig. 9.



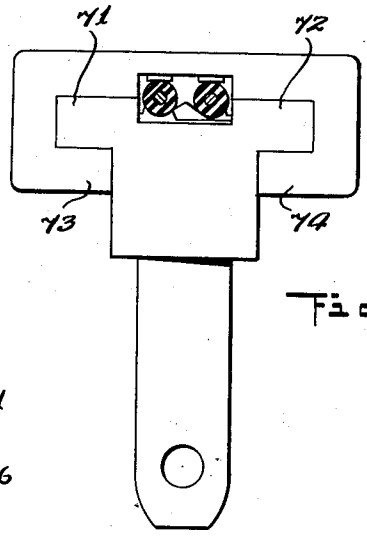


Fig. 13.

Fig. 14.

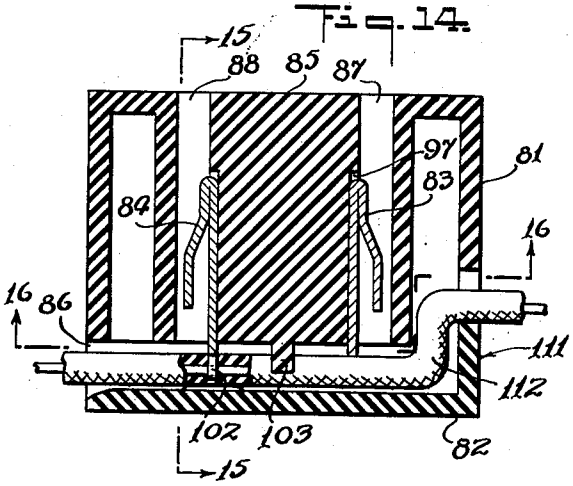


Fig. 15.

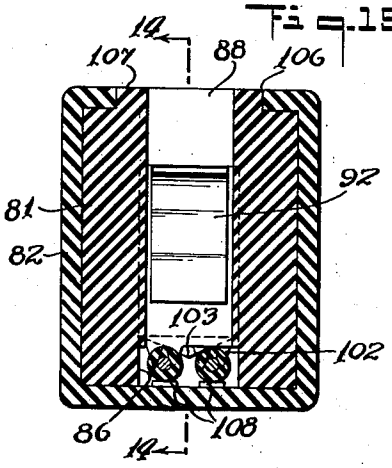


Fig. 16.

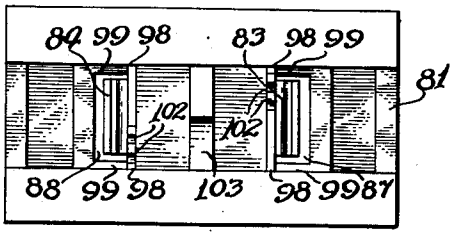


Fig. 12.

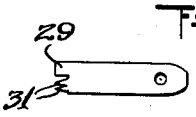


Fig. 10.

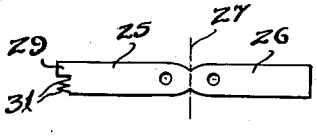


Fig. 17.

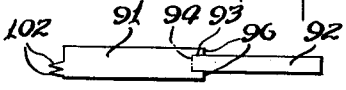
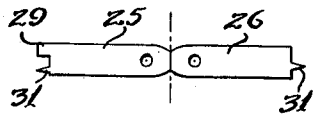


Fig. 11.



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UNITED STATES PATENT OFFICE

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READILY ATTACHABLE ELECTRICAL CONNECTOR

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Application September 23, 1949, Serial No. 118,256

5 Claims. (Cl. 339—99)

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The present invention relates to new and useful improvements in electrical connectors of the type used for making an electrical connection between electrical two-conductor lines, where, for instance, one of said lines is connected to an electrical supply outlet and the other to a cord for an electrical appliance.

The principal object of the invention is to provide improved forms of electrical connectors of this type which can be made of a minimum number of parts and produced at a minimum cost and which permit the cord to be coupled to the connector by the user in a ready and simple manner.

Another object of the invention is to provide connectors of this type in which the contact elements thereof may be securely positioned and held in the connector body in correct alignment and in secure contact with a conductor cord without the use of screws, rivets, or other securing devices.

A further object is to provide an electrical connector construction in which the contact elements thereof are simply positioned in the connector body and in which the connection of the conductor cord to the contact elements may be readily made without requiring any separation or stripping of the respective conductors of the cord.

Still another object is to provide electrical connectors which can be easily assembled and disassembled without the exercise of any particular mechanical skill and without requiring tools therefor.

It is still a further object to provide electrical connectors of the types above referred to either of the male or female types.

Yet another object of the present invention is to provide an improved and simplified device for connecting a plurality of appliances or cords to a single cord, to permit use of a single electrical outlet receptacle for such a plurality of appliances or cords.

Further objects and advantages of the present invention will become more apparent from consideration of the following description of preferred forms thereof taken in conjunction with the appended drawings, in which—

Figure 1 is a longitudinal cross-sectional assembly view of a plug and its connected cord, in accordance with the present invention, viewed along line 1—1 of Figure 2;

Figure 2 is a transverse cross-sectional view of the apparatus of Figure 1, taken along line 2—2 thereof;

Figure 3 is a top view of the plug of Figure 1 with the cover removed and without the conductor cord in place;

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Figure 4 is a cross-sectional view of the plug body taken along line 4—4 of Figure 1;

Figure 5 is a bottom view of the plug cover partly in section, taken along line 5—5 of Figure 1;

Figure 6 is an elevation end view of the plug assembly of Figure 1 viewed from the left side of Figure 1;

Figure 7 is another elevation end view of the plug assembly of the present invention viewed from the right of Figure 1, and without the conductor cord;

Figure 8 is a side elevation view of the plug body and contact assembly of the invention, omitting the cover;

Figure 9 is an end view of the device of Figure 8 viewed from the right thereof;

Figure 10 is a developed or unfolded view of the contact element used in the plug of Figures 1 to 9;

Figure 11 is a similar developed view of a modified form of contact element which may be substituted for that of Figure 10;

Figure 12 is a similar view of still another contact element which may be substituted for either of those of Figure 10 or Figure 11;

Figure 13 is a transverse end view of a modified form of the device of Figures 1 to 9;

Figure 14 is a longitudinal cross-sectional view of a plug receptacle embodying the principles of the present invention and viewed along line 14—14 of Figure 15;

Figure 15 is a transverse cross-sectional view of said plug receptacle along line 15—15 of Figure 14;

Figure 16 is a bottom view of the receptacle body and contact assembly viewed along line 16—16 of Figure 14; and

Figure 17 is a developed or unfolded view of a contact element which may be used in the device of Figures 14 to 16.

Figures 1 to 10 illustrate in detail a plug assembly embodying the present invention and adapted to be readily connected to a conductor cord. This plug assembly comprises four elements, a body 21, a cover 22, and two identical contact elements or prongs 23 and 24. Referring more particularly to Figure 10, which shows a preferred form of each prong 23 and 24, each such prong is suitably formed (as by punching and folding) from a strip of brass or similar conductive material. Its form before bending is shown in Figure 10, and comprises two portions 25 and 26 adapted to lie flat

against one another when the prong is folded about a line 27 to produce the lower bend 28 as as shown in Figure 1. One of the portions, such as 25, exceeds the other in length by virtue of a tab 29 and a pair of sharp points 31 formed therein. As shown in Figure 1 with respect to the prong 24, tab 29 is bent at right angles to the remainder of the prong and assists in positioning the prong 24 in the plug body 21.

The plug body 21 is preferably molded from rigid electrically insulating material, such as any of the well-known thermosetting or thermoplastic insulating substances, and is in the form of a generally hollow rectangular casing having a bottom wall 32, end walls 33 and 34, side walls 35 and 36 and open at the top. A plurality of transverse partitions or walls 37, 38 and 39 are provided, which contribute to the rigidity and strength of the plug body and also have additional functions, as will be described.

The center partition 38 terminates at its top in an inverted V-shape shown at 41 in Figure 2 and serves to locate the two conductors of the cord to be attached to the plug. Where separate wires are used, this partition 38 positions these wires properly in relation to the prongs, to insure proper contact therewith.

Each of the partitions 37 and 39 forms a guide and retaining support for a corresponding one of the prongs 23 and 24. As seen in Figure 1, just to the outside of each of these walls 37 and 39 a respective slot 42 or 43 is formed in the bottom wall 32 of the plug body 21, and is adapted to accommodate a corresponding prong 23 or 24. As will be seen in Figure 4, each of these slots 42 and 43 is formed to have individual guides for each of the portions 25 and 26 of the prong 23 or 24, which is then adapted to be readily slid into the slots 42 or 43 parallel to the partitions 37 or 39. In assembly the punched and folded prong 23 or 24 is inserted into one of the slots 42 or 43 with the longer prong side 25 adjacent the corresponding partition 37 or 39. The top portion 29 of this longer side is then bent over as shown at 29 in Figure 1 to form a retaining means for the prong, to prevent it from sliding out of the body 21. The points 31, however, protrude upwardly beyond the ends of the walls 37 and 39 as shown in Figure 3. This arrangement of the prongs causes the points 31 of prong 23 to lie on one side of the vertex 41 of the inverted V of wall 38 while the points 31 of the other prong 24 lie on the other side of this vertex 41.

The side walls 35 and 36 of the plug body 21 and one end wall 33 extend beyond the upper ends of the partitions 37, 38 and 39 by an amount approximately equal to the thickness of the conductor cord to be attached to the plug. The other end wall 34 has an opening 46 formed therein sufficient to accommodate the conductor cord and this opening is located at least partially somewhat below the upper end of the partition walls 37, 39. This opening may be formed merely by shortening wall 34, if desired. Preferably the wall 34 is also made slightly shorter than the other end wall 33 as shown in Figure 7. The plug cover 22 is also formed as a generally rectangular member having a rectangular channel 47 running therethrough and corresponding closely in dimensions to the transverse cross-section of the plug body 21, to provide a loose sliding fit therewith. It contains a full top wall 51 and full side walls 52 and 53. One end wall, however (corresponding in location to plug body end wall 33), is completely omitted, while the other, as shown in Figure 7 (corresponding to the body end wall 34) is but a partial end wall 54. The bottom wall 56 contains a longitudinally extending opening 57 slightly wider than the width of the prongs 23 and 24. On the inside of the top wall 51 of the cover 22 are a pair of spaced projections 58, 59 having gradually sloping connection to the flat inner surface of the top wall 51. These projections have a depth related to the size of the conductor cord and the points 31 as will now be described.

In assembling the device the conductor cord (which, for example, may be formed of the conventional two-conductor rubber-covered lamp cord or two independent conductors) is merely cut to desired size or may be already of suitable size. There is no need to separate the conductors or to strip their ends. The end 61 of the conductor cord 62 is then placed in the recess in the plug body 21 formed by the end wall 33 and partition 37, as shown in Figure 1. The conductor cord 62 is then bent at right angles to lie across the length of the top of the plug body 21 in contact with the points 31. If two separate conductors are utilized the pointed upper wall 41 of partition 38 serves to align each of these conductors against the inside of the side walls 35 and 36 of the plug body in alignment with the points 31 of the prongs 23 and 24. A two-conductor cord is of proper size to position itself similarly. The cover 22 is then placed around the conductor cord 62 and is slid over the plug body 21 with the inwardly protruding edges 60 at the bottom of the cover 22 engaging the bottom wall 32 of the plug body 21. In so doing the projections 58 and 59 force the respective conductors of the cord 62 into intimate contact with the points 31 which are thereby caused to pierce the insulation of the conductor cord and make electrical contact with the conductive wires. In this way no stripping or separation of the conductors is required, and they are electrically connected to the prongs 23 and 24 in simple fashion. At the same time, the larger end wall 54 of the cover 22 causes the conductor cord 62 to assume an offset position as shown at 63, by creating a double bend at that point which provides a strain relief so that any tension or stress on the cord 62 is taken up by the wall 54, which prevents the stress from being communicated to the contact between the points 31 and the conductors of the cord 62.

In this way there is provided an extremely simple plug arrangement having only three different parts, and only four parts in all, by which a plug can be readily manually connected to a cord without in any way requiring stripping or slitting of the conductors. Therefore, the assembly of the plug on a cord can be performed by anyone, without any tools being required, while still providing good electrical contact between the cord and the prongs of the plug and providing a plug which, when assembled on a cord, will withstand considerable tension or stress without impairing its action. In addition, it will be noted that the cord 62 extends transversely of the plug prongs 23 and 24, so that when the plug is inserted in the usual wall outlet or receptacle the conductor cord 62 tends to lie flat against the wall rather than extending perpendicular thereto in an unsightly fashion as has been characteristic of many prior art devices.

It will be understood that the prongs can be made in a wide variety of forms while maintaining the advantages of the present invention.

Thus, in place of having both points 31 on the portion 25, as shown in Figure 11 a single point 31 may be formed on portion 25 with a further point 31a formed on portion 26 and offset relative to point 31 when the prong is bent. Alternatively, if desired, two points 31 can be put on portion 25 and two additional points 31 formed on portion 26, or one point can be put on each or two points on either or a single point on either one. The points on the two portions 25, 26 may be aligned or staggered in any of these forms. In addition, instead of forming the prong by bending double as in Figures 10 and 11, a single preferably thicker prong of the desired shape may be used as shown in Figure 12, which prong may have either two points 31 as shown or but a single point or a larger plurality of points.

In order to provide a finger hold to facilitate entry or removal of the plug into or from an outlet or receptacle, the side walls 52, 53 may be curved as shown at 66. Alternatively, the structure shown in Figure 13 may be utilized, in which the cross-section of the plug body has been altered to provide laterally extending portions 71 and 72 at the top which engage the inwardly extending portions 73 and 74 of the bottom of cover, which latter portions correspond to elements 56 of Figure 2. By this arrangement the grasping of the plug for removal of or entry into an outlet is facilitated by providing a better finger hold. In the form shown in Figure 13 the prong arrangement and internal arrangement of both the cover and the plug body are essentially as in the preceding figures.

Figures 14 to 17 show another form of connector embodying the principles of the present invention. In this instance, however, the connector is a plug receptacle or female connector adapted to make connection with either a plug of the types shown in Figures 1 to 13 of this application, or any conventional type of two-prong plug.

Ordinarily plug receptacles are utilized either in wall outlet receptacles or at the ends of extension conductor cords to make a connection with a further conductor cord. However, in so doing, the utility of such devices has remained limited since but a single plug can be introduced into any one plug receptacle, so that but a single cord can be connected thereto. In many situations it is desirable to connect more than one cord to a given outlet receptacle as, for example, where a pair of lamps or a pair of other electrical appliances are to be connected to such a receptacle for their energization. In the past it has become customary to use a type of device, sometimes termed "cube taps" which includes a single plug arrangement adapted to be inserted into a wall receptacle; this plug arrangement being connected to a plurality of plug receptacles formed in the device itself. In this way a plurality of conductor cords can be tapped into the cube tap, to be connected in parallel and all energized in multiple upon insertion of the cube tap into the wall receptacle. This necessitates the use of separate conductor cords for the respective electrical devices to be energized thereby. The use of such a multiplicity of cords all running to a single point adjacent the wall receptacle is oftentimes unsightly and inconvenient.

The present invention presents an improved form of plug receptacle which can be connected at any point along a conductor cord. In this way, if two closely adjoining electrical devices

or appliances are to be energized from a given single wall receptacle, the conductor cord for one of them can be plugged directly into the wall receptacle in the usual manner; then by mounting the plug receptacle of the present invention on that conductor cord adjacent the second electrical device, a plug receptacle is provided into which the conductor cord for such second device would be plugged, whereby but a single conductor cord extends from the wall receptacle to a point adjacent the two electrical devices being energized. This avoids completely the necessity of using any device such as a "cube tap" and also eliminates any extra conductor cords running along the floor or wall near the wall receptacle.

The device of Figures 14 to 17 is very similar to the devices illustrated in Figures 1 to 13 in its manner of connection to a conductor cord. As shown in Figures 14 to 16, this plug receptacle is formed by a body member 81, a cover member 82, and a pair of contact members 83 and 84, these contact members being formed identically. The body member 81 is a generally rectangular parallelepiped having a cord-receiving channel 86 formed in the face shown at the bottom of Figures 14 and 15. A pair of slots 87 and 88 are also formed in the body 81 extending from the channel 86 perpendicularly thereof and transversely through the entire extent of the body member 81. These slots 87 and 88 are formed to receive and retain the contacts 84 and 83.

The structure of these contacts 83 and 84 is shown in Figure 17, which shows a developed view (that is, an unfolded view) of the contact member. As shown in this figure, each contact member is formed of a wider portion 91 and a narrower portion 92. The outer edges of the narrower portion 92 are extended by cuts for a short distance along the wider portion 91 as shown at 93 so that when the narrower portion 92 is bent at the dotted line 94, it forms the shape shown in Figure 14, having a pair of upstanding ears 96 left on the wider portion extending just beyond the bend shown at 97 in Figure 14. These ears 96 help locate the contact members 83 and 84 in the slots 87 and 88; thus, formed in the side wall of each slot 83 and 84 is a narrower slot 98 which is just wide enough to accommodate the wider portion 91 of the contact member. Ribs 99 adjoining this narrow slot 88 keep the contact member from falling into the large slot 83 or 84. However, the separation between the ribs 99 is sufficient to permit free passage of the narrower portion 92 of the contact member, which therefore is located within the larger slot 83, or 84 in a position to be slidably engaged by the prongs of a plug entering the slot 83 or 84. These narrow slots 98 extend only partially from the channel 86 toward the upper face 85 of the receptacle body 81 and have a shoulder 97 at their uppermost extent. This shoulder 97 engages the ears 96 and prevents the contact member from passing out of the slot 83 or 84 in an upward direction.

The wider portion 91 of each contact member also has an extending point 102 similar to the points 31 shown in Figures 10 to 12. This point extends below the upper boundary of the channel 86 and is adapted to pierce the insulation of the conductor cable and to engaeg one conductor thereof in the same manner as described with respect to Figures 1 to 10. A conductor-positioning V-shaped protuberance 103 corresponding to element 41 as in Figure 2 is also provided.

The cover member 82 is formed as a generally open-ended hollow rectangular member with an open upper side as at 106. The cover 82 is adapted to slide over the body member 81, the opening 106 engaging the protruding upper face 107 of the receptacle body to form a smooth outer surface for the fully assembled device. The inner lower surface of the cover 82 carries a pair of protuberances 108 similar in size and location to the protuberances 58 and 59 of Figure 5, which serve to press the conductor cord against the points 102 to make contact electrically between the wires of the cord and the contact elements 83 and 84. It will be noted that since the contact elements 83 and 84 are identical, but are positioned in a back-to-back relationship the points 102 of contact 83 cooperate with one wire of the cord while the points 102 of the contact 84 cooperate with the other conductor as shown in Figure 5.

It will be seen that the configuration of the narrower portion 92 of each contact shown in Figure 14 provides an offset formation. The material of the contact member is brass or the like, having a good degree of resiliency plus good electrical conductivity, and upon insertion of the prongs of a plug into the openings 87 and 88, each prong engages a corresponding narrower portion 92 of the contacts 83 and 84, and the resiliency of the contact members 83 and 84 maintains them under pressure and in good electrical contact with the prongs.

The cover 82 is provided with a partial end wall 111 which provides a strain relief for the conductor cord by causing the double bend shown at 112 in a manner similar to that described above relative to Figure 1.

It will be seen that this receptacle can be mounted anywhere along the length of a conductor cord. To assemble it on a connector cord, the cover is removed and the cord is laid in the channel 86 with its wires generally overlying the respective sets of points 102. The cover is then passed around the wire (which freely goes through the opening 106 therein) and is slidably engaged on the body 82. In so doing the protuberances 108 press the wires into good electrical contact with the respective sets of points 102. The conductor cord then may extend outwardly on both sides of the body and in no way is interfered with by the receptacle.

It will be understood that, if it is desired to place the receptacle at the end of a cord, the end of the cord may be placed in the recess 112 formed in the receptacle body 81 similar to the recess in the plug body of Figure 1 between end wall 33 and partition 37 as shown in Figure 1.

Accordingly, this plug receptacle may be assembled and mounted or connected to the conductor cord just as readily as the plugs of Figures 1 to 13, requiring no stripping or separation of the wires, or any special attention thereto. The wire is merely laid into the channel 86 and the cover assembled on the body. This simple action provides all the operations necessary for complete assembly, which is thus very easily effected without any tools whatever.

It will be understood that many minor modifications of the present invention can be readily conceived without departing from the spirit thereof. Accordingly, the above description is intended to be illustrative only, and is not to be interpreted in a limiting sense, the present invention being limited solely as defined in the appended claims.

What is claimed is:

1. An electrical connector comprising a unitary molded body of insulating material having a pair of parallel contact-element-receiving openings, a pair of sheet metal contact elements positioned respectively within said openings, each of said elements having a contact-making portion adapted to make electrical contact with another electrical element and also having a sharply pointed end opposite thereto, the points of said ends being disposed along parallel lines separated by a distance substantially equal to the separation of the wires of a two-conductor cord intended to be connected to said connector, said body having a straight cord-receiving channel interconnecting the corresponding ends of said openings and extending perpendicularly to said openings and to said contact elements, said element pointed ends extending into said channel adjacent opposite sides thereof, and a cover linearly slidably engageable on and partially surrounding said body, and having an inner surface substantially parallel to said channel, said inner surface also having a pair of protuberances which in the assembled position of said cover on said body respectively overlie the points of respective contact element ends, said protuberances in said assembled position being spaced from said pointed ends by a distance less than the thickness of an insulated conductor of said cord while said cover inner surface is spaced from the opposite boundary of said channel by a distance at least equal to the thickness of said insulated conductor, whereby upon assembly of said cover on said body, friction between said cover and said cord is minimized while said protuberances are adapted to press the respective conductors of said conductor cord against the respective pointed ends of said contact elements to pierce the insulation of said conductors and to make electrical contact with the wires thereof.

2. An electrical connector as in claim 1 wherein said body is formed with a pair of flanges extending outwardly from and parallel to said channel, and said cover partially surrounds said flanges.

3. An electrical connector as in claim 1 wherein said contact elements and said body are formed with engaging portions which prevent movement of said elements relative to said body in a direction into said openings and away from said channel.

4. An electrical connector comprising a unitary molded body of insulating material having a pair of parallel contact-element-receiving openings, a pair of contact elements positioned respectively within said openings, each of said elements having a contact-making portion adapted to make electrical contact with another electrical element and also having a sharply pointed end opposite thereto, said body having means defining a conductor-cord-receiving channel interconnecting said openings and extending perpendicularly to said contact elements, said contact element pointed ends being located at respectively opposite sides of said channel, and a generally channel-shaped cover linearly slidably engageable on and partially surrounding said body, said cover having a partial end wall which in the assembled position of said cover extends across said cord-receiving-channel for providing a strain relief for said conductor cord, the inner surface of said cover being substantially parallel to said channel and having a pair of smoothly tapered protuberances which in the assembled position of said cover on said body respectively overlie the

pointed ends of said contact elements and are spaced from said pointed ends by a distance less than the thickness of the insulated conductor of said cord, whereby upon sliding assembly of said cover on said body said protuberances are adapted to press the respective conductors of said conductor cord against the respective pointed ends of said contact elements to pierce the insulation of said conductors and to make electrical contact with wires thereof.

5. An electrical connector as in claim 4, wherein said body has a further recess adjacent one end thereof and parallel to said contact-element-receiving openings for receiving the end of said conductor cord.

CHARLES E. GILBERT.

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