April 13, 1954 M. SAMS ET AL 2,675,531

ELECTRICAL CONNECTOR

Filed Oct. 31, 1949 3 Sheets-Sheet 1

Fig. 1.

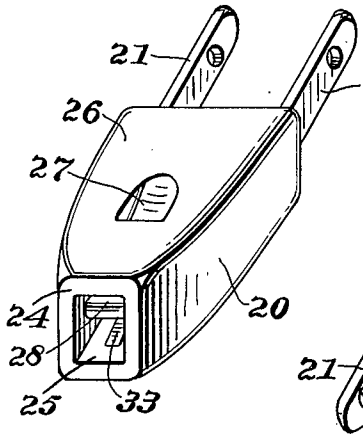


Fig. 2.

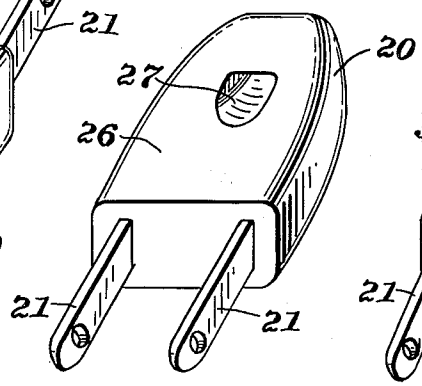


Fig. 3.

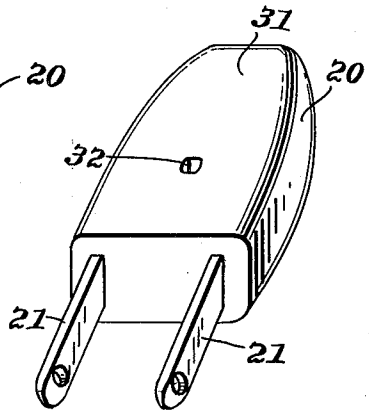


Fig. 4.

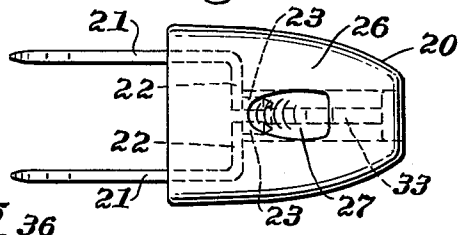


Fig. 8.

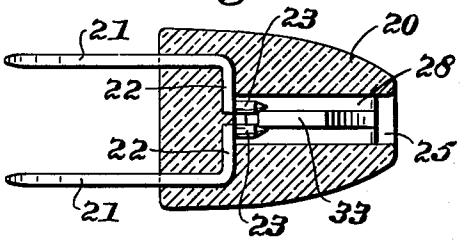


Fig. 5.

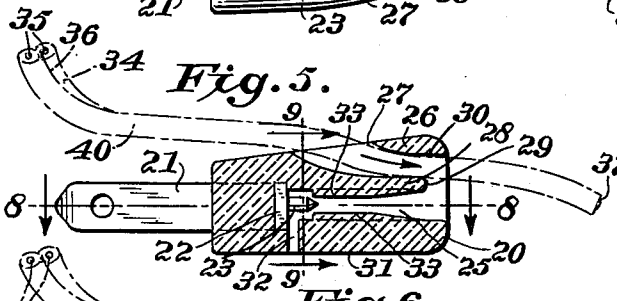


Fig. 9.

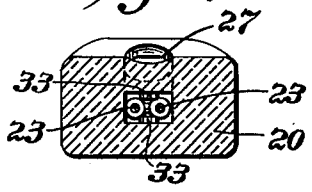


Fig. 6.

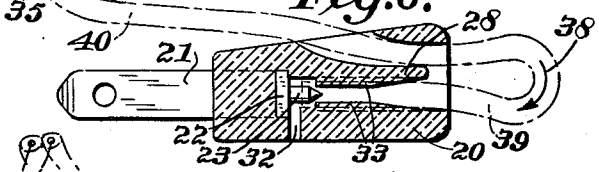


Fig. 10.

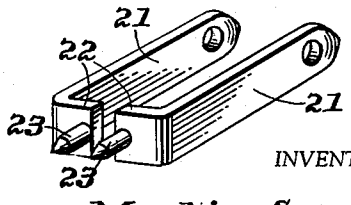
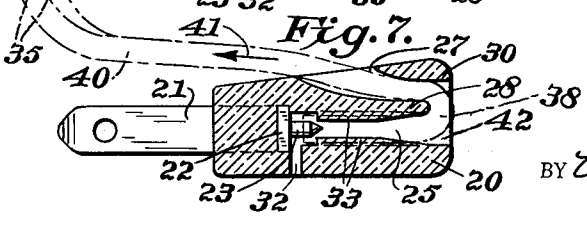


Fig. 7.



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Fig. 11.

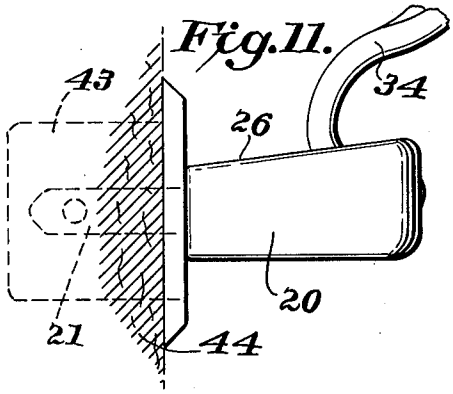


Fig. 12.

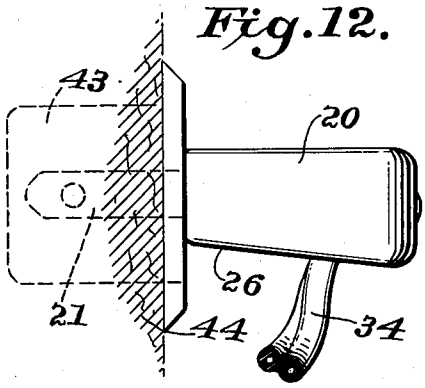


Fig. 13.

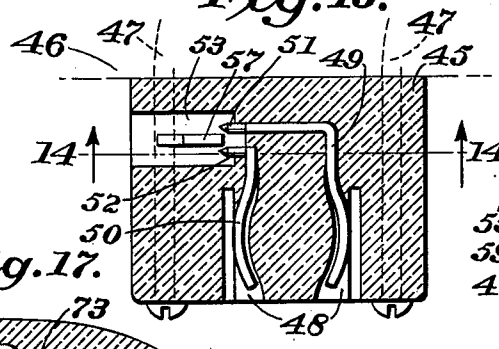


Fig. 14.

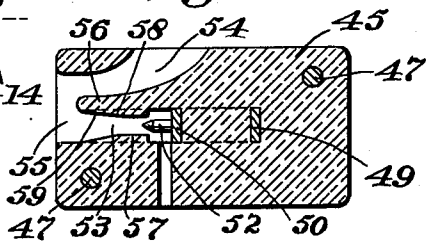


Fig. 17.

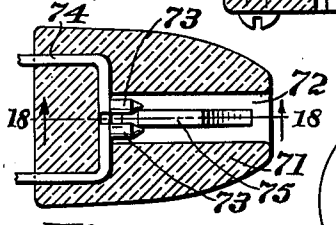


Fig. 18.

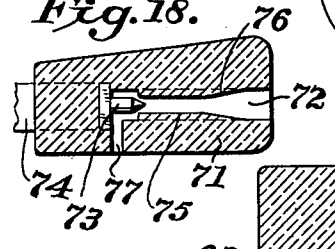
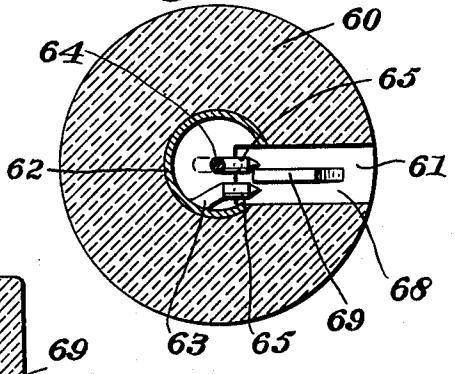


Fig. 15.

Fig. 16.



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ELECTRICAL CONNECTOR

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Fig. 19.

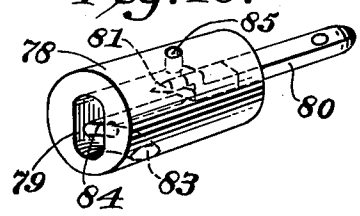


Fig. 20.

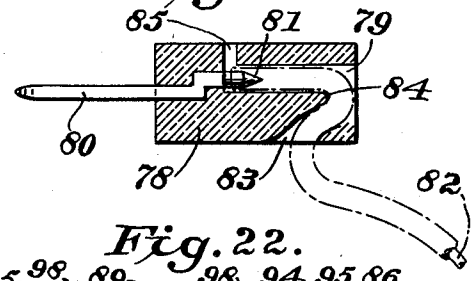


Fig. 21.

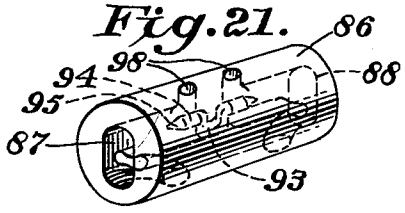


Fig. 22.

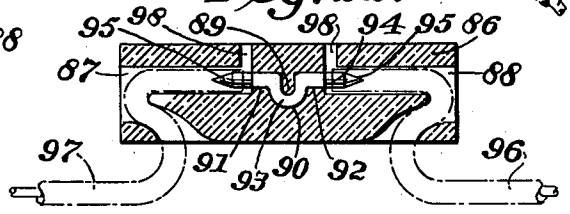


Fig. 23.

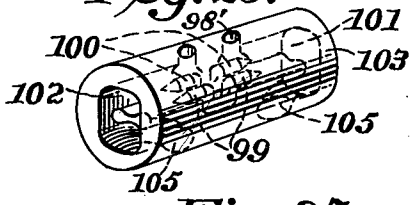


Fig. 24.

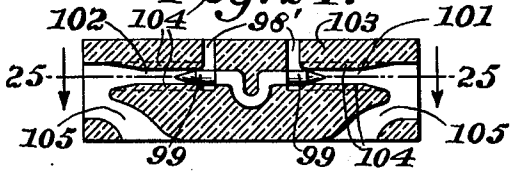


Fig. 27.

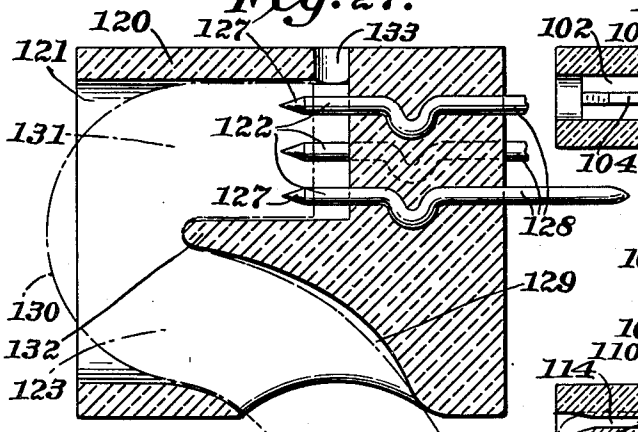


Fig. 25.

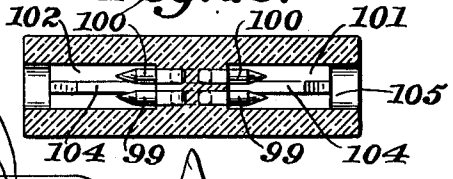


Fig. 26.

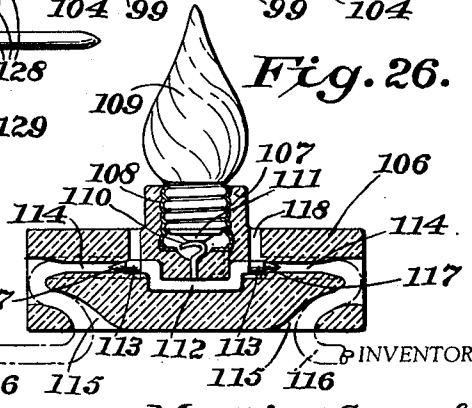
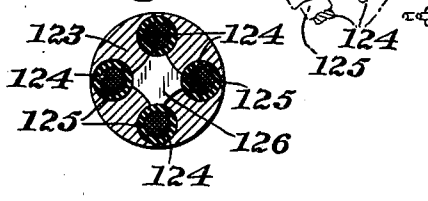


Fig. 28.



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UNITED STATES PATENT OFFICE

2,675,531

ELECTRICAL CONNECTOR

Martin Sams and Herman Feldman,
Miami Beach, Fla.

Application October 31, 1949, Serial No. 124,526

8 Claims. (Cl. 339—100)

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The present invention relates to a new and improved means and method for readily connecting or disconnecting a conductor to an electrical connector.

An important object of the invention consists in providing an electrical connector, splicer or the like, with simple, efficient, and economical means for firmly securing a single conductor, cable or double strand conductor having substantially parallel strands or wires to a connector, so that the number of parts and the operational steps are reduced to a minimum and which insures the single conductor, cable wires, and the parallel strands being brought and maintained in firm engagement with the contacts on the connector. Additionally, the connector and the means for securing the single or double wire strand conductor thereto eliminates the necessity of stripping the wire; removing the insulation, or fastening the wire by external means such as screws, posts or the like. In other words, the parts of the connector may be formed in one piece and may be molded or otherwise assembled to provide a unitary structure that does not require being taken apart or disassembled, in order to insert the parallel wires, and provides an efficient electrical connection of the wires with the fixed contacts of the connector.

A further object is to provide an electrical connector having a body formed with an opening extending inwardly from one end thereof and defining a first passage. Mounted in the body are spaced contacts having prongs extending inwardly into said passage. Beginning with an aperture in one side of the body there is formed a downwardly and inwardly curved second passage that extends to the said end of the body, said second passage being separated from the first passage by a web that preferably terminates short of the end of the body. The two passages thus lie on the same side of said opening and merge with each other at said opening to form a structural return-bend loop. A double strand conductor having the strands of wires substantially parallel and insulated from each other is insertable through the second passage from the said aperture to the said opening so as to extend outwardly from the said end of the body and is then bent or looped by the user to form an end portion which is inserted back into the said opening by the user so as to be moved axially through the first passage into engagement with the prongs of the fixed contacts in order to establish an electrical circuit therewith. The bent or looped portion of the conductor, when

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the parts are assembled, conforms to the structural loop formed in the connector body and engages the outer end of the web so as to be completely housed within the connector to insure the parallel strands being maintained in engagement with the fixed contacts. Conversely, the conductor may be readily withdrawn from the connector upon applying pressure to move the strands out of contact with the prongs, and then straightening out the bent portion so that the conductor may be removed through the aperture from the connector. The side of the body opposite to the aperture may be provided with a transverse slot that communicates with the first passage in the body at a point adjacent where the ends of the parallel strands engage the fixed contacts so as to constitute a window for determining the distance the end portion of the conductor should be moved axially within the first passage in order to insure a firm engagement with the fixed contacts, prior to pressure being applied to the conductor to force the bent or looped portion thereof into engagement with the end of the web.

A further object consists in providing a wire splicer with means for readily connecting one or more splicer wires thereto so as to establish an electrical circuit.

Another object consists in providing a new and improved connector for cables and associating with the connector circumferentially spaced fixed contacts arranged to engage the complementary ends of the strands of the cable when the latter is inserted into the connector and thus form an electrical connection therewith.

Other objects and advantages of the invention will become apparent from the following description when taken in conjunction with the accompanying claims and drawings.

Referring to the drawings:

Figure 1 is a perspective view of an electrical connector, such as a plug, constructed in accordance with the present invention.

Figure 2 is a view similar to Figure 1 looking in the opposite direction.

Figure 3 is a view similar to Figure 2 showing the side of the plug opposite to that shown in Figure 2.

Figure 4 is a plan view of the plug.

Figure 5 is a longitudinal central sectional view of the plug showing the first step of inserting the flexible strand conductor into the plug.

Figure 6 is a view similar to Figure 5 showing the second step of bending an intermediate portion of the conductor to form a loop prior to

inserting into the prongs in order to make contact.

Figure 7 is a view similar to Figure 6 showing the final step and the position of the conductor when pressure is applied to move the loop portion into the plug so that the parallel strands of the conductor are maintained firmly in engagement with the fixed contacts.

Figure 8 is a longitudinal sectional view taken substantially along the line 8—8 of Figure 5.

Figure 9 is a transverse sectional view taken substantially along the line 9—9 of Figure 5.

Figure 10 is a detail perspective view of the fixed contact blades and their prongs.

Figure 11 is a sectional side view of a wall showing the electrical plug connected thereto and the connector extending upwardly from the plug.

Figure 12 is a view similar to Figure 11 with the connector extending downwardly from the plug.

Figure 13 is a longitudinal sectional view of a screw-on extension wall outlet constructed in accordance with the invention.

Figure 14 is a sectional view taken substantially along the line 14—14 of Figure 13.

Figure 15 is a sectional view of a bulb socket having the invention associated therewith.

Figure 16 is a sectional view taken along the line 16—16 of Figure 15.

Figure 17 is a sectional view similar to Figure 5 of a further modification.

Figure 18 is a sectional view taken substantially along the line 18—18 of Figure 17.

Figure 19 is a perspective view of a single wire connector or plug constructed in accordance with the present invention.

Figure 20 is a longitudinal sectional view of Figure 19 showing the wire insertable into the plug so as to establish an electrical circuit therewith.

Figure 21 shows the electrical connector in the form of a splicer for single wires.

Figure 22 is an enlarged sectional view of Figure 21 showing the wires connected to the splicer.

Figure 23 is a perspective view of a splicer for double parallel wires.

Figure 24 is a longitudinal sectional view of Figure 23.

Figure 25 is a longitudinal sectional view taken substantially along the line 25—25 of Figure 24.

Figure 26 is a longitudinal sectional view showing a splicer in the form of a Christmas tree light socket and constructed in accordance with the present invention.

Figure 27 is a sectional view of the connector in the form of a plug for receiving one end of a cable so as to provide an electrical circuit therewith, and

Figure 28 is a transverse sectional view of the cable shown in Figure 27.

Referring to the drawings, 20 indicates a one-piece electrical connector, such as a plug or the like, which may be made of plastic, rubber composition or molded from non-insulating material, and may be opaque, transparent, or translucent, as the best operating conditions require. As shown in Figures 1 to 9, inclusive, for the purpose of illustration, the body 20 of the plug is formed of plastic material and the spaced parallel contact blades 21 extend outwardly from one end of the body and have their inner ends 22 (Fig. 10) bent inwardly toward each other and provided with parallel longitudinally extending prongs or fixed contacts 23. This entire assembly is firmly embedded in the body 20 during the molding operation. The opposite end 24 of the body is preferably shaped as shown in Figure 1, and starting with an opening in said body end has a longitudinal passage 25 extending inwardly thereof a predetermined distance. The prongs 23 extend into the passage 25 and are disposed parallel and in accurate alignment relative to each other. The side 26 of the plug (Fig. 1) is provided starting with an aperture in said side with a downwardly and inwardly curved passage 27 (Fig. 5) which extends to the said body end of the plug and is separated throughout a major portion of its length from the passage 25 by a transverse web 28 formed in the body, and which at its outer end 29 preferably terminates short of the end of the body for a purpose subsequently to be described. The passages 25 and 27 lie on the same side of the opening in the end of the body and merge with each other at said opening and at the outer end 29 of the web to form a structural return-bend loop 30.

The side 31 of the service plug 20 opposite the side 26 has a vertical or transverse slot or opening 32 which communicates with the longitudinal passage 25 so as to constitute a window adjacent the contact prongs or points for a purpose later to be described. The wall of the passage 25 is preferably formed with diametrically opposed guide ribs 33 (Fig. 9) which extend from the inner end of the passage adjacent the prongs 23 to a point short of the outer end of the passage.

As shown, a double strand flexible conductor cord 34 having the wire strands 35 substantially parallel and separated from each other by the insulation 36, which insulation is formed with a volley located between the conductor strands is arranged to be connected or disconnected from the plug or electrical member 20 so as to establish an electrical contact with the prongs 23. This connection is formed by first cutting the double strand conductor cord at one end, such as 37, and extending this end through the passage 27 so that it assumes the position as shown in Figure 5. When a sufficient length of the cord extends outwardly from the end of the plug, an intermediate portion of the cord is bent to form a loop 38 (Fig. 6) and the end portion 39 which extends inwardly, is manually inserted into the opening at the end of the plug and into the passage 25 until the end 37 is moved so as to be visible through the window 32 which indicates that the ends of the strands or wires 35 are making firm contact with the prongs 23. Manual pressure is then applied to the portion 40 (Fig. 6) of the strand conductor cord that does not extend through the passage 27 and in the direction of the arrow 41 (Fig. 7) so as to move the loop portion 38 into the loop space formed by the merging of the passage 25 and the passage 27 at the outer end 28 of the web so as to provide a recess which houses the loop portion 38 when the latter is moved into engagement with the end 29 of the web 28. This locking movement of the cord simultaneously forces the end 37 inwardly into firmer engagement with the prongs 23 to establish an electrical circuit therewith. In other words, it has been found that when axial pressure is applied to secure the loop firmly in engagement with the web 28, the parallel ends 35 of the strands engaging the contacts 23 are brought into further and firmer engagement with the contact prongs. Conversely, when it is desired to detach the flexible double strand cord 34 from the plug, this is accomplished by first moving the portion 40 in a direction opposite to the ar-

row 41, so as to withdraw the loop 38 from the end of the plug and then upon straightening out the loop, the cord may be conveniently passed through the curved passage 27 so as to be removed from the plug. As the end portion 39 is initally introduced into the opening of the passage 25, the spaced ribs 33 engage the volley in the insulation of the connector cord 34 between the strands 35 (Fig. 9), so as to constitute a guide that centers the cord and moves and maintains the parallel ends 35 of the strands in proper alignment with the prongs 23 when the parts are assembled.

Thus, it will be seen that a minimum number of steps or operations are required to either connect the flexible conductor cord 34 to the plug 20 or to disconnect the conductor cord therefrom. Moreover, since it has been found that the centers of the parallel strands or wires 35 of double strand cord conductors of any particular gauge are of substantially uniform distance apart, irrespective of the size or dimensions of the insulating material which separates these wires, we have, by accurately placing the fixed prongs or points 23 at a predetermined distance apart in the passage 25, provied means whereby any double strand conductor cord having parallel strands may be readily and conveniently connected to the plug 20 or other connector by a means which insures the circuit being established every time the conductor cord is inserted into the plug and at a minimum expenditure of time, effort and cost. While the size and dimensions of the plug 20 and its associated parts are shown arranged to be associated with a double strand conductor cord of the tvpe commercially known as #18, it will be manifest that the size, shape and use of the electrical connector and the the double strand conductor cord may be varied depending upon the particular use and purpose with which the structure is to be used.

In Figure 11, the plug connector 20 is shown with the blades 21 extending into a socket 43 of a wall 44 and with the side 26 positioned so that the flexible conductor cord 34 extends upwardly from the plug and is spaced from the adjacent side of the wall 44. In Figure 12, the plug 20 is connected to the wall socket 43 with the side 26 reversed from the position shown in Figure 11 so that the flexible conductor cord 34 extends downwardly and is spaced from the wall 44, in order that it may be carried or extended to any suitable point of use without danger of twisting or bending the conductor more than is absolutely necessary.

In Figures 13 and 14, there is shown a conventional screw-on external wall outlet member 45 which is arranged to be detachably connected to a wall 46 by the spaced screws 47. The member 45 has the usual plug socket 48 and the spaced flexible contacts 49 and 50 which, as shown, are bent to form the prongs or pointed contacts 51 and 52 that extend into a passage 53 from an opening 55 in one side of the member 45. A passage 54 (Fig. 14) extends downwardly and outwardly so as to merge with the outer end of the passage 53 at the opening 55 and a major portion of the passage 54 is separated from the passage 53 by a web 56 that preferably terminates short of the outer end of the opening 55. The wall of the passage 53 has diametrically spaced opposed ribs 57 and 58 which are flared outwardly as at 59. It will be noted that the arrangement of the spaced fixed prongs or contacts 51 and 52, and the passages 53, 54 and 55 and their associated parts, are substantially similar to the plug arrangement previously described, so that a double strand conductor cord may be inserted in the passage 54 and bent to form a loop at the opening 55 and then inserted into the passage 53 so as to be brought and maintained in firm contact with the prongs or points 51 and 52 to establish a circuit therewith. The member 45, when detached from the wall 46 and the screws 47 removed, may be used to constitute a portable connector for attaching the conductor to the member 45 to form a closed circuit therewith.

In the modification shown in Figures 15 and 16, a lamp socket member 60 is shown having the invention associated therewith and is provided with a transverse or lateral passage 61 which communicates with the threaded socket 62. The terminals 63 and 64 of the lamp contacts are provided with parallel spaced prongs 65 which extend outwardly into the passage 61. The bottom 66 of the member 60 has an inwardly and longitudinally curved passage 67 which communicates with the outer end of the passage 61 and is spaced from a major portion of the passage by a web 68. The inner wall of the passage 61 may be provided with the spaced longitudinal guide ribs 69 for receiving the parallel strands of the flexible conductor cord 70 when the latter is inserted through the passage 67 and into the passage 61 so as to bring the ends of the parallel strands into contact with the prongs 65 in substantially the same manner as the conductor cord previously described is secured in position.

In the modification shown in Figures 17 and 18, an electrical connector 71 of any suitable type is shown, and has a passage 72 that extends inwardly from one side thereof a limited or predetermined distance short of its opposite side. Mounted in the wall of the closed side of the passage 72 are a pair of parallel spaced points or contact prongs 73 which, as shown, are connected to leads 74 which may be in the form of any suitable conducting material such as contact blades, wires or the like. The wall of the passage 72 has the spaced opposed ribs 75 which constitute guide means that engage the double strand conductor cord that is insertable into the passage so as to form a contact of the parallel wire strands with the points 73. The outer ends of the ribs 75 preferably merge as at 76 into the wall of the passage 72, and one side of the member 71 may have an aperture or orifice 77 which communicates with the passage 72 adjacent the prongs 73, so as to provide visible means for determining when the ends of the parallel strands are moved inwardly a sufficient distance to form a firm electrical contact with the prongs or fixed contacts.

It will be observed that in all of the above forms of the invention, the connector is constructed and arranged so that a double strand conductor cord having parallel wires or cores may be electrically connected to a complementary pair of contacts positioned in the path of movement of one end of the conductor cord when the latter is inserted into the connector so as to establish an electrical circuit therewith. Moreover, any form of double strand conductor wires having substantially parallel cores can be detached from standard types of plugs and connected to my improved connector by a housewife or child without danger of receiving an electrical shock and at a minimum expenditure of time and effort.

In Figure 19, the connector is shown in the form

of a cylindrical plug body 78 having a passage 79 extending inwardly from one end and a contact 80 extending inwardly from the opposite end of the body. The inner end of the contact 80 is formed with a prong or point 81 (Fig. 20) that extends into the passage 79 so as to engage the inner end of the wire 82, when the latter is inserted through a second passage 83 in one side of the body and then into the passage 79, that is separated from the second passage by the web 84. A lateral port 85 extends inwardly from one side of the body 78 and communicates with the passage 79 adjacent the point 81 of the contact 80, so as to provide means for determining the distance the inner end of the wire 82 is to be inserted into the body in order to establish an electrical circuit with the contact.

In Figures 21 and 22, the connector 86 is shown in the form of a wire splicer member having opposed aligned passages 87 and 88 extending inwardly from opposite ends thereof and separated at their inner ends by a wall or partition 89 having a curved intermediate passage 90 and end passages 91 and 92 which are in axial alignment with the openings 87 and 88, respectively. A fixed contact 93 is mounted in the passages 91 and 92 and has its ends 94 extending outwardly into the openings 87 and 88 and preferably pointed as at 95, so as to engage the adjacent ends of the insulated wires 96 and 97. Adjacent the inner ends of each of the passages 87 and 88 is a window 98 for determining the distance each of the wires 96 and 97 is to be inserted so as to form a proper contact with the points 95.

In Figures 23 to 25, a splicer for double parallel wires is shown, and differs essentially from the splicer in Figure 21 by being provided with a pair of spaced fixed contacts 99 and 100 which are positioned in the aligned passages 101 and 102 of the splicer body 103, and are arranged to be engaged by a double strand, flexible conductor having the wire strands thereof substantially parallel, such as the conductor cord 34 previously described. The walls of the passages 101 and 102 are formed with the tapered ribs 104 that constitute guide means for the double strand conductor cord when the latter is inserted into the splicer 103 through one of the passages 105 and then through one of the passages 101 or 102 so as to engage its associated fixed contact. Openings 98' in the splicer body 103 adjacent the fixed contacts 99 and 100 provide visible means for determining the distance the ends of the conductor wire have to be inserted into the splicer to insure a proper contact therewith.

In Figure 26, the connector is in the form of a Christmas tree splicer having a body 106 provided with a centrally disposed socket 107 having the threaded wall 108 for receiving the light bulb 109, and which also is provided with a flexible contact member 110 that extends inwardly into the socket 107 so as to engage the contact 111 of the light 109. The contact 110 is connected to one of a pair of transverse fixed contacts 112 that has its ends 113 projecting into passages 114 that extend inwardly from opposite sides of the body 106. The body 106 also has inwardly curved spaced passages 115 that communicate with the passages 114 and constitute means for inserting the insulated wires 116 into the passages 114 so that the ends of the wires 116 may engage the points or prongs 117 of the ends 113 of the fixed contacts 112, in order to establish an electrical circuit therewith. The upper side of the body 106 on opposite sides of the socket 107 may be formed with openings 118 which constitute windows for determining the distance the ends of the wires 116 are to be inserted in order to establish a firm electrical circuit with the pair of contacts 112 which may be arranged similar to the contacts 65 (Fig. 16).

In Figure 27, the connector body 120 is constructed and arranged so as to be associated with a cable in order to establish an electrical circuit therewith at a minimum expenditure of time, effort and cost. In this form of the invention, the body 120 has a passage 121 extending inwardly a limited distance and positioned in the passage adjacent its inner end in a series of circumferentially spaced fixed contacts 122 which correspond in number with the number of wire strands of the insulated cable. As shown, the cable 123 (Fig. 28) is formed with four spaced strands 124, each of which is enclosed in insulation 125 and the strands are separated from one another by the spacer 126. The contacts 122 are embedded in the body 120 and have their inner ends tapered as at 127, while their outer ends 128 may constitute blades connected to other contacts not shown. The cable 123 initially is inserted through a passage 129 into the body 120 and is then bent as at 130 so that its end portion 131 extends into the passage 121, in order that the exposed wires 124 may firmly engage the aligned fixed prongs 127 of the contacts 122 to establish an electrical circuit therewith. The passage 129 is separated from the passage 121 by the web 132 and as the looped portion 130 of the cable is forced inwardly into engagement with the web 132, the inner end of the cable is simultaneously urged into firm engagement with the contacts 122 so as to insure the cable being firmly maintained in a fixed position when the parts are assembled. An opening 133 in the side wall of the body 120 adjacent the pointed contacts 127 provides means for determining the distance the portion 131 of the cable is to be inserted in the passage 121 in order to establish a firm electrical circuit of the cable contacts with the fixed contacts.

It will be understood that the forms of the invention shown and described are merely illustrative and that the connector may assume various shapes, sizes and dimensions as the best operating conditions may require.

We claim:

1. An electrical connector comprising a body, a first passage in said body extending inwardly from an opening in said body, a second passage in said body extending inwardly from an aperture in said body, said passages merging with each other at said opening to form a return-bend loop, the said aperture being one end and the point of merger the other end of said second passage, the said passages being thereby adapted to receive an insulated wire conductor inserted through said second passage from aperture to opening and thence from said opening through the first passage, and a prong contact in said body extending axially into said first passage and pointing in a direction opposite to the direction of insertion of said conductor in said first passage for electrical circuit engagement with said wire conductor, the said loop constituting means for forming a locking loop in said conductor.

2. The electrical connector of claim 1, in which the loop is inside the connector body.

3. The electrical connector of claim 1, in which said body is provided with an opening communicating with said first passage for determining

the distance the end of the conductor is to be inserted into said passage to effect said circuit engagement.

4. An electrical connector comprising a body, a first passage in said body extending inwardly from an opening in said body, a second passage in said body extending inwardly from an aperture in said body, a web in said body separating said passages, said passages merging with each other at the end of the web and at said opening to form a return-bend loop, the said aperture being one end and the point of merger the other end of said second passage, the said passages being thereby adapted to receive an insulated wire conductor inserted through said second passage from aperture to opening and thence from said opening through the first passage, and a prong contact in said body extending axially into said first passage and pointing in a direction opposite to the direction of insertion of said conductor in said first passage for electrical circuit engagement with said wire conductor, the said loop constituting means for forming a locking loop in said conductor.

5. The electrical connector of claim 4, in which the web terminates short of the outer end of the passages whereby the locking loop of the conductor is housed by the connector body.

6. An electrical connector comprising a body, a first passage in said body extending inwardly from an opening in said body, a second passage in said body extending inwardly from an aperture in said body, said passages merging with each other at said opening to form a return-bend loop, the said aperture being one end and the point of merger the other end of said second passage, the said passages being adapted to receive a multistrand conductor cord having the strands substantially parallel and insulated from each other inserted through said second passage from aperture to opening and thence from said opening through the first passage, and a plurality of parallelly spaced prong contacts in said body extending axially into said first passage and pointing in a direction opposite to the direction of insertion of said conductor cord in said first passage for electrical circuit engagement, one prong for each wire strand, with said wire strands of said conductor cord, the said loop constituting means for forming a locking loop in said multistrand conductor.

7. In the electrical connector of claim 6, in which the cord insulation is provided with a valley between the conductor strands, guide means in said first passage located between the prong contacts and arranged to engage the valley between the strands of the conductor and acting to guide the conductor strands through the passage for effecting said electrical circuit engagement.

8. The electrical connector of claim 7, in which said guide means comprises at least one rib projecting into said passage and extending longitudinally thereof.

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