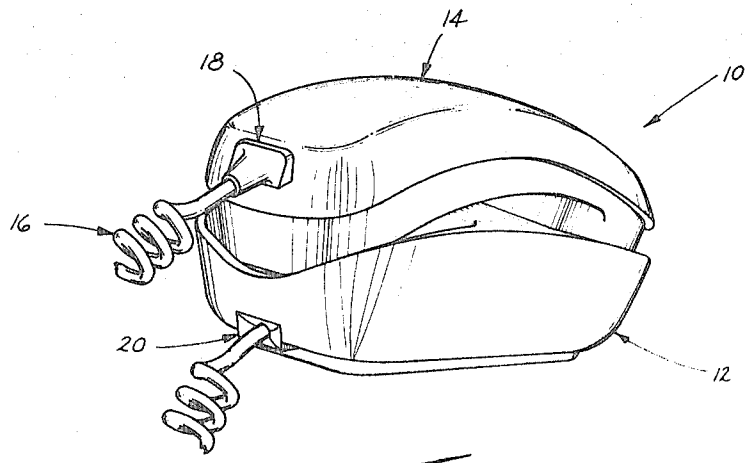


FIG. 1

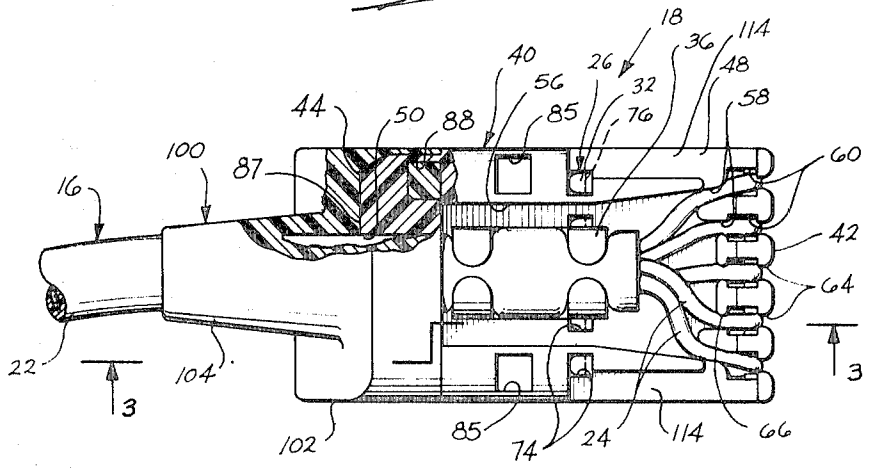


FIG. 2

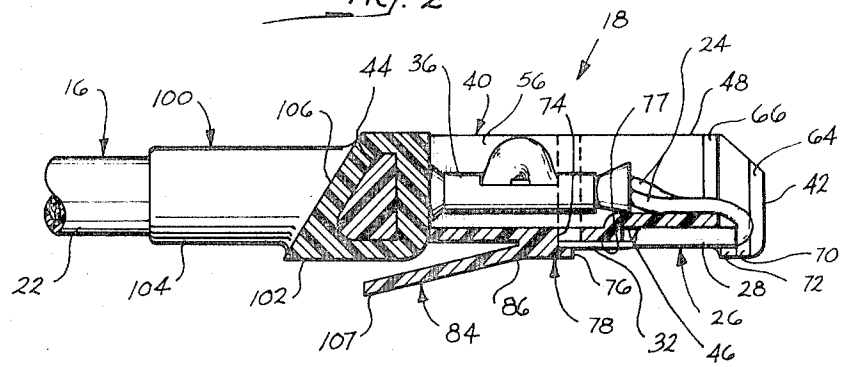


FIG. 3

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United States Patent

[11] 3,617,982

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Perry Hall, Md.

[21] Appl. No. **758,502**
[22] Filed **Sept. 9, 1968**
[45] Patented **Nov. 2, 1971**
[73] Assignee **Western Electric Company, Incorporated**
New York, N.Y.

[54] **DEVICE FOR MAKING AN ELECTRICAL CONNECTION**
9 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **339/91,** 339/102, 339/105, 339/106, 339/176
[51] **Int. Cl.** **H01r 13/56,** H01r 23/04
[50] **Field of Search** 339/105, 101, 91, 176, 102, 63, 48, 106

[56] **References Cited**

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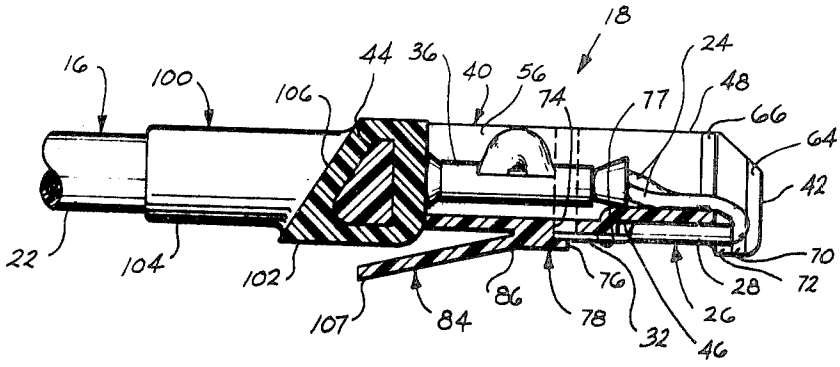
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Attorneys—H. J. Winegar, R. P. Miller and Don P. Bush

ABSTRACT: A plug is provided wherein substantially straight terminals can be attached to flexible conductors, and the straight terminals can be inserted into a molded dielectric body of the plug with substantial ease from a high-volume manufacturing point of view. The body of the plug is molded together integrally so that it can be handled as a one-piece structure when it is being assembled with the terminals.



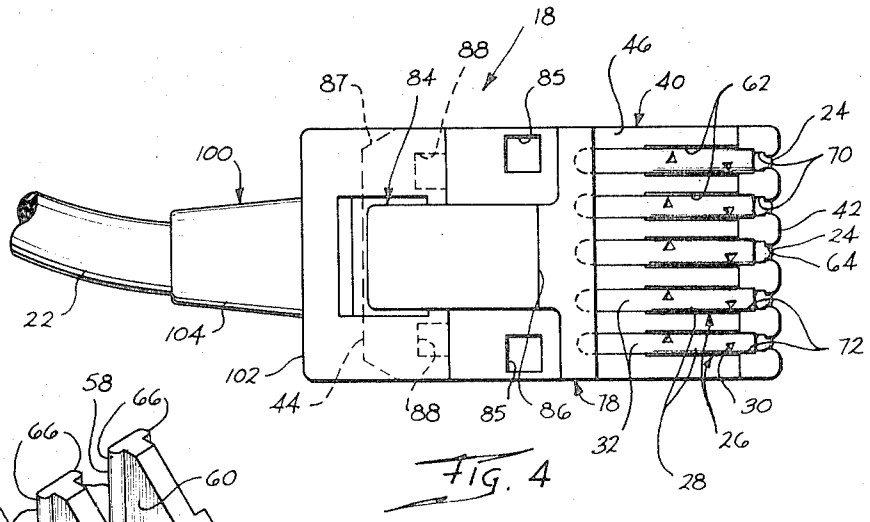


FIG. 4

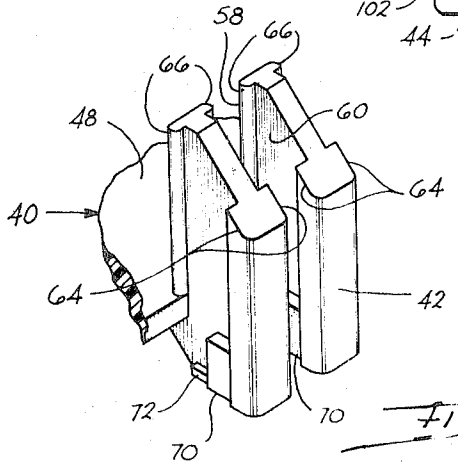


FIG. 5

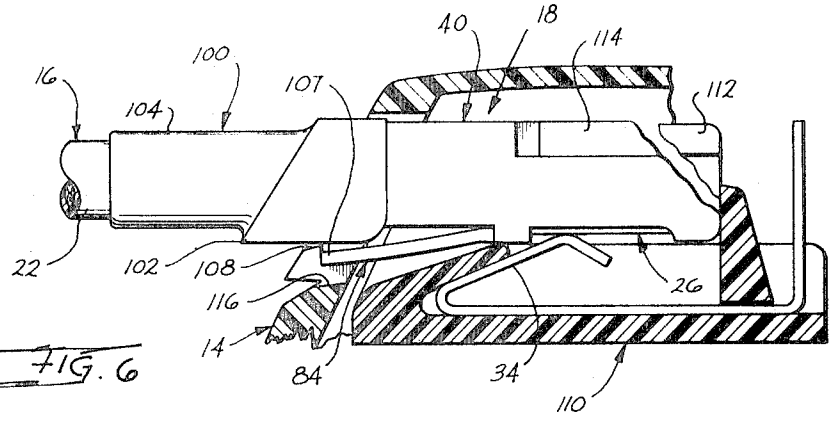


FIG. 6

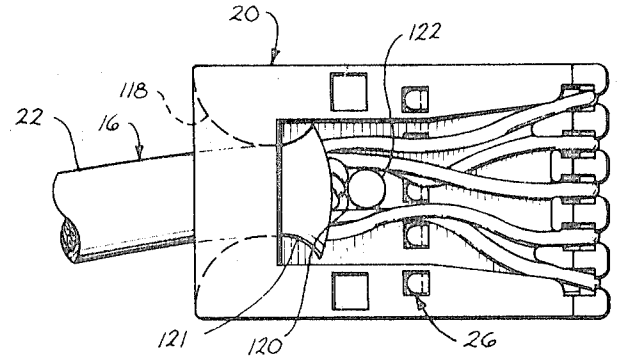


FIG. 7

DEVICE FOR MAKING AN ELECTRICAL CONNECTION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to devices for making electrical connections; and particularly, it relates to devices for making electrical connections between flexible conductors and terminals wherein conductive terminals are combined with dielectric members to form plugs.

2. Description of the Prior Art

In the telephone industry, increasing use is being made of plug-type connectors on straight and spring handset and line cords which are used between a base and a handset of a telephone and between the base and a terminal. One of the plug-type connectors which has been in use for some time is described in U.S. Pat. No. 3,369,214, issued on Feb. 13, 1968 to C. L. Krumreich et al. In the presently used plugs, a plurality of terminals are applied to each of a plurality of insulated conductors contained within a jacketed length of retractile cordage. These terminals are mounted within a dielectric structure which is attached securely to the associated coradage. The dielectric portions of the plugs, which are mounted on both ends of a length of the cordage, cooperate with receptacles in the handset and the base of the telephone to properly align the terminals of the plug with mating terminals within the components of the telephone.

Although these presently employed plugs function satisfactorily, their increased usage has developed a situation in which it has become important to effect manufacturing economies in both the fabrication of the plug and the attachment of the plug to the associated cordage.

The presently employed plug is made up of a number of plastic parts which are riveted together. Terminals are mounted to the plug using a relatively complex bending operation, which is disclosed in a pending application for a U.S. Pat., Ser. No. 590,280, filed Oct. 28, 1966, in the name of K. McNamara. Additional metal parts are used to latch the plugs within the associated handset components.

When plugs are formed of molded pieces of plastic that are riveted together, it becomes impractical to preassemble the plugs to cordage which will eventually be rendered retractile by heat treatment. Many conventional retractile cords are formed from conductors which are enclosed within a resilient plastic jacket that is rendered retractile after being wound on a mandrel and being subjected to relatively high temperatures. As the riveted plugs are subjected to the high temperatures needed to render the cords retractile, the stresses introduced by the riveting of the plastic parts together will manifest themselves in distortions of the plastic components of the plug.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a device for making electrical connections between conductors and a terminal wherein manufacturing of the device and attachment of the device to the conductors can be accomplished conveniently and economically.

It is another object of this invention to provide a device for making electrical connections which can be fabricated by using conventional molding techniques and into which device electrical conductors having terminals attached thereto can be very easily assembled.

It is still another object of the invention to provide a device for making electrical connections wherein electrical conductors and electrically conductive terminals attached thereto can be readily assembled to and disassembled from an integral dielectric portion without distortion of the terminals.

It is a further object of the invention to provide an electrical connector for a retractile-type electrical cord which connector can be assembled to the cord before the cord is heat treated to achieve its desired retractile properties and which connector can be exposed to the same environments to which the cord is exposed in the treatment without the connector suffering any degradation in its properties due to the exposure.

A device for making an electrical connection embodying certain features of the invention may include a dielectric portion having a conductor-input end and having a free end opposite the conductor-input end, at least one electrically conductive terminal portion having a conductor-input end, having a free end opposite the conductor-input end and having a substantially straight longitudinal axis and the device being assembled with the conductor-input end of the terminal oriented toward the free end of the dielectric portion and with the free end of the terminal oriented toward the conductor-input end of the dielectric portion.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects and features of the present invention will be more readily understood from the following detailed description of specified embodiments thereof when read in conjunction with accompanying drawings, in which:

FIG. 1 is a perspective view of a telephone set showing the inventive plugs inserted into a handset and a base portion thereof;

FIG. 2 is a top view of one of the plugs with a portion of a grommet thereof removed for purposes of clarity to show an interconnection between the grommet and a dielectric portion of the plug;

FIG. 3 is a sectional view of the plug shown in FIG. 2 shown along the lines 3—3;

FIG. 4 is a bottom view of the plug illustrated in FIG. 2;

FIG. 5 is an enlarged perspective view of a portion of the plug illustrated in FIG. 2;

FIG. 6 is a view showing the relationship between the plug illustrated in FIG. 2 inserted into a handset portion of the telephone illustrated in FIG. 1;

FIG. 7 is a top view of a plug used in the base portion of a telephone used in FIG. 1 showing an alternate arrangement for attaining strain relief in a cord inserted into a plug.

DETAILED DESCRIPTION

Referring now to FIG. 1, there is shown a telephone, designated generally by the numeral 10, which includes a base portion, designated generally by the numeral 12 and a handset portion, designated generally by the numeral 14. A retractile cord, designated generally by the numeral 16, interconnects the base portion 12 and the handset portion 14. The retractile cord 16 is provided with a plug, designated generally by the numeral 18, at the handset end thereof and a plug, designated generally by the numeral 20, at the base end thereof.

Referring now to FIGS. 2, 3 or 4, a more detailed view of the structure of the retractile cord 16 can be seen. The retractile cord 16 includes a jacket 22 and a plurality of insulated conductors 24—24. At the free end of each of the conductors 24—24, there is a terminal, designated generally by the numeral 26. The terminals 26—26 are placed directly over the insulated conductors 24—24. Incorporated in a ferrule portion 28 (FIGS. 3 and 4) in each of the terminals 26—26 are some insulation-piercing barbs 30—30 (FIG. 4) which provide electrical connection between the conductive portion of the conductor 24 and the associated terminal. Each of the terminals 26—26 also has a flat contact portion 32 which is utilized to complete he connection between the conductor 24 and an associated internal-contacting component 34, which is illustrated in FIG. 6.

A conventional, strain-relief band 36 (FIGS. 2 and 3) is applied to the cord 16 after the cord is inserted in the plug 18.

Referring now to FIGS. 2, 3 and 4, there are shown detailed views of the plug 18. A rigid, dielectric portion, designated generally by the numeral 40, is designed to be a part which can be easily molded by using conventional injection-molding techniques. The rigid, dielectric portion 40 has a free end 42, a conductor-input end 44, a terminal-supporting side 46 and a conductor-guiding side 48.

A cavity 56 (FIGS. 2 and 3) is formed as a depression into the conductor-guiding side 48. The cavity 56 extends from a

conductor-input aperture 50 (FIG. 2) to a series of conductor-guiding grooves 58—58 (FIG. 2) which are in communication with the free end 42 of the dielectric portion 40. The conductor-guiding grooves 58—58 also communicate with free-end grooves 60—60 (FIG. 2); and the free-end grooves, in turn, communicate with terminal-orienting grooves 62—62 (FIG. 4) which are formed as depressions in the terminal-supporting side 46.

Conductor-retaining teeth 64—64 are formed at the free end 42 of the dielectric portion 40. Rounded teeth 66—66 (FIGS. 2 and 3) restrict the opening in the associated conductor-guiding grooves 58—58. The space between two of the opposing teeth 64—64 and 66—66 is sufficiently small so that when one of the insulated conductors 24—24 is placed within the conductor-guiding groove 58, the insulation on the conductor must be distorted before the conductor will pass laterally between the opposed sets of teeth. The interrelation between the conductor insulation and each of the opposed sets of teeth 64—64 and 66—66 provides a locking force on the conductors 24—24 which helps to assure that each conductor remains in place within its conductor-guiding groove 58.

Referring now to FIG. 5, viewing each of the free-end grooves 60—60 from the free end 42, inwardly, there are three types of teeth which face into each of the free-end grooves. The first type of teeth is the already-mentioned conductor-retaining teeth 64—64. The second type of teeth is terminal-captivating teeth 70—70; each tooth traversing substantially a middle one-third of the depth of the associated free-end groove 60; each tooth extending outwardly into the groove approximately 0.014 inch, and each tooth extending inwardly from the end of the groove which faces the terminal-supporting side 46 a sufficient distance to partially occlude the opening of the terminal-orienting groove 62 with which the associated free-end groove communicates. The terminal-captivating teeth 70—70 help to prevent undesired longitudinal motion of the terminals 26—26 in the direction of the free end 42 after the terminals are assembled to the dielectric portion 40. The third type of teeth is terminal-retaining teeth 72—72, each tooth extending outwardly into the associated free-end groove 60 approximately 0.006 inch along the depth of the free-end groove from the innermost side of the associated terminal-captivating tooth 70 to the bottom of the free-end groove, and each tooth 72 extending inwardly from the end of the associated groove which faces the terminal-supporting side 46 sufficiently to act as a snap lock for the ferrule portion 28 of the terminal 26.

It should be noted that the arrangement of the teeth 70—70 and 72—72 is one which allows for a design of an injection-molding die (not shown), wherein core pins (not shown) which move perpendicularly to the plane of the conductor-guiding side 48 can be utilized. Since it is desirable to make an injection-molding die for the dielectric portion 40 with a parting line substantially parallel to the conductor-guiding side 48, it can be seen that the particular arrangement of teeth 70—70 and 72—72 is one which does not require undercutting with respect to the desired motion of the die; and thus, the necessary complexities of die structure which are associated with undercutting are eliminated.

Referring now to FIG. 3, terminal-locking apertures 74—74 extend through the entire body of the dielectric portion 40 from the conductor-guiding side 48 to the terminal-supporting side 46. At the end of the apertures 74—74 facing the terminal-supporting side 46, a shelf 76 crosses a substantial portion of the aperture but does not completely block it. The shelf 76 is formed on a bridge projection, designated generally by the numeral 78, which bridge projection extends across the entire width of the dielectric portion 40 on the terminal-supporting side 46 thereof. The combined height of the bridge projection 78 and thickness of the shelf 76 is such that the terminal-locking apertures 74—74 are accessible through an opening from the plane of a contact-supporting surface 77. The walls of each of the apertures 74—74 form a closed end of the associated one of the terminal-orienting grooves 62—62.

It should be noted that the terminal-locking apertures 74—74 can be formed with core pins (not shown) or molding die components (not shown) which move perpendicularly to the plane of the terminal-supporting side 46. If it were not for the apertures 74—74 extending through the entire thickness of the dielectric portion 40, it might be necessary to provide means for undercutting in the injection-molding die (not shown).

Each of the terminal-locking apertures 74—74 is in alignment with one of the terminal-orienting grooves 62—62. In assembling one of the terminals 26—26 to the dielectric portion 40, the flat contact portion 32 of the terminal is inserted through the opening between the shelf 76 and the contact supporting surface 77 into one of the terminal-locking apertures 74—74 to the closed end of one of the grooves 62—62, and the ferrule portion 28 is pressed into the associated terminal-orienting groove 62. When the ferrule portion 28 is in its proper position within the associated terminal-orienting groove 62, the outermost surfaces of the ferrule portion are located inwardly of the associated terminal-retaining teeth 72—72 and inwardly of the terminal-captivating teeth 70—70. The combination of the flat contact portion 32 of the terminal 26 being captively engaged in the terminal-locking aperture 74 and the ferrule portion 28 of the terminal being captively engaged within the terminal-retaining teeth 72—72 and terminal-captivating teeth 70—70 along with the ferrule portion of the terminal being lodged within the well-defined terminal-orienting groove 62, provides a situation wherein the terminal is very securely positioned and held on the dielectric portion 40.

The contact-supporting surface 77 is disposed between each of the terminal-locking apertures 74—74 and their associated terminal-orienting grooves 62—62. The existence of the flat contact-supporting surface 77 in this area provides a situation where the flat contacting portion 32 of each of the terminals 26—26 is provided with a solid support which will prevent undesirable deflection or twisting of the flat portion of the contacting portion of the terminal when the contacting portion becomes engaged with the associated internal contacting portion 34 (FIG. 6). This prevention of deflection or twisting and provision of a solid backing for the contacting portion 32 of the terminal 26 helps to provide a highly desirable electrical connecting system.

Formed integrally with the dielectric portion 40 is a resilient locking tab, designated generally by the numeral 84. The locking tab 84 is approximately 0.035 inch thick, 0.300 inch wide, 0.500 inch long, and is molded so that its longitudinal axis is oriented at an angle of approximately 15° with respect to the plane of the terminal-supporting side 46. A hinge end 86 of the locking tab 84 is molded into one side of the bridge projection 78, substantially in the middle of the projection. The combined height of the bridge projection 78, thickness of the locking tab 84 and resilience of the locking tab are such that the tab can be deflected inwardly of the dielectric portion 40 so that the tab can become substantially coplanar with the outermost surface of the bridge projection 78. After being released, the locking tab 84 will resume its originally molded shape and orientation because of its natural resilience. Proper resilience to provide the desired flexing properties can be incorporated into the locking tab 84 when it is molded from polycarbonate with the aforementioned dimensions.

Referring now to FIGS. 2 and 4, there are apertures 85—85 provided through the dielectric portion 40 from the conductor-guiding side 48 to the terminal-supporting side 46 for purposes of providing a substantially uniform wall thickness for the molded part. In addition, these apertures 85—85 are useful for mounting the dielectric portion 40 to an assembly fixture (not shown) when assembly of the terminals 26—26 to the dielectric portion is being accomplished.

The grommet 100 includes a plug-engaging portion 102 and a conductor lead-in portion 104. A sloped surface 106 is provided at the end of the portion 102 facing away from the dielectric portion 40. The angle of the sloped surface 106 is such that when the plug 18 is inserted into its associated hand-

set 14, the sloped surface will be aligned with and substantially conform to the configuration of the surface of the handset and will thus present an aesthetic appearance. The conductor lead-in portion 104 provides a gradual, flexible transition section from the diameter of the cord 16 which is inserted therethrough to the cross-sectional area of the plug 18. In addition to helping to provide an aesthetic appearance, the conductor lead-in portion 104 helps to prevent undesirably sharp bends from developing in the cord 16 where the cord enters the plug 18.

Referring now to FIG. 6, the interrelationship of the plug 18 and the handset portion 14 is shown, wherein each of the internal-contacting portions 34—34 are mounted in an internal-connector assembly, designated generally by the numeral 110. Each of the terminals 26—26 engages with one of the internal-contacting portions 34—34. A free end 107 of the tab 84 snaps in behind a ridge 108. Each of the internal-contacting portions 34—34 is formed of a resilient material so that contact with the associated terminal 26 is maintained properly. Both the internal-contacting portions 34—34 and the terminals 26—26 are preferably plated with gold to reduce the adverse effects of corrosion on the electrical connection which might otherwise form between these elements.

The connector assembly 110 includes some indexing shoulders 112—112 which fit into indexing depressions 114—114 of complementary shape which are formed into the dielectric portion 40 of each of the plugs 18—18.

A grommet-anchoring projection, designated generally by the numeral 87, is formed at the conductor-input end 44. The projection 87 is provided with two substantially rectangular grommet-anchoring apertures 88—88 extending therethrough perpendicular to the plane of the conductor-guiding side 48.

A grommet, designated generally by the numeral 100, is molded in place onto the grommet-anchoring projection 87 of the dielectric portion 40. The grommet 100 is formed preferably of a material with a high degree of plasticity such as polyvinyl chloride. It is expected that the grommet 100 should be relatively flexible whereas the dielectric portion 40 should be substantially rigid; and for this reason, the grommet must be formed of a different material than the dielectric portion. Consequently, the grommet 100 is molded to the dielectric portion 40 in an operation which is separate from the actual molding of the dielectric portion. When the polyvinyl chloride material of the grommet 100 is molded onto the grommet-anchoring projection 87, the material flows through the grommet-anchoring apertures 88—88. The grommet-anchoring projection 87 is of generally smaller cross-sectional area than the main body of the dielectric portion 40. The grommet 100 is of such a size that when it becomes formed around the projection 87, its cross-sectional area is substantially the same as the main body of the dielectric portion 40. This arrangement provides that a substantially uniform wall thickness of polyvinyl chloride surrounds the entire outer surface of the grommet-anchoring projection 87. This uniform wall is, of course, in communication with the polyvinyl chloride material which fills the grommet-anchoring apertures 88—88 and thus, a highly secure anchoring of the grommet 100 to the dielectric portion is obtained.

The indexing shoulders 112—112 of the connector assembly 110 and indexing depressions 114—114 of the plug 18 are used to ensure that the plug 20 (FIGS. 1 and 7) which is used for the base portion 12 is not inserted into the handset portion 14. Because of differences in configuration of the internal members (not shown) of the base portion 12, it is necessary to provide the plug 20 with a tab (not shown) which is of a different length than the tab 84 of the plug 18.

If desired, it would be possible to incorporate a secondary locking ridge (not shown) across tabs like the tab 84 so that it would not be required to have tabs of different lengths used for the base portion 12 and the handset portion 14. It would then be possible to use a universal plus (not shown) which could be placed on either end of the cord 16.

The ridge 108 is provided with a notch 116 through which a stiff wire (not shown) can be inserted to lift the free end 107 of the tab 84 when it is desired to move the plug 18 from the handset portion 14.

Referring now to FIG. 7, there is illustrated the plug 20 which is used with the base portion 12 of the telephone 10. The plug 20 does not have a grommet formed thereon, but instead, uses a bellmouth-shaped or flared aperture 118 through which the retractile cord 16 is inserted. The bellmouth aperture 118 is provided with a smooth curvature so that no unduly sharp bending will occur in the retractile cord 16 when the cord is moved from side to side with respect to the base portion 12.

FIG. 7 also illustrates an alternate embodiment for accomplishing strain relief. The individual conductors 24—24 are tied into a knot 120. The knot 120 is made by separating the conductors 24—24 into a group of two of the conductors and a group of three of the conductors and then tying the knot by passing a first group of the conductors around a second group of the conductors in an end-over-end fashion, similarly to accomplishing the first stage of tying a square knot. It is important to make the knot 120 relatively small so that a portion of the jacket 22 can be easily made to slide up over the knot to form a wedgelike covering 121. A simple knot (not shown), tied by using all of the conductors 24—24 as a single "end," will result in too large a cross-sectional area for proper functioning in forming the wedgelike covering 121.

A peg 122 is included in the plug 20 in the case where the knot 120 is used for strain relief. The peg 122 can be molded directly into the plug 20. The peg 122 is positioned so that some of the conductors 24—24 will lie on either side of the peg. Thus, rotation of the plug 20 with respect to the cord 16 is to a large extent prevented. If the peg 122 were not used to help maintain the knot 120 in position, forced against the aperture 118, it might be possible to have situations develop in which the cord 16 was continually rotated about its own axis and eventually the individual conductors 24—24 would be wound up on one another to the extent that the conductors would be pulled out of their proper positions within the ferrules 28—28 and consequently, create electrical discontinuities.

When the plug 20 is assembled with the cord 16, an excess length of the cord is pulled out through the bellmouth aperture 118 before the knot 120 is tied. After the knot 120 is tied and the terminals 26—26 are in their proper positions, the excess length of the cord 16 is pulled back out through the bellmouth aperture 118. The existence of the peg 122 creates a tortuous path for the excess length of the cord 16; and because of a scraping of the jacket 22 over the peg, the jacket is pulled forward so that it forms the wedgelike covering 121. The creation of the wedgelike covering 121 helps to reduce stress concentration between portions of the individual conductors 24—24 and the edges of the bellmouth aperture 118.

The material from which the plugs 18 and 20 are formed can be pigmented to match the color of the telephone 10. Similarly, the material of the grommet 100 can be pigmented to match the color of the telephone 10 with which it is used.

A distinct advantage of the hereindescribed shape and arrangement of the plugs 18 and 20 is that they can be attached to the retractile cord 16 before the cord is rendered retractile. In a manufacturing operation (not shown), it is much simpler to handle straight lengths of cordage while assembling large numbers of plugs 18 and 20 to large numbers of cords 16—16. The particular dielectric portion 40 herein described is made of a material which can tolerate prolonged exposure to high temperature atmospheres to which the cords 16—16 are exposed when their retractile properties are imparted to them. The dielectric portion 40 is preferably molded from polycarbonate of an injection-molding grade which remains distortion free at temperatures up to 280° F. to 290° F. at atmospheric pressure. An example of such a material is Lexan 2805-112, available from General Electric Company, Pittsfield, Mass. The temperature to which the cord 16 is exposed in order to

set the retractile shape in the cord is 265° F. Thus, the polycarbonate in the dielectric portion **40** can readily tolerate the retractile setting temperature of 265° F. without suffering any undesired change of shape.

The grommet **100** is formed of polyvinyl chloride of the same resin composition that the jacket **22** is formed. The apertures **85—85** can be used to support the plug **18** so that the grommets **100—100** can be held from contact with any fixtures or disturbing elements (not shown) during the time when the cord **16** is exposed to the high temperatures needed to impart the retractile shape to the cord. Thus, it is possible to keep the grommet **100** from being distorted during the heating of the cord **16**.

Since the plugs **18** and **20** have no closed cavities, it is possible to allow a conventional washing operation (not shown), to be performed on the cord **16** and plug without the hazard of having water and detergent solution entrapped within the plug. It is part of the conventional manufacturing technique to wash retractile cords **16—16** after the cords have been placed in a retractile configuration with water and detergent solution.

The configurations of the plugs **18** and **20** are such that water and detergent solutions can easily be rinsed out of the plugs and the plugs can be readily dried, thus substantially eliminating any future hazard of corrosion from allowing water and detergent to remain in the plugs. It is, therefore, possible to utilize the conventional manufacturing techniques for making a cord retractile and washing it after it becomes retractile, even though the plugs **18** and **20** are in place on the ends of the cords **16—16**.

It is to be understood that the above-described arrangements are simply illustrative of the principles of the invention. Other arrangements may be devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

I claim:

1. A plug device which cooperates with a receptacle for making an electrical connection between an elongated flexible conductor connected to the plug device and an internal contacting component within the receptacle, which comprises:

a dielectric portion having an input end for receiving an elongated flexible conductor and a free end opposite the conductor-input end,

an electrically conductive terminal having one end thereof connected electrically to the conductor, and having a free end opposite the one end, the one end and the free end lying along a substantially straight longitudinal axis, the device being assembled with the conductor inserted into the input end of the dielectric portion and reversely bent around the free end thereof, the one end of the terminal oriented toward the free end of the dielectric portion and with the free end of the terminal oriented toward the conductor-input end of the dielectric portion, the terminal caused to engage electrically the internal contacting component when the plug device is assembled to the receptacle;

means connected to the dielectric portion for engaging the terminal to restrict relative movement between the terminal and the dielectric portion; and

means connected to the dielectric portion for engaging the conductor adjacent the free end of the dielectric portion to lock conductor to the dielectric portion.

2. A device for making an electrical connection which comprises:

a dielectric portion having a conductor-input end and a free end opposite the conductor-input end,

at least one electrically conductive terminal portion having a conductor-input end, a free end opposite the conductor-input end, and a substantially straight longitudinal axis, the device being assembled with the conductor-input end of the terminal portion oriented toward the free end of the dielectric portion and with the free end of the terminal portion oriented toward the conductor-input end of the dielectric portion;

a flexible grommet portion, and

a grommet-securing aperture extending through the dielectric portion, wherein the grommet portion is formed in surrounding relationship with a portion of the dielectric portion, and the material from which the grommet is formed substantially fills the aperture in the dielectric portion so that the material in the aperture is in communication with the remainder of the material of the grommet portion at both ends of the aperture to form an integral connection between the grommet portion and the dielectric portion.

3. A device for making an electrical connection as set forth in claim 1, which comprises:

a resilient tab formed integrally with the dielectric portion for locking the dielectric portion into the receptacle, the tab having a free end and a secured end, the tab being attached by its secured end to the dielectric portion, and the axis of the tab being oriented outwardly of the dielectric portion and toward the conductor-input end of the dielectric portion.

4. A device for making an electrical connection as set forth in claim 1, wherein:

the dielectric portion being formed with at least one groove having walls; and

the means for engaging the conductor including at least one tooth projecting from at least one of the walls inwardly of the groove, past which tooth a portion of the conductor can be urged so that the conductor is retained within the groove.

5. A device for making an electrical connection as set forth in claim 1, which also comprises:

a jacket formed over the conductor, the jacket having an expanded end wherein the conductor is formed into a knot which combines with the expanded end of the jacket to form a strain-relief system.

6. A device for making an electrical connection which comprises:

a dielectric portion having a conductor-input end and a free end opposite the conductor-input end,

at least one electrically conductive terminal portion having a conductor-input end, a free end opposite the conductor-input end, and a substantially straight longitudinal axis, the device being assembled with the conductor-input end of the terminal portion oriented toward the free end of the dielectrical portion and with the free end of the terminal portion oriented toward the conductor-input end of the dielectric portion;

at least one elongated conductive element;

a jacket formed over the element, the jacket having an expanded end, wherein the conductive element is formed into a knot which combines with the expanded end of the jacket to form a strain-relief system; and

a member that is engageable with the knot to maintain the knot and the expanded end of the jacket securely against the dielectric portion so that a potential for twisting of the conductive elements with respect to the dielectric portion is reduced.

7. A device for making an electrical connection as set forth in claim 1, wherein:

the dielectric portion including at least one opening therein, the opening being large enough to permit insertion of the free end of the at least one terminal so that the material of the dielectric portion adjacent the opening will substantially encompass a portion of the free end of the associated terminal to prevent unintended lateral motion of the free end; and

the dielectric portion including at least one groove therein, the longitudinal axis of the groove being aligned with the desired orientation for the axis of the at least one terminal and wherein at least portions of the walls of the groove engage with the associated terminal to limit lateral movement of said terminal.

8. A device for making an electrical connection, which comprises:

a dielectric portion having a conductor-input end and a free end opposite the conductor-input end,

at least one electrically conductive terminal portion having a conductor-input end, a free end opposite the conductor-input end, and a substantially straight longitudinal axis, the device being assembled with the conductor-input end of the terminal portion oriented toward the free end of the dielectric portion and with the free end of the terminal portion oriented toward the conductor-input end of the dielectric portion;

the dielectric portion including at least one opening therein, the opening being large enough to accommodate the free end of the at least one terminal portion so that the material of the dielectric portion adjacent the opening will substantially encompass a portion of the free end of the associated terminal portion to limit lateral motion of the free end;

the dielectric portion including at least one groove therein, the longitudinal axis of the groove being aligned with the desired orientation for the axis of the at least one terminal portion, and wherein at least portions of the walls of the groove engage with with associated terminal portion to limit lateral movement of said terminal portion; and

the groove is closed on at least one of its ends and the opening is spaced from the closed end of the groove so that a portion of the material of the dielectric portion between the closed end of one of the grooves and one of the openings forms a supporting surface for a portion of the at least one terminal portion.

9. A device which cooperates with a receptacle for making an electrical connection between insulated conductors and internal contacting components within the receptacle, which comprises:

a dielectric portion having an input end for receiving an insulated conductor and a free end opposite the conductor-input end, and having a cavity intermediate the input end and the free end;

the dielectric portion further having a terminal-supporting side and a conductor-guiding side;

the free end being formed with a plurality of free-end grooves which communicate with associated ones of a plurality of terminal-orienting grooves formed on an underside of the dielectric portion, the free end further formed with conductor-retaining teeth for retaining the conductors within the associated free-end grooves, the free-end grooves connected to the cavity through associated ones of a plurality of conductor-guiding grooves;

the underside of the dielectric portion being formed with terminal-captivating teeth traversing substantially a portion of the associated free-end groove, the terminal-captivating captivating teeth extending outwardly into the associated ones of the free-end grooves and inwardly from the free-end of the dielectric portion a sufficient distance to partially occlude the opening of the associated terminal-orienting groove, the free end further being formed with terminal-retaining teeth, each of the terminal-retaining teeth projecting outwardly into the associated free-end groove along the depth of the free-end groove from the innermost side of the associated terminal-captivating tooth to the bottom of the free-end groove, each terminal-retaining tooth also extending inwardly from the end of the associated free-end groove which faces the terminal supporting side; and

a plurality of electrically conductive terminals each having facilities at one end thereof for establishing an electrical and mechanical connection with associated ones of the insulated conductors and having a free end opposite the one end, the one end and the free end lying along a substantially straight longitudinal axis;

the device being assembled with the insulated conductors inserted into the input end of the dielectric portion and received in associated ones of the conductor-guiding grooves and through the associated ones of the free-end grooves, reversely bent around the free end of the dielectric portion, and connected to the one end of the associated terminal, each terminal being received in an associated one of the terminal-orienting grooves with the one end oriented toward the free end of the dielectric portion and with the free end thereof oriented toward the input end of the dielectric portion, the terminal positioned in the associated terminal-orienting groove so as to be caused to engage electrically the internal contacting component when the device is assembled to the receptacle;

the conductor-retaining teeth providing a locking force on the conductors to secure the conductors within the associated ones of the conductor-guiding grooves,

the terminal-captivating teeth preventing undesired longitudinal motion of the associated ones of the terminals; and

the terminal-retaining teeth securing the conductor-receiving portion of the associated terminal within the associated one of the terminal-orienting grooves.

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