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3,204,212

ELECTRICAL CONNECTOR

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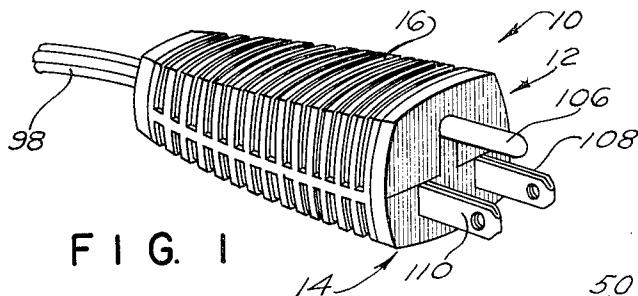


FIG. 1

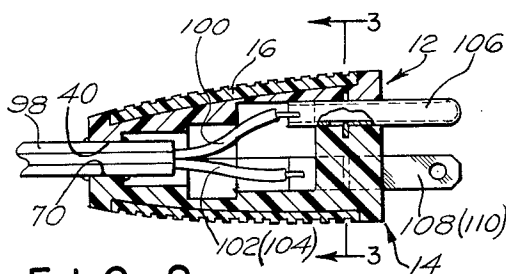


FIG. 2

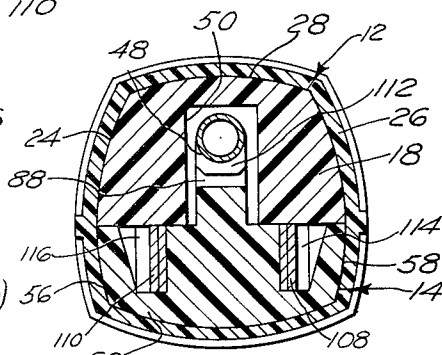


FIG. 3

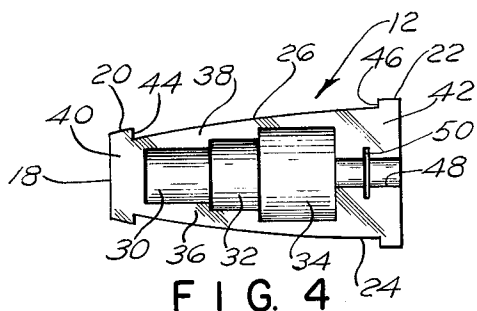


FIG. 4

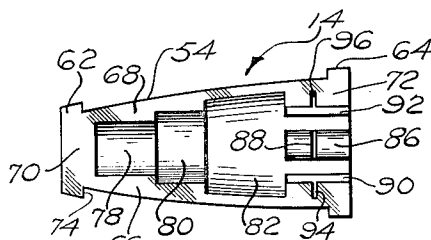


FIG. 5

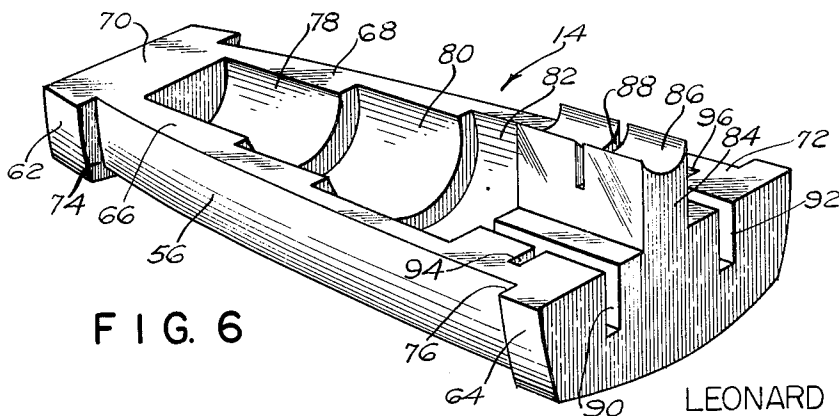


FIG. 6

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3,204,212

ELECTRICAL CONNECTOR

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4 Claims. (Cl. 339-14)

The present invention relates to an electrical connector and to the method of manufacture thereof. More particularly, the present invention relates to an electrical connector in which the component parts thereof are molded as separate units from a material such as vinyl plastic, the component parts being assembled in inter-fitting relation to define the complete connector.

The present invention has particular application with three-wire cables and connections therefor; however, it will be understood that the concept of the invention embodied herein may be utilized with the conventional two-wire cable. The one-piece molded unitary connector for use with an extension cord or as an outlet plug-in unit has found great favor in the trade in recent years. However, the fabrication of such a connector wherein the conductor prongs and cable are embedded therein requires the use of relatively expensive molding equipment. In the absence of such expensive molding equipment, many connectors are fabricated by assembling individual parts that are formed independently of each other. This assembled type of connector normally requires the use of screws and nuts and is somewhat of a laborious task thereby increasing the cost of the fabrication thereof. In the manufacture of the prior known assembled type of connectors it has been necessary to utilize relatively rigid plastic materials that are not as desirable as the molded materials since they are relatively fragile and have been found to break even after normal usage.

The present invention is designed to overcome the attendant difficulties experienced in the prior known pre-assembled connectors, and in the finished assembly thereof, has the appearance of a molded connector. The connector of the present invention includes complementary elements that are molded of a relatively resilient plastic material and that are constructed in such a manner so as to positively secure conductor prongs therebetween at one end thereof. A cable extends between the other end of the elements, the exposed wires of the cable being secured to the prongs. In order to lock the elements together, a relatively flexible sleeve formed of a plastic material is utilized and envelops the elements in tight fitting relation. The ends of the elements between which the cable extends are molded in a relatively flat configuration so that when the resilient sleeve is assembled around the elements in tight fitting relation, the flat ends of the elements that engage the cable conform to the configuration thereof. Thus the elements are not only clamped together in tight fitting relation, but the cable is secured therebetween in such a manner that it appears to be formed as a molded part thereof. Since the elements also act to positively retain the prongs in position, the connector of the present invention has all the appearances of a one-piece molded connector in the finished assembly thereof.

It is therefore an object of the present invention to provide an electrical connector in which the component parts thereof are preassembled to form a unitary construction that has the appearance of a one-piece molded connector.

Another object of the invention is to provide an electrical connector that includes a pair of complementary interfitting elements that are secured together by an enveloping sleeve formed of a relatively resilient plastic material.

Still another object is to teach a method of manufactur-

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ing an electrical connection by molding the component parts thereof and interfitting the parts to simulate a one-piece molded connector.

Still another object is to provide an electrical connector that is defined by a pair of elements that are molded in complementary half sections, the elements cooperating to secure terminals therebetween that are connected to the wires of a cable extending between the elements.

Still another object is to provide an electrical connector in which the body portion thereof is defined by a pair of resilient complementary fitting elements, a cable extending between one end of said elements, and the elements being clamped by a resilient sleeve in engagement with the cable so as to conform to the configuration thereof.

Other objects, features and advantages of the invention will become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

In the drawings which illustrate the best mode presently contemplated for carrying out the instant invention:

FIG. 1 is a perspective view of the assembled connector embodied in the present invention;

FIG. 2 is a vertical sectional view of the connector illustrated in FIG. 1;

FIG. 3 is a sectional view taken along lines 3-3 in FIG. 2;

FIG. 4 is a top plan view of one of the elements that define the body portion of the connector embodied herein;

FIG. 5 is a top plan view of the other element that is formed as part of the body portion of the connector; and

FIG. 6 is a perspective view of the element illustrated in FIG. 5.

Referring now to the drawing and particularly to FIG. 1, the electrical connector embodied in the present invention is illustrated and is generally indicated at 10. The connector 10 as shown is designed primarily for use with three-wire cables and equipment requiring three wires or three-wire terminals such as the window installed air conditioning unit. The connector 10 is basically defined by three parts all of which are molded independently of a non-rigid plastic material such as vinyl. The first two parts of the connector 10 define a body portion thereof and include a first element generally indicated at 12 in FIG. 4 and a second element generally indicated at 14 in FIGS. 5 and 6. The third part is defined by a securing element indicated as sleeve 16 that is adapted to substantially envelop the elements 12 and 14 and as will also be described hereinafter, locks the elements in interfitting relation.

Referring now to FIGS. 2, 3 and 4, the element 12 that defines one part of the connector body portion is illustrated and includes a portion 18 on which end flanges 20 and 22 are formed. The element 12 is molded of a relatively resilient plastic material such as vinyl and has generally curved outer side walls 24, 26, an outer wall 28 and a flat inner surface that is hollowed out to define stepped cavities 30, 32, 34. The stepped cavities 30, 32, 34 are generally semi-cylindrical and increase in size toward the flange 22. As will be described the cavities 30, 32, 34 cooperate with similar cavities formed in the element 14 to define a central chamber when the elements 12 and 14 are located in interfitting relation. As shown in FIG. 4 the cavities 30, 32, 34 communicate with each other to form a continuous hollowed-out portion and further define flat marginal edges 36 and 38 that are continuous with flat end surfaces 40 and 42 that are formed on the ends of the body portion 18 and a part of which is defined by the flanges 20 and 22 respectively. It will be noted the body portion 18 has an increasing taper from the flange 20 to the flange 22, the flange 22 being somewhat larger than the flange 20. The element 14 has a

similar taper and when the elements are locked in interfitting relation by the sleeve 16, the connector defines a generally truncated cone. In order to accommodate the sleeve 16, the flanges 20, 22 are formed which project outwardly of the surfaces of the body portion 18 to form shoulders indicated at 44 and 46, the shoulders 44, 46 cooperating with similarly formed shoulders on the element 14 to receive the sleeve 16 therebetween.

Communicating with the cavity 34 and formed in the flat surface 42 is a rounded groove 48 that extends through the flange 22. The groove 48 is adapted to cooperate with a similarly formed groove in the element 14 to receive therein a conductor or prong having a circular cross-sectional configuration. Also formed in the flat surface 42 of the element 12 is a transverse slot 50 that is provided for receiving an anchoring tab of the cylindrical conductor that is to be located in the groove 48. As will be further described in connection with the element 14, additional anchoring slots for the circular terminal are also provided, but the anchoring slot 46 is formed in the element 12 in the event that the cylindrical conductor to be utilized requires such a slot for the anchoring thereof.

Referring now to FIGS. 3, 5 and 6, the element 14 is illustrated in detail and is constructed substantially similar in configuration and shape as the element 12 and is molded of a relatively flexible plastic material such as vinyl. The overall configuration of the element 14 is identical to the element 12, although as seen in FIG. 3, the dimensions of the sidewalls of the element 14 are somewhat smaller than that of the walls 24, 26 of the element 12. The element 14 is defined by a body portion 54 that is formed with curved side walls 56 and 58, a curved outer wall 60, and end flanges 62 and 64. The inner face of the element 14 is defined by flat marginal edges 66 and 68 and flat end surfaces 70 and 72 that form part of the flanges 62, 64 respectively. As shown in FIG. 3, the flat surfaces 70, 72 and the adjoining flat marginal edges 66, 68 are adapted to engage the complementary surfaces 36, 38, 40 and 42 of the element 12 when the elements are interfitted. The side walls 56, 58 and outer wall 60 of the element 14 cooperate with the flanges 62, 64 to form shoulders 74 and 76, the shoulders 74, 76 coacting with the shoulders 44 and 46 of the element 12 to form continuous flanges between which the sleeve 16 is locked in the assembled position thereof. The element 14 also has an increasing taper from the flange 62 to the flange 64 and as mentioned above when the elements 12, 14 are interfitted the resulting configuration defines a generally truncated cone. This configuration is not only easy to handle but is pleasing and ornamental in appearance.

As seen particularly in FIG. 6, the element 14 is provided with semi-cylindrically formed cavities 78, 80 and 82, the radii of curvature of which increase from the cavity 78 to the cavity 82. The radii of curvature of the cavities 30, 32 and 34 are identical to their respective oppositely located cavities 78, 80 and 82 so that when the elements 12 and 14 are located in interfitting relation a central chamber is defined that graduates in diameter in stepped relation.

Formed on the flat end surface 72 adjacent the cavity 82 of the element 14 is an outwardly extending projection 84 that is located intermediate the side walls 56, 58. The outermost edge of the projection 84 has a recess 86 of concave or arcuate shaped formed therein that is adapted to cooperate with the groove 48 formed in the element 12 to define a generally circular opening when the elements 12, 14 are located in interfitting relation. As will be described, a cylindrical conductor or prong is adapted to be inserted into the circular opening defined by the recess 86 and the groove 48. Formed in the projection 84 intermediate the ends thereof and extending transversely of the recess 86 is a slot 88 that is provided for receiving an anchoring tab that will be secured to the cylindrical prong to be received within the recess 86.

Formed in the flat surface 72 of the element 14 and on

opposite sides of the projection 84 are longitudinally extending slots 90 and 92. The slots 90, 92 receive relatively flat conductors or prongs therein that cooperate with the cylindrical prong received within the recess 76 to form a three-wire connector. As will be described, the conductors or prongs are adapted to be electrically connected to the wires of a cable that is received within the chamber defined by the cavities of the elements 14 and 16. Transverse slots 94 and 96 are formed in the flat surface 72 and communicate with the longitudinally extending slots 90 and 92 respectively, the transverse slots 94, 96 being adapted to receive anchoring tabs of the flat prongs for positively locating the prongs within the connector elements.

In the assembly of the connector a cable indicated at 98, which in this particular case include three wires 100, 102 and 104, extends between the flanges 20 and 62 of the elements 14 and 16, the exposed wires 100, 102, 104 being received in the chamber between the elements. A cylindrical conductor or prong 106 is connected to the wire 100 of the cable 98, and relatively flat conventional conductors or prongs 108 and 110 are joined to the wires 102 and 104, respectively. As illustrated in FIGS. 1 and 2, prongs 106, 108 and 110 are of the male type and extend outwardly of the connector. However, it is understood that conventional female conductors may also be utilized with the elements 12 and 14 in place of the male prongs to form a socket conductor rather than the male conductors as illustrated in the drawing. It is understood that the outwardly extending cylindrical male prong 106 defines a ground terminal that is required for use with the three-wire cable 98.

The ground prong 106 has an anchoring tab 112 joined thereto that projects into the slot 88 formed in the projection 84. If required, an additional anchoring tab may be joined to the prong 106 for extending into the slot 50 of the element 12. The prongs 108 and 110 have anchoring tabs 114 and 116 respectively joined thereto, the tabs 114, 116 extending into the transverse anchoring slots 94 and 96 respectively. With the prongs 108 and 110 located within the slots 90 and 92 and the ground prong located in the recess 86 of the projection 84, the element 12 is placed in interfitting relation on the element 14. The projection 84 is then received within the groove 48 and the flat inner surfaces of the element 12 engage the flat inner surfaces of the element 14. As illustrated in FIG. 3, the recess 86 cooperates with the groove 48 to define a circular opening for receiving the cylindrical prong 106. In the assembled position the flat surface 42 of the element 12 overlies the prongs 108 and 110 and locks these conductors in position within the slots 90 and 92, respectively. Also in the assembled position the insulated portion of the cable 98 extends between the flat surfaces 40 and 70 of the elements 12 and 14, respectively.

In order to secure the elements 12 and 14 in position and to lock the cable 98 between the elements, the sleeve 16 is provided. The sleeve 16 is formed of a vinyl material that is relatively flexible and has an inside tapered construction that generally conforms to the taper of the assembled elements 12 and 14. In order to provide gripping surfaces for the user of the connector, the outer surface of the sleeve 16 is formed with a plurality of transversely extending ridges and grooves. The longitudinal dimension of the sleeve 16 is proportioned such that it exactly fits between the flanges of the elements, and the thickness of the sleeve 16 is such that it occupies substantially the space defined by the outwardly extending portions of the flanges with respect to the body portions of the elements, wherein the outer edges of the ridges of the sleeve 16 are substantially coextensive with the outer surfaces of the adjacent flanges. This relationship is clearly illustrated in FIG. 2. The inner dimensions of the sleeve 16 are proportioned such that when the sleeve 16 is located in the assembled position thereof, it fits tightly over the interfitting elements 12 and 14. The elements

12 and 14 are thus disposed in firm interfitting relation and are caused to squeeze the insulated portion of the cable 86 that extends between the flat surfaces 40 and 70. Since the sleeve 16 does exert a clamping action to lock the elements 12 and 14 in interfitting relation, and since the material from which the elements are formed is relatively flexible, the surfaces 40 and 70 will conform to the configuration of the cable 98 and the resulting assembly appears to form a one-piece molded construction.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claims.

What is claimed is:

1. In an electrical connector, a body portion defined by a pair of interengaged elements molded of a plastic material that has resilient characteristics, both of said molded elements having hollowed out portions that combine to form an interior chamber when said elements are located in interengaged relation, a plurality of conductors extending into said interior chamber, one of said elements having spaced slots formed therein that communicate with the hollowed out portion therein and that receive ends of said conductors therein for anchoring said conductors, a projecting portion formed on said last named element between said slots and having a concave recess formed in the outermost end thereof, the other element including a groove formed therein that receives said projecting portion, the inner end of said groove being concave and cooperating with the concave recess in said projecting portion to receive a cylindrical conductor therebetween, the ends of said elements opposite the projecting portion and groove being relatively flat, a three wire electrical cable extending into said chamber, each of the wires of said cable being electrically connected to a conductor, and the insulated portion of said cable extending between the flat ends of said elements, and a flexible sleeve enveloping said elements in clamping relation so as to define a rigid assembly therewith, the flat ends of said parts between which said cable extends being deformed by said cable and conforming to the configuration of the cable to impart a molded appearance to said connector.

2. In an electrical connector, a first element molded of a relatively flexible plastic material and having a recess formed therein, a second element molded of a relatively flexible plastic material and having a recess formed therein, said elements being located in complementary relation, wherein the recesses therein cooperate to define a central chamber, conductors secured between said elements at one end thereof, a cable projecting into said recess between the elements at the other end thereof and being electrically connected to said conductors, the other ends of said elements through which said cable extends including flat surfaces against which said cable is engaged, and a sleeve enveloping said elements and being proportioned for clamping them together in tight fitting relation, the flat surfaces of said elements that engage said cable being

deformed and conforming to the configuration of said cable to impart a molded appearance to said connector, one of said elements including an outwardly extending projection having an arcuate recess formed in the outermost edge thereof, and the other end of said elements including a groove, the innermost end of which has a concave configuration, said groove receiving said projection when said elements are located in engaging relation, the recess in said projection and concave end of said groove cooperating to receive a round conductor therebetween.

3. In an electrical connector as set forth in claim 2, said one element having spaced longitudinally extending slots formed therein on opposite sides of said projection, and transverse slots communicating with said longitudinal slots, at least two of said conductors being disposed in said longitudinal slots, each conductor including an anchoring tab that is disposed in a transverse slot, thereby providing for securement of said conductor between said elements when they are clamped together by said sleeve.

4. In an electrical connector, a pair of elements that are molded of a relatively resilient plastic material, and define complementary half sections, each element including a hollowed-out portion that is bordered by flat marginal side edges and end portions, a projection formed on an end portion of one of said elements, slots formed in the end portion of said one element and on opposite sides of said projection, said other element including a groove that is formed in an end portion thereof and receives said projection therein, a conductor being secured between said groove and projection, additional conductors disposed in said slots and secured therein when said elements are located in complementary relation, a cable extending between said elements into the hollowed-out portions thereof, said cable having exposed wires that are interconnected to said conductors and are insulated from each other, the insulated portion of said cable extending between the flat end portions of said elements that are opposite said conductors, and a flexible sleeve enveloping said elements and clamping them together such that the flat side edges and end portions thereof abut in engaging relation, the flat ends of said elements between which said cable extends being compressed against said cable so as to be deformed thereby and conforming to the configuration of said cable to impart a molded appearance to said connector.

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