Dec. 29, 1970 E. M. WALLER, SR 3,551,879

NONLOOSENING ELECTRICAL CONNECTOR

Filed Dec. 20, 1968

Fig. 1

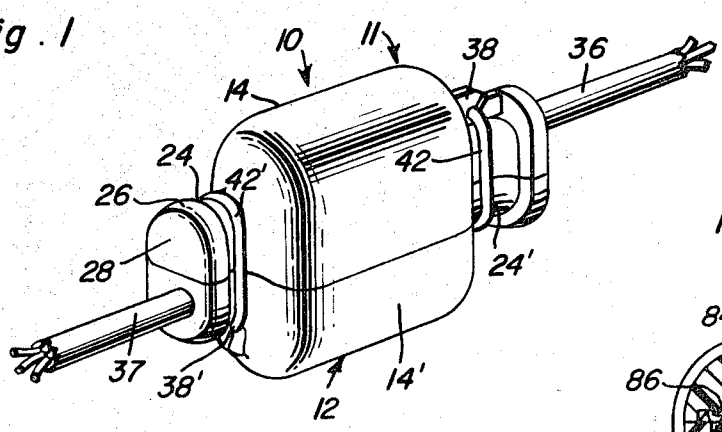


Fig. 5

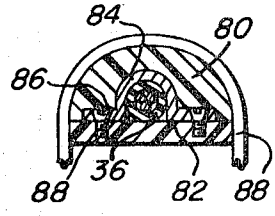


Fig. 2

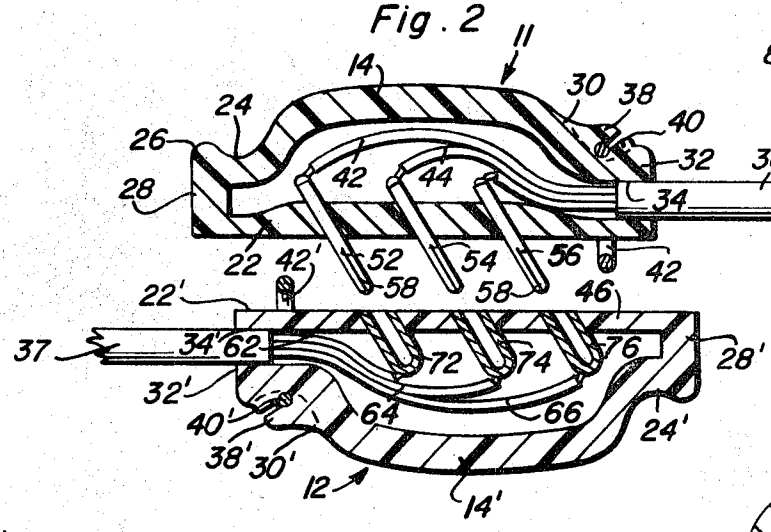


Fig. 3

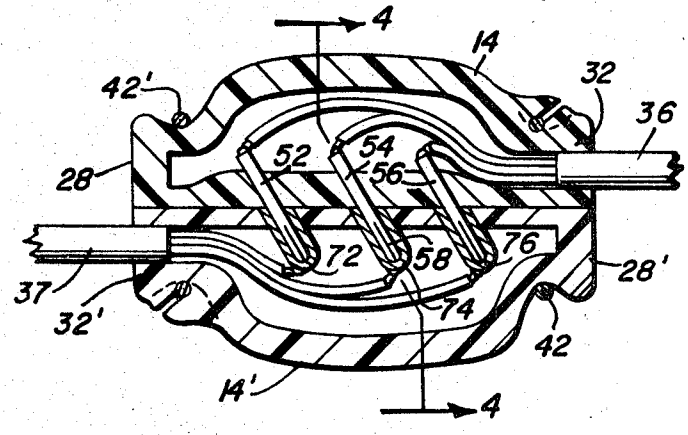
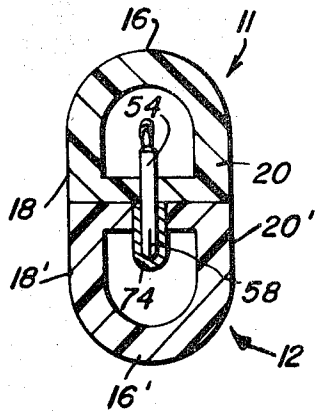


Fig. 4



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NONLOOSENING ELECTRICAL CONNECTOR

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ABSTRACT OF THE DISCLOSURE

A connector assembly including a male connector having outwardly extending slanted prongs adapted to engage similarly slanted receptacles, the latter being recessed within a female connector. Upon coupling the connectors together, oppositely directed shearing forces exerted upon the connectors cause more complete engagement between the prongs and receptacles thereby inhibiting loosening.

The present invention relates to electrical connectors and more particularly to connectors employed as terminations on extension cables.

Present date extension cords or cables generally include a connector termination for accommodating the straight prongs of a conventional appliance plug. Although such a connector assembly is generally adequate for supplying power to most stationary appliances, they present difficulty to an individual using an appliance in tight spaces or at elevated heights. To be more specific, after extended use, the frictional engagement between conventional plugs and extension cord terminations is not sufficient to maintain engagement during heavy-duty use of a portable machine or power tool, which causes pulling forces on the supply cord or cable. Thus, for example, if a workman is employing an electric drill having its cord connected to an extension cord termination, and should the plug of the drill loosen from the termination, it is likely that the workman will be required to climb down from his perch to reconnect the drill. Such an annoying and time consuming occurrence is also quite common when utilizing portable household appliances such as vacuum cleaners and the like.

The present invention is directed to a connector assembly which prevents mating connectors from loosening when pulling forces are exerted in opposite directions upon the connector assembly. To achieve this end, the invention employs a first connector having angularly disposed prongs that are adapted to engage generally inclined receptacles in a second connector. Thus, when the connectors experience oppositely disposed shearing forces the prongs and receptacles are forced into more intimate engagement. Means are further provided for clamping the first and second connectors of the assembly together thereby insuring that under reasonable use, the connector assembly will not separate. The clamping means are in the form of manually manipulatable flexible bands which require no special tools.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a perspective view of the present connector assembly.

FIG. 2 is a longitudinal sectional view illustrating the connector assembly sections in spaced relation from one another.

FIG. 3 is a longitudinal sectional view illustrating the disposition of components when the connector assembly is in a fastened position.

FIG. 4 is a transverse sectional view taken along a plane passing through section line 4—4 of FIG. 3.

FIG. 5 is a transverse sectional view illustrating a modified version of the present invention.

Referring particularly to the drawings, reference numeral **10**, shown in FIG. 1, designates the present connector assembly which is seen to include a first male connector **11** and a second mating female connector **12**. The aforementioned connectors each have a generally semi-cylindrical housing or casing characterized by a generally semi-oval cross-section as seen in FIG. 4. The casings **14** and **14'** associated with connectors **11** and **12** respectively are adapted for mating relation whereby a completed cylindrical casing is formed.

Referring to FIG. 4 the first casing **14** is seen to include an elongated bight section **16** appending to parallel spaced planar sections **18** and **20**. Identical sections characterize casing **14'** and are distinguished from casing **14** by the inclusion of prime numbers.

Considering FIG. 2, the casing **14** of male connector **11** is seen to include a substantially planar surface **22** adapted to engage a similar surface of female connector **12'** as hereinafter explained. The present design contemplates utilization of resilient material for fabricating the casing so that by seating surface **22** against a mating surface, a weather seal is created. If desired, a recess may be formed within the mating planar surfaces to accommodate a gasket (not shown) therein for sealing the mating connectors **11** and **12** together. Alternately, the planar surface of one or both connectors may include confronting rib-like projections (not shown) for achieving the same result. The main body of casing **14** tapers longitudinally downwardly to a neck portion **24**, the latter extending to a semi-oval neck element **26** having an outwardly planar surface **28**. The neck and shoulder portions of the casing serve to retain a clamp assembly as hereinafter discussed.

An opposite end of casing **14** includes a similar neck portion **30** appending to an apertured ear projection **38** having an inwardly extending slit **40** terminating at the inner end thereof by an aperture transversely disposed of the slit. The ear projection **38** extends longitudinally outwardly to a shoulder projection **32** having a transverse planar surface oppositely disposed from the aforementioned surface **28** and includes a longitudinally extending passageway or bore **34** extending inwardly through the casing to communicate with the hollow interior of the casing **14**. This entrance permits receipt of a cable or wire **36** therein, the interior of the entrance frictionally retaining the wire. In certain instances, the wire and connector **14** can be retained together in a molded assembly by utilizing means well known in the art.

A generally oval elastic band **42** is slipped through slit **40** in projecting ear **38** for final disposition within the aperture formed at the inward end of the slit **40**. The band is normally positioned transversely of casing **14** in order to retain the mating connector casing **14'** in engaging relation. This is effected by manually slipping the free end of band **42** over the neck portion **24'** of casing **14'** when the latter casing of the second connector **12** is positioned in an opposing relation from casing **14**. Thus, the projecting ear **38** of casing **14** is positioned in underlying relation with the neck portion **24'** of the oppositely disposed casing **14'**.

As will be noted from FIG. 2, the casing **14'** of connector **12** is identical to the casing **14** of connector **11**. However, to distinguish the component parts of each, the portions of casing **14'** are indicated by prime numbers. As shown in FIG. 2, casing **14'** also includes an

elastic band 42' which is adapted to encircle or engage neck portion 24 of mating connector casing 14.

In the particular design illustrated in FIG. 2, three prong contacts 52, 54 and 56 are embedded within the planar face surface 22 and extend outwardly therefrom to engage mating receptacles. The opposite end portions of each prong provides a means for securing or soldering exposed ends of associatively connected wires 42, 44 and 46 contained within cable 36. Attention is directed to the angular inclination of the prongs with respect to base surface 22. The prongs are longitudinally aligned and parallel spaced from one another. In order to improve the resilient nature of the prongs, slits 58 are formed within the outward tip portion of each prong.

Considering connector 14', a cable 37 is admitted through an entrance 34' identical to entrance 34 in connector 14. In the case of connector 34', three wires are illustrated as indicated by 62, 64 and 66. These wires are welded, soldered or otherwise connected to tubular receptacles 72, 74 and 76. These receptacles are embedded within the planar surfaces 22' of connector 14' and are inclined in a manner to mate in registry with the prongs 52, 54 and 56. As will be noted from FIG. 2, the upper edge of the receptacles are flush with surface 22' and disposed in parallel spaced relation with respect to one another. In the particular embodiment illustrated, three contacts are employed in each connector so that the connector assembly may be used with three wire systems.

FIG. 2 illustrates the connectors 14 and 14' in spaced relation prior to engaging the connector together. In order to accomplish engagement, the prongs and receptacles are maintained in registry as the prongs are inserted within the mating receptacle. The resulting motion may be characterized as inwardly directed sliding motion consumating in confronting engagement of planar surfaces 22 and 22' producing electrical continuity between the mating prong and receptacle contacts. The engaged position is illustrated in FIG. 3 wherein the casings are illustrated to be in transverse alignment thereby forming a generally smooth and substantially sealed casing assembly. In order to insure engagement between the connectors, the elastic bands 42 and 42' are slipped over associated casing portions 24 and 24'. Thus, as will be appreciated, clamping section by the elastic bands may be achieved by manual manipulation without the aid of special tools.

In operation of the connector, cables 37 and 36 represent hot line and appliance cord respectively. In normal use of the connector assembly when outwardly directed pulling forces are exerted upon cables 36 and 37, the tendency will be for the prongs to more fully engage the receptacles. Thus, the annoying and time consuming inconvenience of continually separating connectors in a cable is obviated.

Although the present invention has been described in terms of a factory molded connector and wire assembly, it will of course be appreciated that a connector being capable of hand assembly may be fabricated so that an individual may connect a wire to the connector without the assistance of machine fabrication.

FIG. 5 represents a modification of the invention to reflect a component connector. In essence, the modification includes additional hollowing of each connector shell in the vicinity of the wire entrances or passageways 34 and 34'. This portion of each shell is indicated by reference numeral 80 having an associated flat plate portion 82. A generally U-shaped clamp or collar 84 is inverted in confronting relation to the upper surface of the plate 82. The clamp includes the two horizontally disposed flanges 86 having apertures therein for receiving suitable screws 88 which become secured within tapped holes in plate 82. Thus, a wire 36 may be secured within the connector by positioning the wire within clamp member 84 and screwing the clamp to the plate 82. Of course,

if a component connector is to be utilized, the plate member 82 must be removable from the casing 80 so as to permit access to the inward end of the prongs and receptacles. This would merely require the fabrication of the casing 80 separate from the plate 82, the two being securable by means of suitable fasteners. Connecting of cable wires to the respective prongs and receptacles may be effected by soldering or by including screw-type terminals at the inward ends of the prongs and receptacles.

In light of the present disclosure, it will be obvious to one of ordinary skill in the art to utilize the prong-receptacle relation of the present invention in the form of an electrical wall outlet and a mating appliance plug. In such an application, one of the connector casings 14 or 14' would be stationarily positioned to a wall mounting while the other connector would form the terminal of an appliance. The procedure for electrically engaging the connectors would be similar to that discussed hereinbefore.

In applications where protection from mismatch of mating connectors is desired, the male and female connectors may be arranged in a nonsymmetrical offset pattern.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. A connector assembly comprising a female connector including a casing, at least one receptacle contact mounted in an interface of the casing, an entrance formed in the casing, a wire extending through the entrance in spaced acute angular relation to the contact and parallel with the interface for connection with an inner end of the contact; a male connector of the assembly comprising a casing having a connector interface abutting the female casing interface, at least one prong contact mounted in the interface and engaging the receptacle contact, an entrance formed in the latter casing, a wire extending through the latter entrance in spaced acute angular relation to the prong contact and parallel with the interface for connection with the inner end of the prong contact wherein the engagement between the contacts increases in response to outward pulling forces on the wires.

2. The connector assembly set forth in claim 1 wherein the prong contacts have longitudinal slits therein for increasing resiliency.

3. The structure of claim 2 together with at least one clamping means for securing the male and female connectors together, the clamping means comprising an apertured ear projection extending from one casing for retaining one end of a band, an aligned shoulder projecting from the other casing wherein the shoulder is encircled by an opposite end of the band to effect securement of the casings.

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U.S. Cl. X.R.

339—176, 196