Oct. 20, 1970 W. HANSEN 3,535,674

STRAIN RELIEF ASSEMBLY FOR ELECTRICAL CONNECTOR DEVICES

Filed Aug. 5, 1968

Fig. 1.

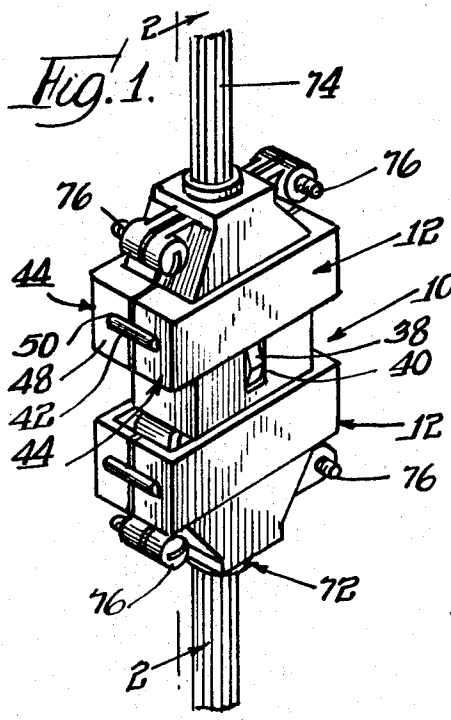


Fig. 2.

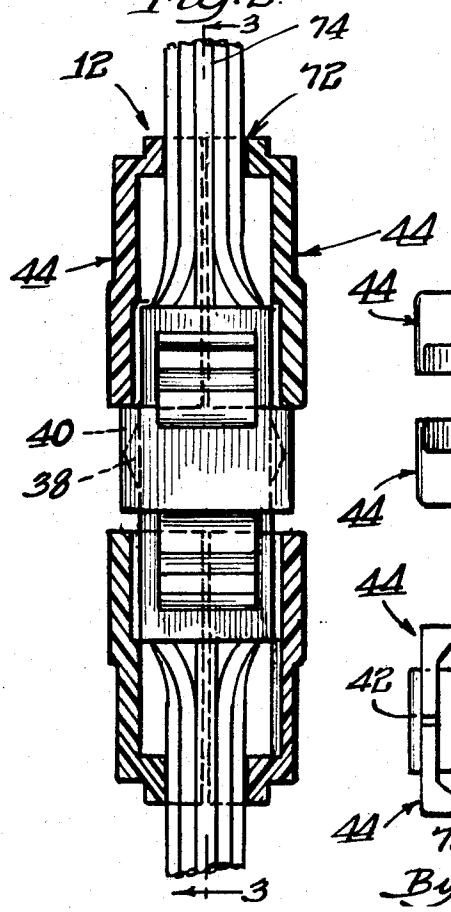


Fig. 3.

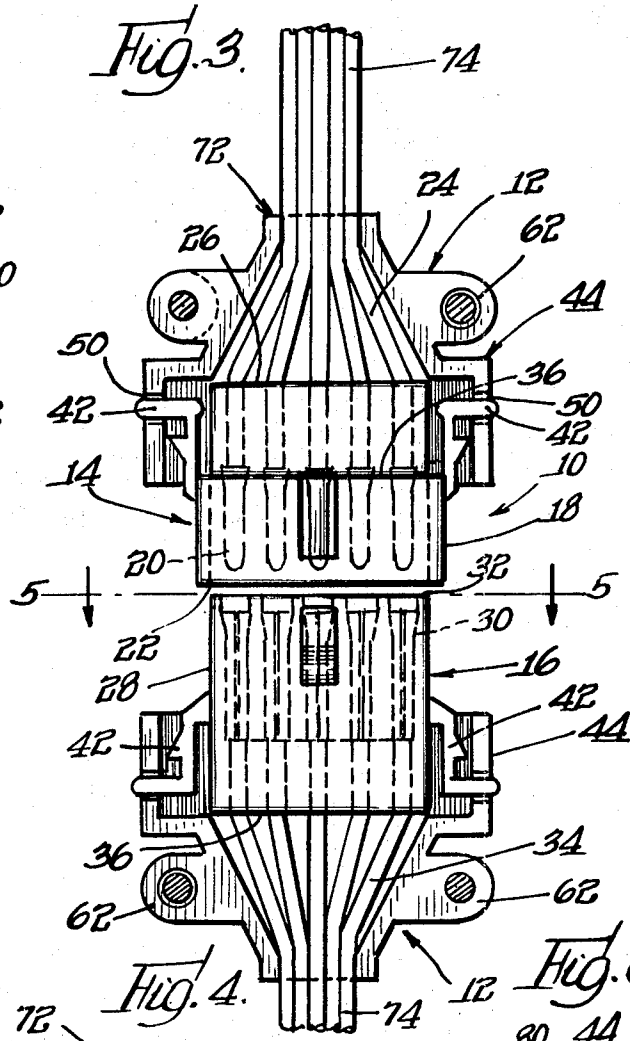


Fig. 4.

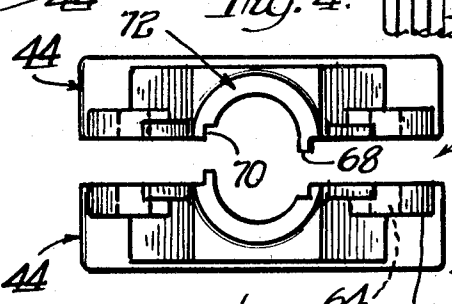


Fig. 5.

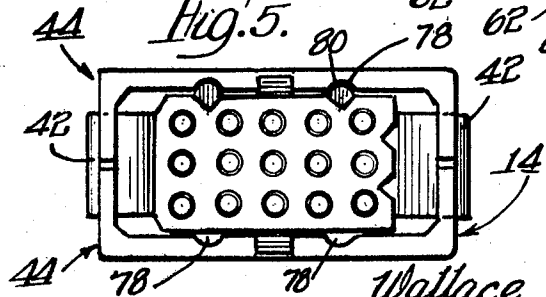
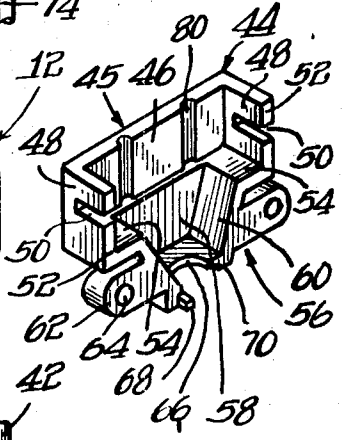


Fig. 6.



Inventor
Wallace Hansen
By: Olson, Trexler, Wolters & Bushnell atty's.

United States Patent Office 3,535,674 Patented Oct. 20, 1970

3,535,674

STRAIN RELIEF ASSEMBLY FOR ELECTRICAL CONNECTOR DEVICES

Wallace Hansen, Glen Ellyn, Ill., assignor to Molex Products Company, Downers Grove, Ill., a corporation of Illinois

Filed Aug. 5, 1968, Ser. No. 750,120
Int. Cl. H01r 13/58
U.S. Cl. 339—107 9 Claims

ABSTRACT OF THE DISCLOSURE

A strain relief cover assembly comprising a pair of cover halves which are mounted in mating relation on the body of a connector element. A collar formed upon the mating of the cover halves serves to grip the terminal wires extending from one end of the connector body to prevent the wires from being pulled from their respective terminals mounted in the connector body in the event force is applied to the wires or the connector body in the separation of the elements or otherwise.

BACKGROUND OF THE INVENTION

This invention relates generally to strain relief devices and more particularly to strain relief devices for electrical connectors.

Presently, electrical connector assemblies of the type including a mating male and female plug element are finding wide use. Such a connector assembly may be found in John H. Krehbiel U.S. Pat. 3,196,380. Most often each of the plug elements of these connector assemblies includes a plurality of terminals embedded in some fashion in a plug body. Each of the terminals is connected by crimping, soldering, or other suitable means to a lead wire which in turn is connected to some external circuitry. Thus, upon joining the plug elements, a multiple connection is completed.

While these connector assemblies are for the most part efficient and reliable, there is the disadvantage that it is possible, upon separating the male and female plug bodies, for a wire or wires connected to terminals of a respective plug to be pulled or disconnected from a corresponding terminal or for a terminal to be pulled out or damaged. This is caused by forces being applied to the lead wires when the separation takes place. Moreover, even when the plug elements are not being separated, forces applied to the wires extending from the plugs may cause the disconnection of the former from their terminals.

SUMMARY OF THE INVENTION

Accordingly, it is a general object of this invention to provide strain relief devices for use with male and female plug elements of an electrical connector assembly to prevent the disconnection of terminal wires from the terminals of the plugs due to forces acting on the plug elements, such as, for example, in the separation thereof.

It is another object of this invention to provide a new and improved male and female connector plug assembly which includes means for preventing the disconnection of lead wires from respective terminals thereof upon the application of force thereto, either in separating the plugs, or otherwise.

It is a more specific object of this invention to provide a strain relief cover for each plug element of a male-female plug connector assembly which includes means for retaining the cover to the plug element, and which grips the wire leads extending therefrom so as to take up forces applied to the wires upon the separation of the plug elements.

It is still another object of this invention to provide strain relief covers of the type described above, each of which includes a pair of identical mating halves mounted on and joined about a plug element.

The foregoing and other objects and advantages of the present invention are realized by the provision of a pair of cover halves mounted in mating relation on the body of a connector element. The connector element is provided with resilient ears locked in an opening or aperture in the cover assembly. A collar formed by coaction of the mating halves grips the terminal wires extending from the connector body to prevent the wires or terminals from being pulled from the connector body.

DESCRIPTION OF THE DRAWINGS

A better understanding of the present invention and its organization and construction may be had by referring to the description below in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of an electrical connector assembly including mating male and female plug elements, each of which includes a strain relief cover assembly according to the invention;

FIG. 2 is a longitudinal sectional view of the connector assembly of FIG. 1, taken along the line **2—2** thereof;

FIG. 3 is a longitudinal sectional view of the connector assembly at right angles to FIG. 2 and taken along the line **3—3** thereof;

FIG. 4 is an exploded end view of a strain relief cover assembly according to the invention;

FIG. 5 is an end view of the male half of the connector assembly of FIG. 3, taken along the line **5—5** thereof; and

FIG. 6 is a perspective view of one of the identical halves of a strain relief cover assembly according to the invention.

DETAILED DESCRIPTION

Referring now to the drawings more in detail, an electrical connector assembly **10** incorporating a pair of strain relief cover assemblies, each designated by the numeral **12**, according to the invention, is shown in FIG. 1. The connector assembly **10** is similar to the type shown in John H. Krehbiel U.S. Pat. No. 3,196,380, and includes a male plug **14** and a female receptacle **16** (FIG. 3).

The male plug **14** comprises a body **18** of molded plastic material, and includes, mounted therein, a plurality of male terminals **20** (as disclosed and claimed in John H. Krehbiel U.S. Pat. 3,178,673) extending outwardly toward one end **22** thereof. Each of the terminals **20** is connected to a lead wire **24** which extends through the plug body **18** and out the opposite end **26** thereof. The female receptacle **16** likewise comprises a body **28** of molded plastic material and includes a plurality of female terminals **30** mounted therein with the leading end thereof extending toward one end **32** of the body. The terminals **30** are each connected to a lead wire **34** which extends through plug body **28** and out the opposite end **36** thereof.

A wedge-shaped lug **38** is formed on the male plug body, and mates with a slot or aperture **40** provided in the female receptacle body upon joining the respective plugs to maintain the plugs in an interlocked relation. Also provided upon both the male and female plug bodies and formed integrally therewith and extending from opposite sides thereof, are resilient, bendable ears **42**. The ears **42** which have been provided primarily to facilitate ready assembly of the electrical connector on a mounting panel or the like support surface, are, as will be explained more fully hereinafter, used in the mount-

ing of a strain relief cover assembly 12 to a respective plug body.

Each of the strain relief cover assemblies 12 includes a pair of identical mating cover halves, each designated by the numeral 44, which are joined together about a respective one of the plugs 14 and 16. Each cover half 44, as shown in FIG. 6, comprises a leading end 45 which has a rectangular shape and includes a main wall 46 having a pair of side walls 48 connected thereto and extending perpendicularly outwardly therefrom. Each side wall 48 includes therein a slot 50 extending from an outer edge 52 of the wall toward the main wall 46. A shoulder portion 54 joins each side wall 48 and main wall 46 to the trailing end 56 of the cover half. The trailing end 56 has the shape of a truncated triangle including a main wall 58 extending in the same plane as, and which is, in effect, an extension of main wall 46 of the leading end 45, and a pair of inwardly extending side walls 60 connected to the main wall 58. A tab 62 extends outwardly from each side wall 60 and includes an aperture 64 therein. At the truncated end of the triangular shaped trailing end 56 there is provided a semicircular collar or flange half 66, the purpose of which will be described hereinafter. A finger 68 extends outwardly from one outer edge of the semicircular collar and a shoulder 70 is formed at the other outer edge thereof, one hundred eighty degrees from the finger 68. Finger 68 and shoulder 70 of the mating collar halves, as can be seen in FIG. 4, provide a means for interlocking the collar halves to form a circular collar 72 when the cover halves are mated.

For purposes of affording a more complete understanding of the invention, the assembly of the strain relief covers onto respective ones of the plugs of the connector assembly will now be described.

A pair of identical cover halves 44 is mounted with each half being on an opposite side of a connector element 14 or 16, so that the resilient ears 42 of the connector body extend through respective slots 50 in the end walls 48 of the cover halves. The cover halves are joined together as shown in FIG. 4, about the connector body. The ears 42, being resilient and tending normally to bend outwardly, are manually depressed and inserted into slots 50. Upon release of the ears 42, they tend to return to their normal position to lock the cover halves on the connector body. As the cover halves are being mounted on and joined about the plug, a plurality of terminal lead wires 74 extending from one end thereof, are moved into position within collar 72 formed upon the mating of collar halves 66. Fingers 68 of each of the collar halves engage opposing shoulders 70 of the respective collar halves to position the latter relative to one another. The joining of the collar halves 66 insures the gathering of the plurality of wires 74 therebetween, while the fingers insure against escape of individual wires in the event the cover is sprung. Fasteners, in this case self-tapping screws 76, are inserted into the apertures 64 in adjacent tabs 62 of the respective cover halves. The tightening of the screws secures the cover halves to each other and forces the collar halves together in a gripping relation about the wires 74. Thus, if an external force is applied to the wires, either in separating the plugs or otherwise, the force is concentrated at the collar 72 and is not transmitted to the terminal-wire connections of the plug. This prevents the pulling or disconnecting of a wire from its terminal or undesired moving of the terminal. In the strain relief cover assembly 12 shown in the drawings, self-tapping screws 76 and tabs 62 are used to apply the gripping force through the collar to the wires, but other suitable fastener means may be used also; such other means may be, for example, a snap connection between the cover halves.

The strain relief cover assemblies, while eliminating or greatly reducing the forces applied to the terminal-wire connections of the plug connector assembly, also provide a means for easily holding the plug and receptacle

when they are being separated. One can grip the cover assembly 12 to apply a pulling force to separate the plug and receptacle. The force applied to the cover assemblies 12 when separating the plug 14 and receptacle 16 acts to cause the disengagement of the locking arrangement, comprising wedge 38 and slot 40 of the plug and receptacle bodies and in turn the separation of the latter.

Each of the connector elements shown in the drawings include a pair of reinforcing ribs 78 along at least one side thereof. Thus, recesses 80 have been provided in cover halves 44 for receiving the ribs therein upon mounting the cover assembly to the connector elements. This, as can be seen in FIG. 5, also serves further to prevent relative sidewise movement between the element and cover halves.

The cover halves described herein are preferably of a molded plastic material such as nylon, or the like, and because they are identical in structure, are relatively inexpensive to produce and have the advantage of being interchangeable.

While a particular embodiment of the invention has been shown and described, it should be understood that the invention is not limited thereto, since many modifications may be made. It is therefore contemplated to cover by the present application any and all such modifications as fall within the true spirit and scope of the appended claims.

What is claimed is:

1. Strain relief apparatus for a connector element of an electrical connector assembly including wired terminals mounted in a connector body, said strain relief apparatus comprising: cover means, means for mounting said cover means on said connector body, and gripping means attached to said cover means for gripping the terminal wires extending from the body of said connector element to prevent the wires from being pulled from the terminals mounted in said body upon the application of force to said wires or connector element, said cover means comprising a pair of cover sections, each mounted on said connector element in mating relation with each other and wherein said gripping means includes a pair of mating collar portions, one connected to each of said cover sections, said collar portions forming a collar to grip said terminal wires, upon mounting said cover sections on said connector body, each of said cover sections being identically shaped to form a cover half, wherein said collar portions comprise semi-circular shaped collar halves and wherein each said collar half includes a finger portion and a shoulder portion, the finger portion of a first one of said collar halves mating with the shoulder portion of the second one of said collar halves and vice versa, upon the mating of said cover halves, to insure the interlocking relation of said collar halves about said terminal wires, the body of said connector element including at least one resilient ear member extending therefrom and wherein each of said cover halves comprising said cover means, includes at least one slot therethrough, said respective slots of said cover halves being in alignment and communicating with each other upon the mating of said cover halves on said connector body to form an opening for receiving said ear member upon mounting said cover means on said connector body, thereby to retain said cover means thereon.

2. Apparatus as claimed in claim 1 wherein each of said cover halves includes at least one tab member extending therefrom, said respective tab members being in mating relation upon the joining of said cover halves on said connectod body, and wherein said apparatus further includes complementary fastening means connected to said tabs for locking said tabs together, thereby further to secure said cover means on said connector body and to provide a gripping force for said collar portions about said terminal wires.

3. Apparatus as claimed in claim 1 wherein said ear member is of a resilient, bendable plastic material and normally extends outwardly from said connector body so

that, upon the mounting of said cover halves on said connector body, said ear member is moved from a normal to a bent position to be received in said opening, said ear member tending to return to a normal position upon entering said opening, thereby to lock said cover portions on said connector body.

4. In combination: an electrical connector comprising a mating male and female connector element each including a connector body having a plurality of wire terminals mounted therein, the wires of said terminals extending outwardly from a first end of each of said elements, and a pair of strain relief cover assemblies, each comprising: a cover portion, including a pair of cover halves, means for mounting said cover halves on the connector body of said connector element in mating relation thereon, said cover portion including restraining means formed upon the joining of said cover halves on said connector body, said restraining means grippingly engaging said terminal wires extending from said connector body, thereby to prevent forces applied thereto from disconnecting said wires from said terminals, each of said connector elements including at least one resilient ear member extending outwardly from one side thereof and wherein said cover halves each includes a slot means therein, said respective slot means being aligned and communicating with one another upon the mating of said cover halves, to form an opening, said opening receiving therein said one ear member, thereby to retain said cover portion in mounted relation on said connector element.

5. The combination as claimed in claim 4 wherein each of said cover halves includes a tab extending therefrom, said tabs being in mating engagement upon the joining of said cover halves, wherein said restraining means includes a collar formed from collar portions connected to said cover halves upon the joining of the latter, and wherein said cover portion further includes fastener means for locking said tabs together upon the mating of said cover halves, thereby further to secure said cover halves on said connector body and to provide a gripping force for said collar on said wires.

6. The combination as claimed in claim 5 wherein each of said collar halves includes a finger portion and a shoulder portion, the finger portion of one of said collar halves being joined with the shoulder portion of the other of said collar halves and vice versa, upon the joining of said cover halves on a respective connector element.

7. In combination: an electrical connector comprising a mating male and female connector element, each including a rectangularly shaped connector body of a plastic material, each said connector body including a plurality of wire terminals mounted therein, the wires of said terminals extending outwardly from a first end of said connector body opposite the second mating ends thereof, each of said connector elements further including a pair of resilient ear members integrally formed therewith and extending from opposite sides of each said connector body between said first and second ends thereof; and a strain relief cover assembly for each of said connector elements, each of said strain relief cover assemblies comprising: a pair of cover halves, each of said cover halves including a first rectangularly shaped leading end having

a main wall and a pair of side walls extending therefrom, each of said side walls having a slot therein, said slot having one open end, each of said cover halves further having a trailing end having the shape of a truncated triangle including a main wall extending in the same plane as said main wall of said leading end and a pair of side walls extending outwardly from said main wall in the same direction as the side walls of the leading end, said triangularly shaped trailing end further including at the truncated end thereof a collar half, said cover halves of respective ones of said cover assemblies being mounted in mating relation on a corresponding connector element, the leading rectangular end of said cover halves being joined about said rectangular connector body with the open ends of said corresponding slots of said cover halves being aligned with each other to form a single closed-ended opening, each of said openings receiving therein a corresponding ear member of said connector body to secure said cover halves on the former, and said truncated triangular trailing ends of said cover halves being joined together and extending outwardly from said first end of said connector body, said collar halves being joined to form a collar member for grippingly engaging said plurality of wires extending from the first end of said connector body, and locking means connected to said cover halves for applying the necessary force through said collar member to said wires to prevent external forces applied to said wires or said connector element from disconnecting said wires from their terminals.

8. The combination as claimed in claim 7 wherein each of said collar halves of the trailing end of said cover halves includes, at one end thereof, a finger portion and at the other end thereof, a shoulder portion, whereby upon the mating of said collar halves to form said collar member, a finger portion of a first one of said collar halves mates with a corresponding shoulder portion of a second one of said collar halves and vice versa to insure against escape of said terminal wires.

9. The combination as claimed in claim 7 wherein each of said cover halves further includes an apertured tab member extending from each of the pair of side walls of said truncated triangular trailing end, whereby upon the mating of said cover half, respective tab members assume a position adjacent each other, and wherein said locking means includes bolt members extending through said apertured tab members to lock said tab members together, thereby, in accordance with the tightening of said bolt members, to apply the necessary gripping force about said terminal wires.

References Cited

UNITED STATES PATENTS

3,170,749	2/1965	Johanson et al.	339—107
3,328,748	6/1967	Winter	339—107

FOREIGN PATENTS

921,274	12/1954	Germany.
887,853	1/1962	Great Britain.

RICHARD E. MOORE, Primary Examiner