United States Patent

Startin et al.

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[45] **July 4, 1972**

[54] MULTIPLE COLD CRIMP SLEEVE PLUG AND SOCKET

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[73] Assignee: **AMP Incorporated**, Harrisburg, Pa.

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Related U.S. Application Data

[62] Division of Ser. No. 762,068, Sept. 24, 1968, Pat. No. 3,590,108.

[52] **U.S. Cl.** .....**339/220 R**, 339/62, 339/191 M

[51] **Int. Cl.**.....**H01r 9/08**

[58] **Field of Search** 339/220, 276, 198.4, 198.41, 339/62, 63, 20, 21, 191, 213

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[57] **ABSTRACT**

A method of forming plug or socket multiple connectors by the cold crimp sleeve technique involves the use of a twin sleeve extrusion, the sleeves being joined by a web, portions of the sleeves being cut out at intervals around web portions which serve as a carrier strip. Such an extrusion can then be fed conveniently to the dual die of a crimping machine where terminals of a twin core lead are inserted into respective sleeves. On crimping, both sleeves are simultaneously cold formed about respective terminals, and the carrier strip portion is severed. To facilitate use, a portion of the web between the sleeves may also be cut away to allow penetration of one multiple connector into the sleeves of another multiple connector.

2 Claims, 13 Drawing Figures

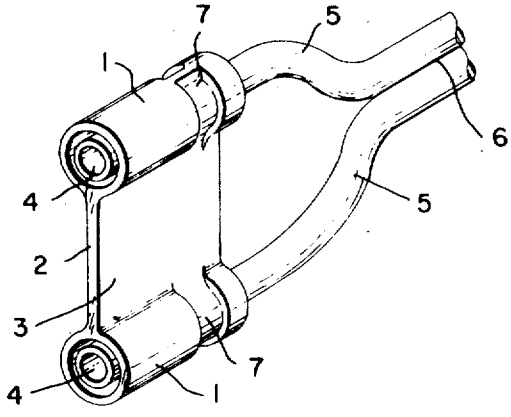


FIG 1

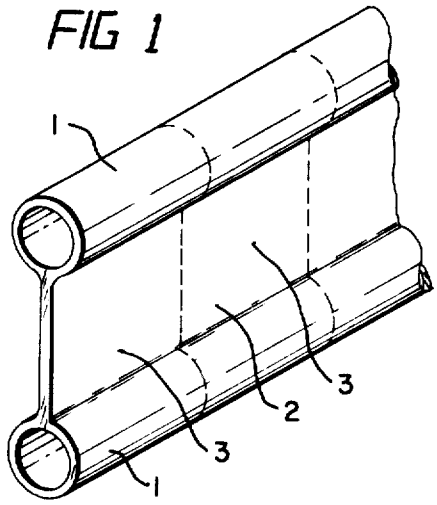


FIG 2

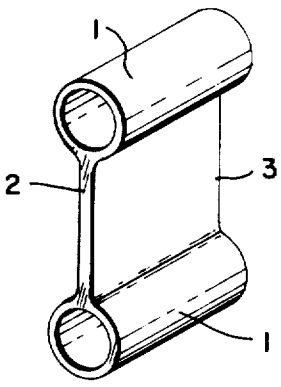


FIG 3

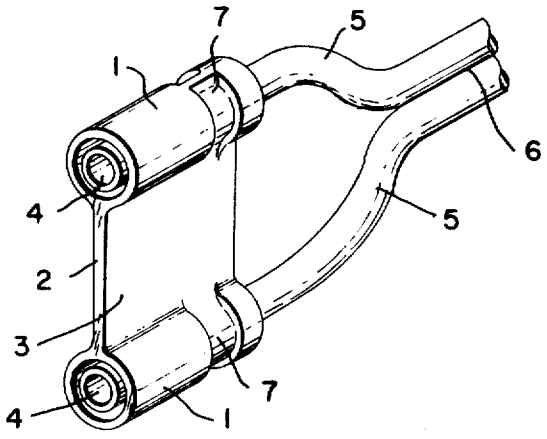


FIG. 4

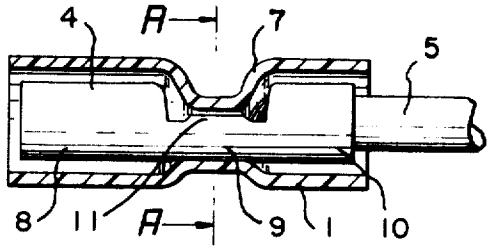


FIG. 4A-A

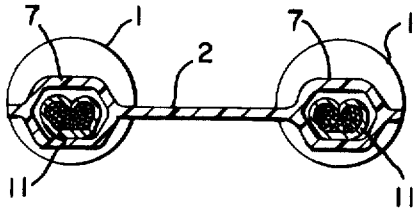


FIG. 5

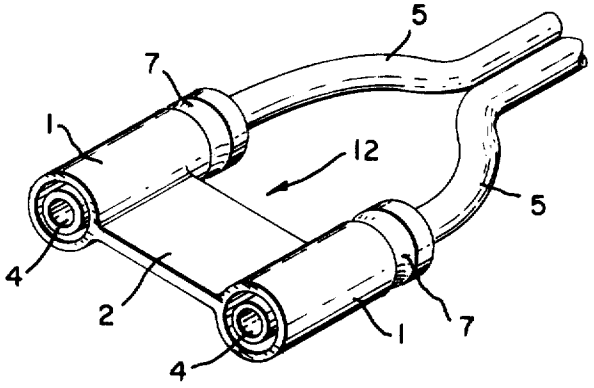


FIG. 6

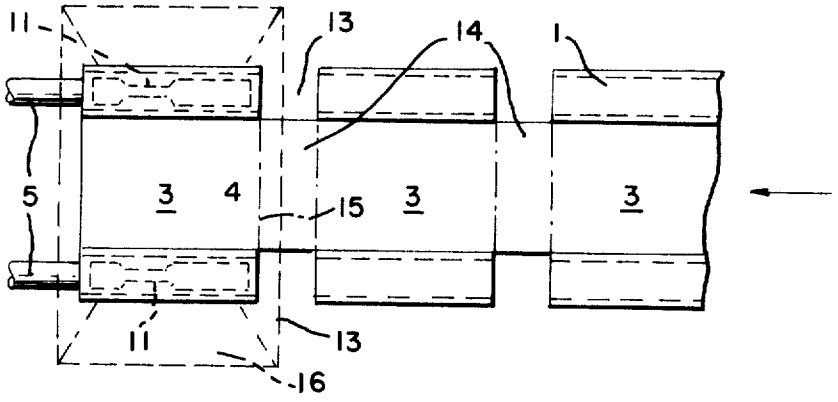


FIG. 7

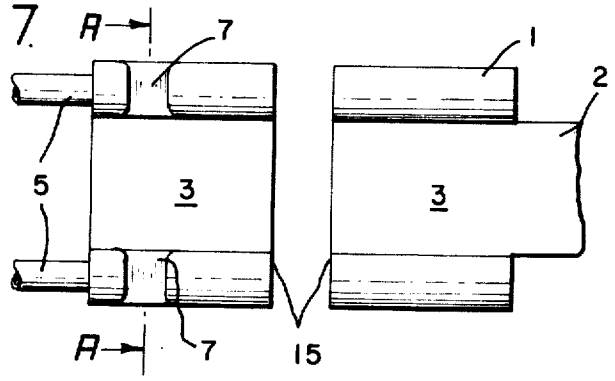


FIG. 7 A-A.

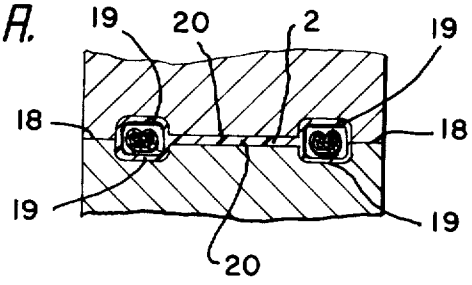


FIG. 8.

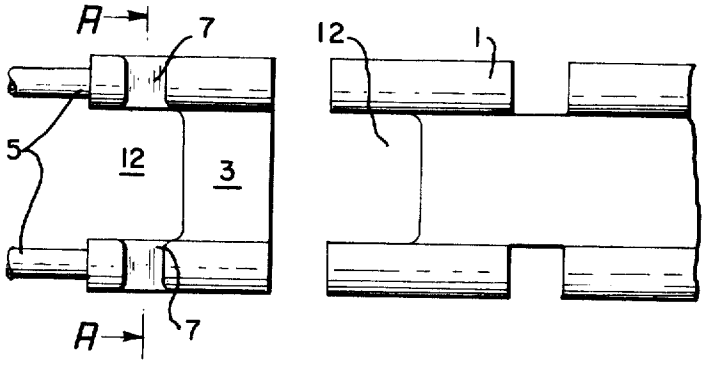


FIG. 8 A-A.

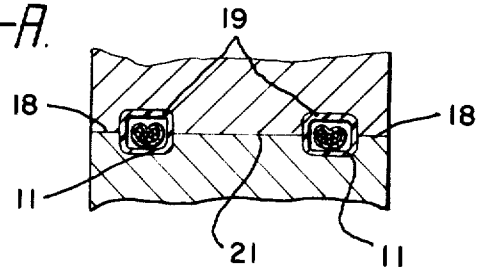


FIG. 9.

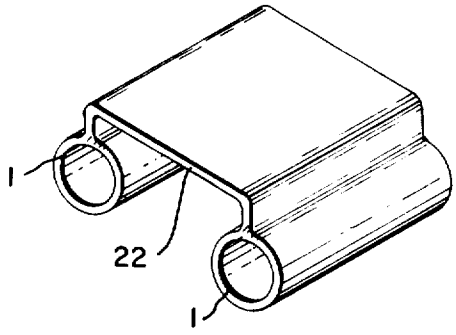
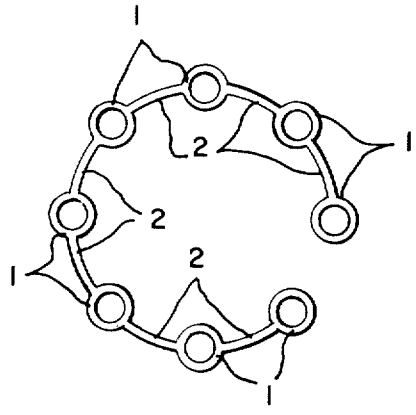


FIG. 10.



MULTIPLE COLD CRIMP SLEEVE PLUG AND SOCKET

This application is a division of pending application Ser. No. 762,068, now U.S. Pat. No. 3,590,108, issued June 29, 1971.

This invention relates to electrical connectors and the insulation of plural contact connectors.

It is known to insulate a connection between a wire and a terminal by positioning the connection within a sleeve of insulating material and cold-crimping or pressure forming the sleeve about the connector. In practice this technique has been found to be a successful and economic means of insulating connections and may be practiced with relatively rigid insulating material such as rigid PVC to provide an electrically insulating cover to the connection which also protects the connection and the terminal against damage in use.

In machines for applying such insulating sleeves to connections, individual sleeves may be fed in loose-piece form to a crimping zone of the machine where the sleeves are located to receive a wire terminal connection which is pushed through the sleeve from one end to position the connection within the sleeve, and then the sleeve is cold-crimped between crimping dies of the machine.

Where a group of connections is required to be insulated, it is customary to mount individual connections within respective cavities of a molded block of insulating material. Alternatively, the insulating material may be molded directly about the connections. Neither of these techniques is adapted for automatic operation and they tend to be expensive relative to the cold-crimp sleeve application technique.

It is an object of the present invention to manufacture connectors with plural contacts by use of the cold-crimp sleeve application technique.

Another object is of a method of forming an insulated electrical connector having a plurality of contacts, which according to the present invention comprises positioning the contacts in respective sleeve members of an extruded insulating member of crimpable material, the insulating member comprising a corresponding plurality of sleeve members integrally joined by a web or by webs, the or each web extending between a pair of the sleeve members, and crimping the sleeve members about respective contacts to secure the contacts in the insulating member.

A further object is that, suitably, the insulating member is formed as an extrusion of indefinite length from which portions are out to define each insulating member.

An additional object is that, suitably, parts of the sleeve portions are removed at intervals to define a series of insulating members spaced by short web portions to define a strip suitable for feeding in an automatic machine.

A still further object is that in operation of such machine for crimping the sleeves to contacts, the strip is fed in steps towards the crimping zone, successively to position the insulating members at the crimping zone.

Still an additional object is that the machine is arranged during a crimping operation to sever the crimped insulating member from the strip and to slug out the short web portion between the crimped member and the adjacent member of the strip.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

The invention will now be described by way of example with reference to the accompanying partly diagrammatic drawings, in which:

FIG. 1 is a fragmentary perspective view of a short length of plastic extrusion for use according to the invention;

FIG. 2 is a perspective view of an insulating member cut from the extrusion of FIG. 1 and prior to crimping about a pair of contacts;

FIG. 3 is a perspective view of the member of FIG. 2 after assembly with a pair of socket contacts terminating respective conductors of a twin-core lead;

FIG. 4 is a view taken along line 4—4 of FIG. 3;

FIG. 4A is a view taken along line 4A—4A of FIG. 4;

FIG. 5 is a perspective view of a modification of the assembly of FIG. 3;

FIG. 6 is an elevational view of an insulating extrusion similar to that of FIG. 1 but having parts removed and in an initial stage of assembly to a pair of wire terminations;

FIG. 7 is a similar view to that of FIG. 6 after a crimping and severing operation;

FIG. 7A is a view taken along line 7A—7A of FIG. 7 with the insulating member positioned between a pair of crimping dies;

FIG. 8 is a view similar to that of FIG. 7 illustrating the application of an alternative form of the invention;

FIG. 8A is a view taken along line 8A—8A of FIG. 8 with the insulating member disposed between a pair of crimping dies;

FIG. 9 is a fragmentary perspective view of an alternative extrusion to that of FIG. 1; and

FIG. 10 is an end view of a third alternative extrusion for forming a multiple contact connector.

The plastic extrusion of FIG. 1 is of indefinite length and conveniently for automatic machine operation may be wound on a reel. The extrusion comprises a pair of parallel tubular sleeves 1 spaced by a web 2 and may be cut into short lengths as indicated by broken lines, to form a plurality of insulating members 3, each as shown in FIG. 2. Each insulating member 3 is adapted to receive a pair of wire terminations, one in each sleeve portion, to form a two-contact insulated connector assembly, as shown in FIG. 3.

The connector of FIG. 3 contains, in each sleeve portion 1, a socket contact 4 terminating an insulated conductor wire 5, the two conductor wires 5 forming an end portion of a twin-core conductor cable 6. The contacts 4 are secured in the sleeve portion 1 by cold-crimp portions 7 of the sleeves 1 which are cold formed about the contacts as indicated more clearly in FIGS. 4 and 4A. Each of the socket contacts 4, as seen in FIG. 4, comprises a socket portion 8 of tubular form integral at one end with a wire crimping ferrule 9 and an insulation support ferrule 10. The ferrules 9 and 10 are respectively crimped about a stripped core portion and an insulated portion of the conductor wire 5 in known manner to define between the socket portion 8 and the insulation support ferrule 10, a zone 11 of reduced cross-section at the wire crimp ferrule 9. Each sleeve 1 is cold-crimped about the zone 11 to define a constriction in the sleeve 1 which engages the socket portion 8 at one side and the insulation support 10 at the other side to secure the socket contact 4 within the sleeve against longitudinal movement.

It will be understood from FIGS. 4 and 4A that, due to the web 2 extending between the sleeves 1 at the cold-crimp zones 7, crimping dies for defining the cold-crimp zones will in operation be spaced by the web 2. This is described in greater detail below in connection with FIG. 7A.

In an alternative arrangement, as shown in FIG. 5, in which like reference numerals refer to similar parts of FIGS. 1 to 4, a portion of the web 2 is cut away, before cold-crimping, between the crimped zones 11 to define an openended recess 12 between the crimped zones, so that dies for cold-crimping may meet within the recess 12. In this way cold-crimping may be effected by dies embracing the cold-crimp zone 7 in circumferentially confined manner as will be described below in connection with FIGS. 8 and 8A.

While the extrusion of FIG. 1 may be cut into individual lengths, and each length positioned at a crimping station in loose-piece form, the extrusion may be adapted as shown in FIG. 6, for continuous feeding to a crimping and shearing sta-

tion of an automatic or semi-automatic machine. In FIG. 6 like reference numerals refer to similar parts in FIGS. ! to 4, and the extrusion has portions removed from the sleeves 1 at evenly spaced intervals on each side of the web 2 to define slots 13. The web portions 2 between each pair of slots 13 define carrier strip portions 14 between adjacent insulating members 3. The limits of the carrier strip portions are indicated by chain-dotted lines 15.

In use, the extrusion of FIG. 6 is fed in the machine in the direction of the arrow towards a crimping and shearing station 16 in steps corresponding to the length of an insulating member 3 and a carrier strip portion 14 to position successive insulating members 3 at the station 16. The feed mechanism of the machine, not shown, may comprise a feed finger engageable in the slots 13, and the station 16 suitably comprises a stop device (not shown) for registering with the leading end of the extrusion, to properly locate the leading insulating member 3 in position between the crimping dies. Terminated wires 5 are inserted into the sleeve portions 1 of the leading insulating member 3 to position the terminals 4 of the terminated wires 5 within the sleeve portions 1, generally as indicated above in connection with FIGS. 1 to 4A. Crimping dies (not shown) at the station 16 are then operated to cold-crimp about the zones 11 of reduced cross-section to define the cold-crimp zones 7, and simultaneously a shear blade (not shown) is operated to sever and slug out the carrier strip portion 14 between the leading insulating member 3 and the next adjacent insulating member 3 as shown in FIG. 7. On withdrawal of the crimping dies and the shear blade, the severed leading insulating member 3 can be withdrawn with its wires 5 and terminals 4 secured as described in connection with FIGS. 3 to 4A thereby providing an insulated connector assembly. The remaining part of the extrusion may then be fed forwards to position the next leading insulating member 3 at the crimping station 16 and the cycle of operations repeated. Of course, the process of FIG. 6 could include the extrusion of the plastic material.

Crimping dies 17 at the station 16 comprise, as shown in FIG. 7A, a pair of dies meeting at die shoulders 18 generally coplanar with, and on opposite sides of, the web 2. Each die has a pair of die recesses 19 corresponding with the crimp zones 7 and joined by shallow recesses 20 for accommodating the web 2 of the extrusion when the die shoulders 18 engage.

In the alternative arrangement of FIGS. 8 and 8A, in which like reference numerals refer to similar parts in preceding Figures, the shear blade at the crimping and cutting station 16 is suitably arranged to sever the carrier strip portion 14 between the leading and next insulating members 3 of the strip, and to slug out a web portion at the leading end of the next insulating member 3 to define the recess 12, as described above in connection with FIG. 5. As seen in FIG. 8A, the dies for crimping the zones 7 are generally similar to those of FIGS. 7A but do not have the shallow recesses 20. Instead, a pair of die faces 21, coplanar with die shoulders 18, extend between the die recesses 19 and meet within the recess 12 between the crimp zones 7, so that the crimp zones 7 are circumferentially confined at the complementary die recesses 19.

In the modified extrusion of FIG. 9, a web 22 is of channel shape and is formed with a sleeve portion 1 along each of the side limbs of the channel. A twin-contact connector may be formed from the extrusion of FIG. 9 by the cold-crimp technique described, and spacing between the sleeve portions 1 and hence between the contacts disposed within them may be varied by flexure of the channel side limbs.

The invention may be applied using an extrusion of the form shown in FIG. 1 and having several parallel sleeve portions 1 spaced in pairs by respective web portions 2. In this way, multiple contact connectors may be formed in a single piece which, as shown in FIG. 10, can be rolled into a generally circular configuration by bending of the web portions. Of course, web portions can radiate from a central part with sleeve portions at the free ends thereof.

Two-part plug and socket connectors may be made according to the invention, by utilizing insulating members 3 of different sizes for the plugs and sockets. A first insulating member, having a pair of sleeve members 1 at a specified spacing, is crimped about socket contacts so that receptacle portions of the socket contacts are separated from the surrounding sleeve members by an annular space. A second insulating member, having a pair of sleeve members of smaller diameter but at the same pitch as those of the first insulating member, is crimped about complementary plug contacts so that plug portions of the contacts are separated from the surrounding sleeves by second annular spaces. A portion of the web of the insulating member of the plug assembly is cut away at the end between the plug portions so that the plug connector assembly is mateable with the socket connector assembly. The sleeve portions of the plug connector enter the sleeve portions of the socket connector within the first annular spaces, and the socket contacts enter between the plug contacts and the surrounding sleeves in the second annular spaces.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however, it should be emphasized that the particular embodiments of the invention, which are shown and described herein, are intended as merely illustrative and not as restrictive of the invention.

The invention is claimed in accordance with the following:

1. An electrical connector assembly comprising a body formed of dielectric material and containing at least two electrical terminals, the body comprising a member having at least two parallel open ended tubular portions, adjacent tubular portions being integrally joined by a web, each tubular portion containing a terminal and the tubular portions having crimped sections deformed about the terminals to secure the terminals within the tubular portions, the insulating body having a uniform cross-section throughout its length, other than at the crimped sections, so as to permit said body to be made by an extrusion process.

2. An electrical connector assembly as set forth in claim 1 wherein said tubular portions are disposed at free ends of said web with their axes being in the same plane as that of said web.

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