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[54] **ELECTRICAL CONNECTOR FEED STRIP**
ASSEMBLY
5 Claims, 16 Drawing Figs.

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206/56
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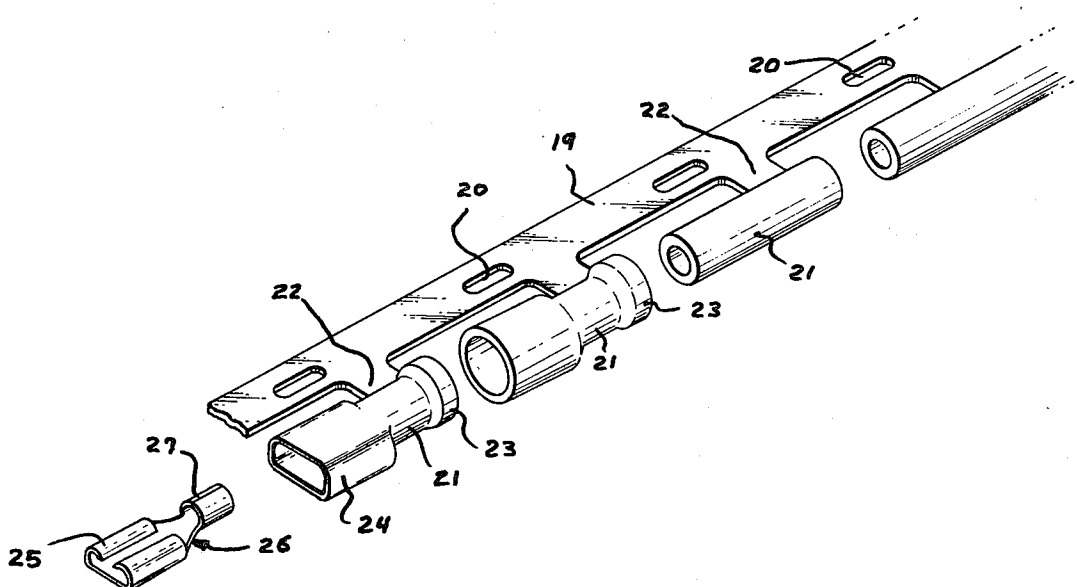
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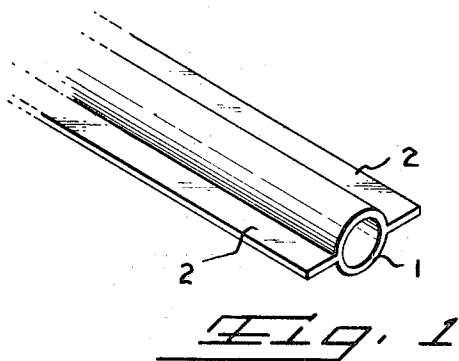
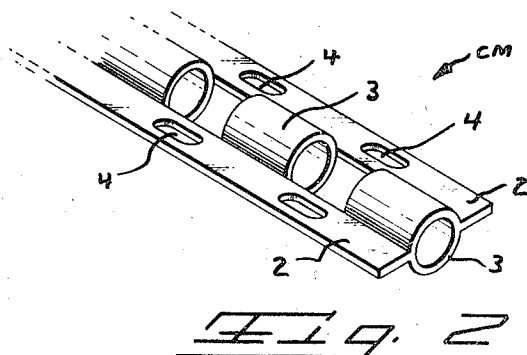
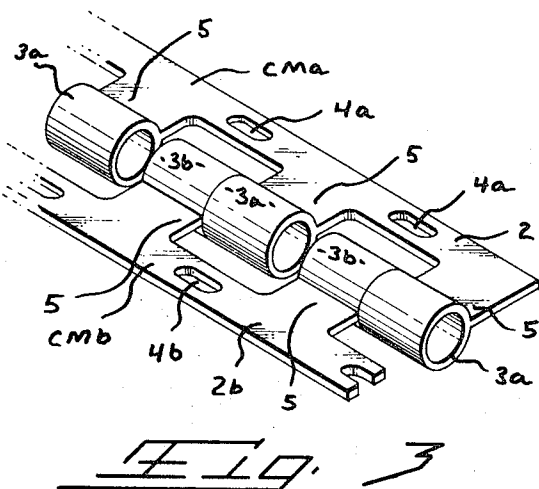
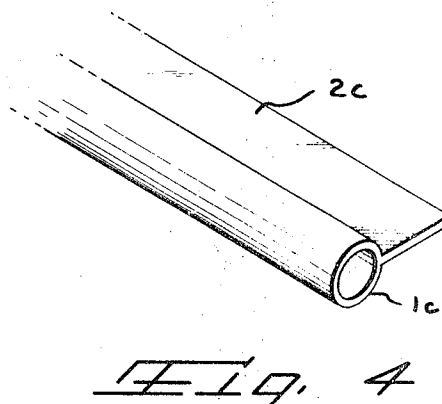
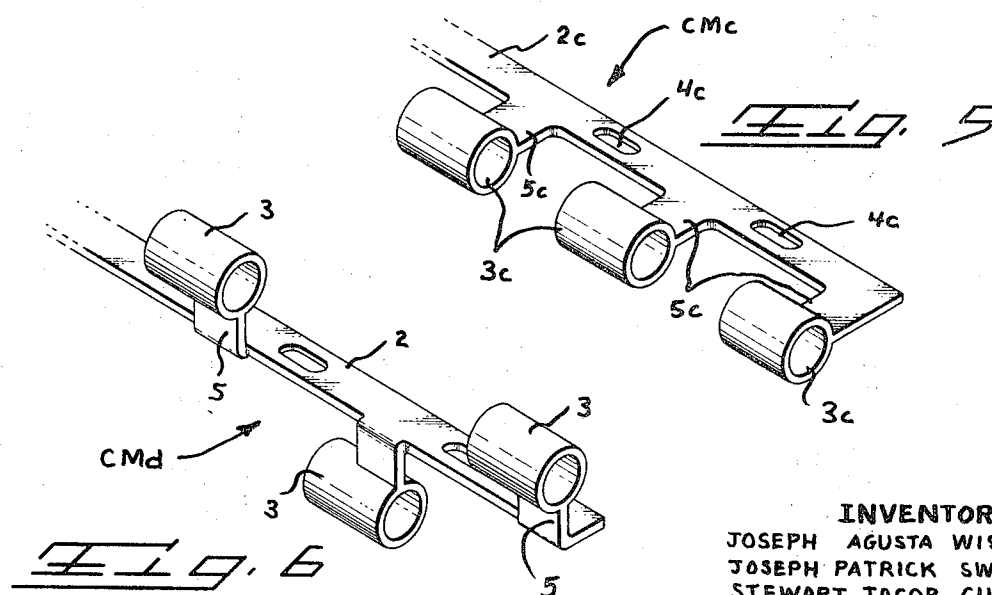
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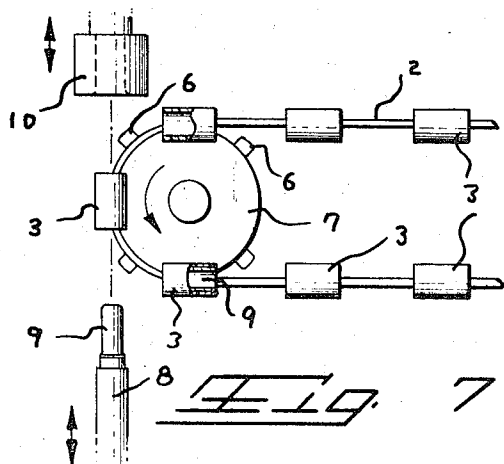
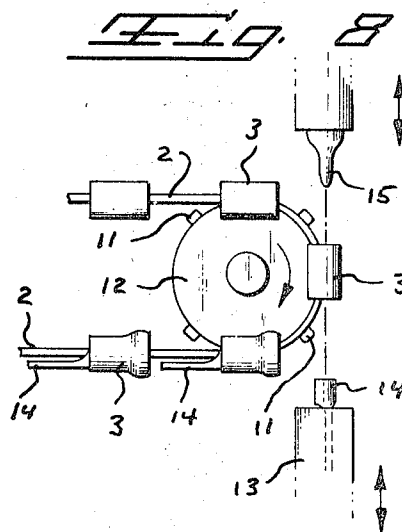
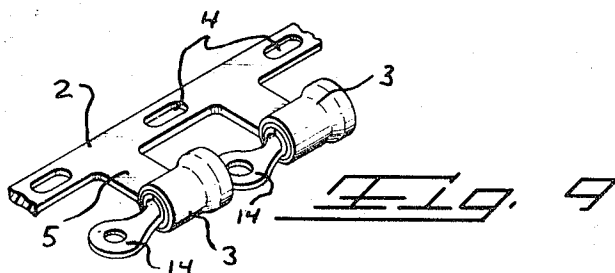
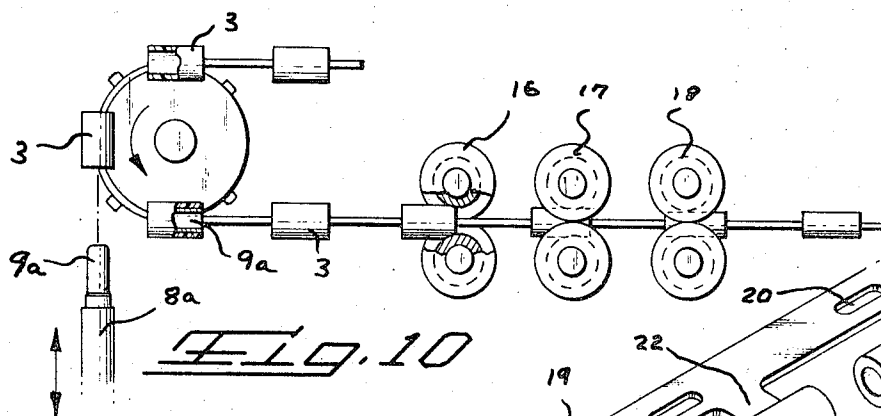
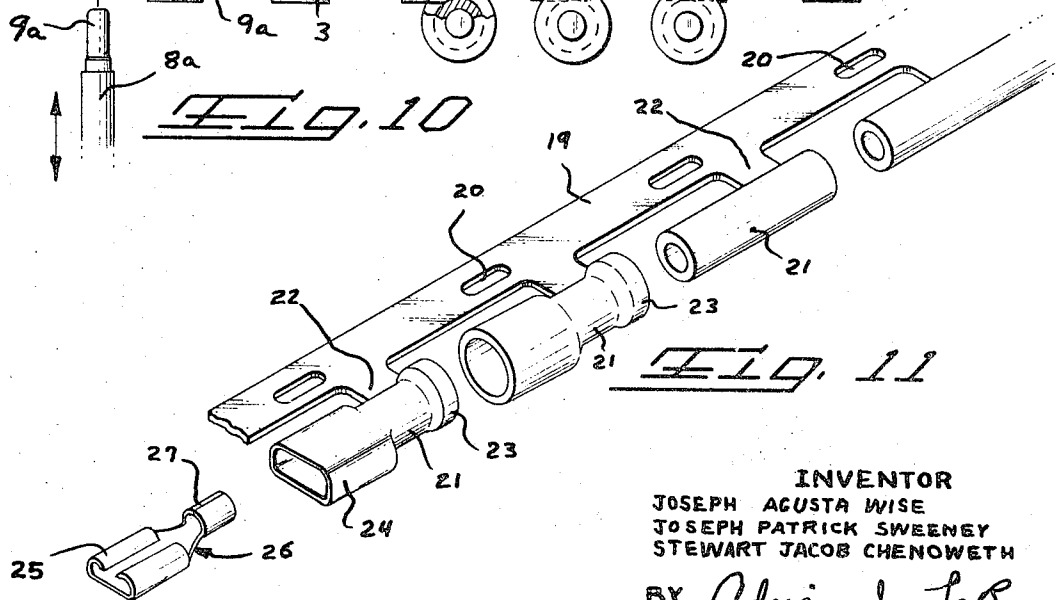
ABSTRACT: An electrical connector assembly comprises a strip of dielectric material from which integral tubular members extend, electrical terminal members carried by the tubular members forming electrical connectors for connection with conductive means, the strip defining a feeding means for feeding the connectors into crimping areas of crimping means.





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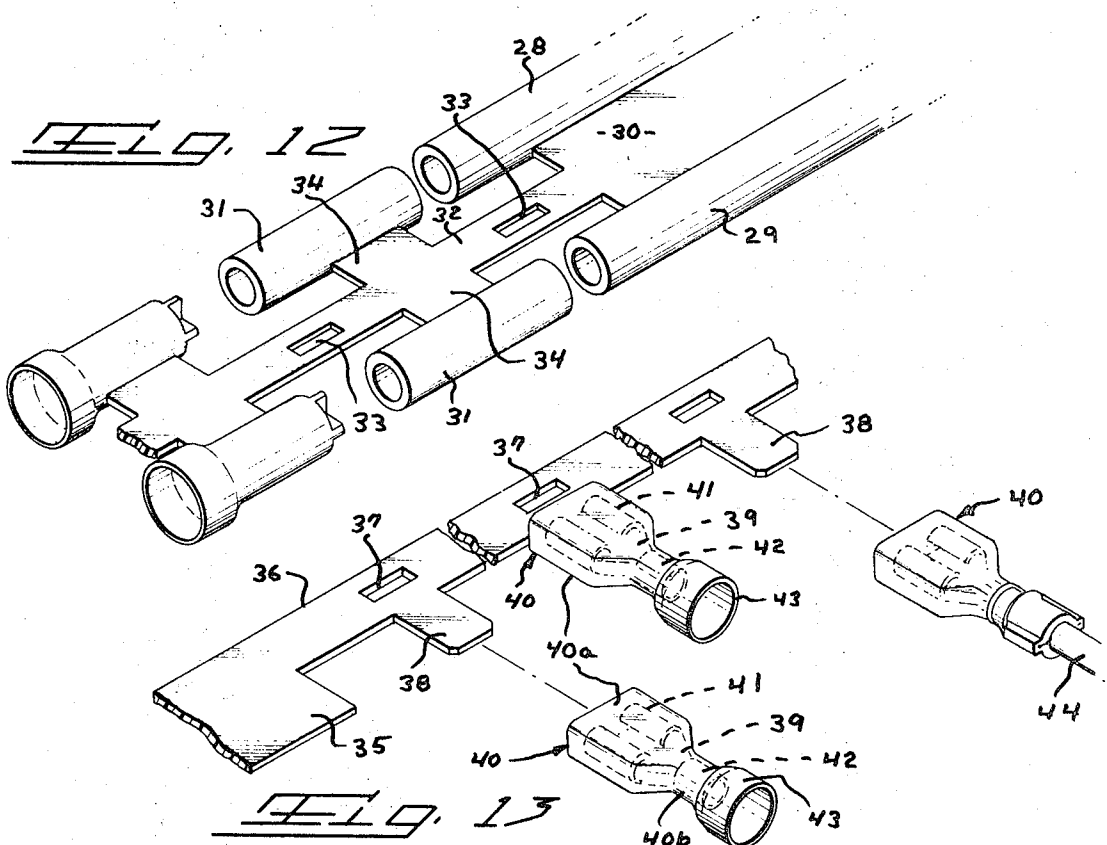
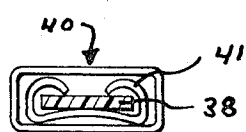
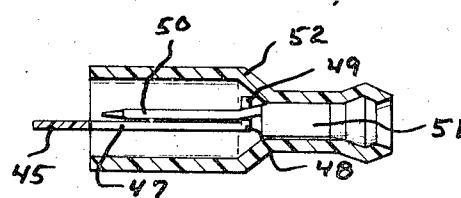
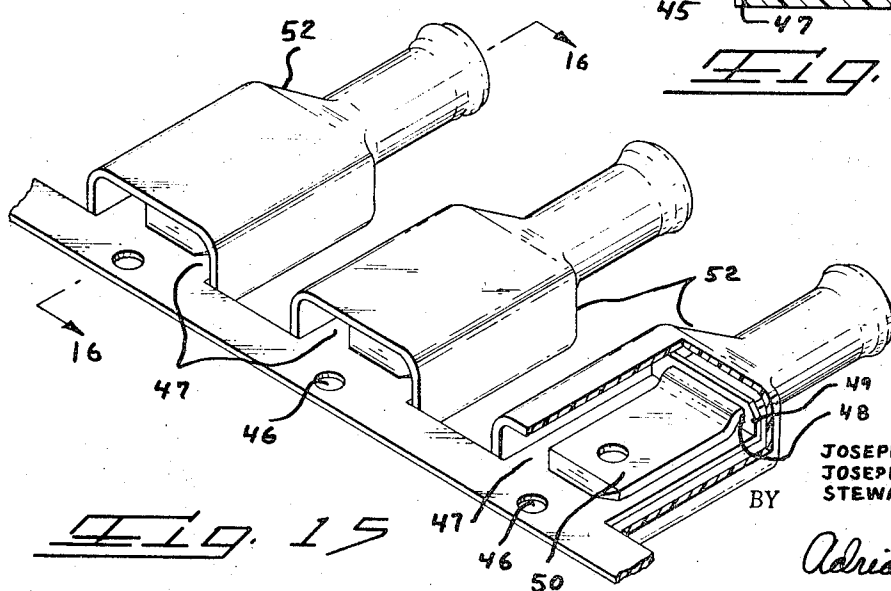


Fig. 14



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ELECTRICAL CONNECTOR FEED STRIP ASSEMBLY

This invention relates to electrical connectors and more particularly to an electrical connector assembly including a feed carrier strip having electrical connectors carried thereby.

U.S. Pat. No. 2,963,775 discloses a molded dielectric grid having sleeves in which components are inserted to form an electrical connector assembly. The grid can be formed into rows of connectors connected together to form a continuous strip for feeding into a crimping area of a crimping means. The dielectric sleeves as part of the grid are injection molded which is expensive. The webs interconnecting the sleeves are not provided with means therein for engagement by feed means for feeding connectors into a crimping area of crimping means. Rows of connectors have to be connected together to form a continuous strip of connectors of indefinite length.

It is old, as disclosed by U.S. Pat. No. 2,715,764, to use the sheet of material from which the connectors are formed by leaving sections of the sheet between adjacent connectors as a metal carrier to form a continuous strip of connectors which is capable of being engaged by feeding means for feeding the connectors into crimping-die means of a crimping means, the connectors being severed from the carrier thereby the carrier becoming scrap. The metal carrier leaves nonplated areas exposed when the connectors are severed from the carrier. The carrier is plated which is expensive. The carrier is generally discarded which is expensive in view of the increasing cost of metal. Metal carriers are susceptible to forming kinks therein which impedes or stops feeding of connectors into crimping means. It is conventional practice to secure loose connectors onto a carrier member in accordance with the teaching of U.S. Pat. No. 3,075,198 but this is expensive in view of forming the carrier and then applying and securing the loose connectors thereonto.

The present invention overcomes the drawbacks of the carrier members described hereinabove by extruding a tubular member of a suitable dielectric material as a continuous strip which is provided with at least one projection extending outwardly therefrom, cutting the dielectric tubular member thereby forming spaced sleeves along the projection and providing the projection with means for engagement by feed means to feed the sleeves into crimping die means of a crimping means, and placing connector components in the sleeves to form a connector assembly.

An object of the invention is to provide a continuous strip connector assembly with the dielectric strip forming the carrier member.

Another object of the invention is the provision of a connector carrier strip which is an integral part of the dielectric sleeves forming the electrical connectors.

A further object of the invention is to provide a connector carrier strip that has improved reeling and feeding capabilities.

An additional object of the invention is the provision of continuously molded dielectric material being formed as a carrier strip having dielectric sleeves to be fabricated into a continuous connector assembly of indeterminate length.

A still further object of the invention is the method of making the electrical connector assembly.

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.

In the drawings:

FIG. 1 is a perspective view of a continuously extruded tubular member provided with projections extending outwardly therefrom;

FIG. 2 is a view similar to FIG. 1 of the tubular member and projections after having undergone a cutting operation;

FIG. 3 is an alternative embodiment showing the tubular member and projections of FIG. 1 after undergoing a cutting operation;

FIG. 4 is a perspective view of a further embodiment of FIG. 1;

FIG. 5 is a view similar to FIG. 4 after the extruded member of FIG. 4 has undergone a cutting operation;

FIG. 6 is a view similar to FIG. 5 of an embodiment thereof;

FIG. 7 illustrates the insertion of metal sleeves in the dielectric sleeves of the carrier member;

FIG. 8 illustrates the insertion of a terminal component in the sleeves of the dielectric carrier and a bell-mounting operation thereof;

FIG. 9 is a perspective view of a completed electric connector assembly;

FIG. 10 is an alternative embodiment of FIG. 7;

FIG. 11 illustrates a further embodiment of the electrical connector assembly;

FIG. 12 is a perspective view of an alternative embodiment of the electrical connector assembly.

FIG. 13 is a perspective and exploded view of an additional embodiment;

FIG. 14 is a partly-sectioned view showing a preinsulated connector in position on a tab of the carrier strip of FIG. 13;

FIG. 15 is a perspective view partly in section of an additional embodiment of the electrical connector assembly; and FIG. 16 is a view taken along lines 16-16 of FIG. 15.

Turning now to FIGS. 1 and 2, there is illustrated in FIG. 1, a tubular member 1 provided with projections 2 extending outwardly therefrom. Tubular member 1 and projections 2 are made from a suitable dielectric material such as, for example, polyvinyl chloride, polysulfane, or the like as a continuous member in accordance with conventional extrusion molding techniques. The extrusion molded member of FIG. 1 is then subjected to a cutting operation thereby forming a carrier member CM as illustrated in FIG. 2 which includes sleeves 3 connected together via projections 2 having oblong holes 4 cut therethrough. Projections 2 along with oblong holes 4 provide carrier means for engagement with tooth means of a feed means for feeding the carrier member to various stations of an assembly for forming the carrier member into a strip of connector members to be described in further detail hereinbelow.

FIG. 3 illustrates carrier member CMab which is an alternative embodiment of the carrier member CM. In this embodiment, the carrier member is originally extruded in the form illustrated in FIG. 1 except that projections 2a and 2b are wider so that when the extruded member is subjected to the cutting operation, carrier member CMab is formed into carrier member CMa provided with projection 2a having oblong holes 4a and sleeves 3a and carrier members CMb provided with projection 2b having openings 4b and sleeves 3b. Carrier member CMab of FIG. 3, as readily discerned, is economical in that two carrier members are formed from a single extrusion. Projections 2a and 2b of FIG. 3 have to be wide enough so that the sleeves can be properly cut and connected to the carrier strips via extensions 5.

The structure CMab can be used as a hinge means since the cutting out of the sleeves and their extensions can be accomplished on plastic or metal to form perfectly mating hinge elements to form a hinge means that do not have to be mated after the hinge elements have been formed. The hinge means formed here is of the piano hinge-type. The cutting of sleeves 3a from projection 2b and sleeves 3b from projection 2a would be at the juncture of the projections with the sleeves and the spacing between adjacent ends of sleeves 3a and 3b would be eliminated and holes 4a would be round instead of oblong.

FIG. 4 illustrates an alternative embodiment of the continuously extruded configuration of the embodiment of FIG. 1 wherein FIG. 4 shows tubular member 1c having a single projection 2c extending outwardly therefrom. The continuously extruded member of FIG. 4 is subjected to a cutting operation to form carrier member CMc of FIG. 5 which is provided with

a carrier strip 2c having holes 4c and sleeves 3c extending outwardly from strip 2c via extensions 5c. Thus, carrier member CMc is similar to carrier members CMa and CMb with the strip and extensions being in a plane extending through axes of the sleeves.

FIG. 6 illustrates carrier member CMd which is carrier members CMa, CMb, or CMc with every other extension 5 being bent at an angle with respect to carrier strip 2 along one side thereof while every other extension 5 along the other side of carrier strip 2 is bent at a corresponding angle with respect thereto so that the axes of sleeves 3 are disposed in parallel planes relative to each other and relative to carrier strip 2. Of course, extensions 5 can be bent in the same direction relative to strip 2 thereby being disposed on respective sides of strip 2 as desired.

FIGS. 7 and 8 illustrate the carrier members of FIGS. 3 and 5 being subjected to an assembly operation after the cutting operation to form the connector assembly of FIG. 9. The carrier members of FIGS. 2 and 6 can be subjected to similar assembly operations to form connector assemblies. The holes in carrier strip 2 are engaged by teeth 6 of sprocket wheel 7 to move sleeves 3 of the carrier member into position in alignment with mandrel 8 on which is disposed a metallic sleeve 9. Mandrel 8 is reciprocally moved to insert sleeve 9 into a sleeve 3 in alignment therewith and after metal sleeve 9 has been inserted into a sleeve 3, a die 10 is moved along sleeve 3 in a reciprocable manner to size sleeve 3 onto metal sleeve 9 thereby securing the two sleeves together. Of course, an adhesive can be applied within sleeve 3 or along the exterior of sleeve 9 and the two secured together in such a manner. Die 10 can, of course, be heated in any suitable manner to effect the sizing.

Sleeves 3 with metal sleeves 9 therein are moved via teeth 11 and sprocket wheel 12 to another station, illustrated in FIG. 8, whereat reciprocal mandrel 13 inserts connector component 14 into a leading end of sleeve 3 and metal sleeve 9 in alignment therewith, the connector component 14 remaining within metal sleeve 9 under the influence of a clinching operation or by friction. Once connector components 14 have been inserted into sleeves 3 and 9, the sleeves can be subjected to a sizing operation to secure the connector components therein. If desired, die 15 is moved via a reciprocal action into the end of sleeves 3 and 9 opposite the end in which connector component 14 was inserted. Die 15 enlarges the trailing end of sleeves 3 and 9 thereby providing a bell-mouth configuration thereto for engagement with insulation on electrical conductors.

In some cases, it may be necessary to provide a connector assembly without metallic sleeves 9 in sleeves 3. If this is the case, sleeves 3 bypass the station of FIG. 7 and connector components 14 are inserted within sleeves 3 at the station illustrated by FIG. 8. The connector elements can be secured in the sleeves via sizing, adhering substance or frictional engagement therebetween. If desired, die 15 can be used to bell mouth the trailing end of each of sleeves 3.

After the connector assembly, as illustrated in FIG. 9, has been completed, the connector assembly is reeled onto a reel means (not shown) so as to be used in conjunction with applicator means for applying the connectors onto electrical conductors or the like. Feed strip 2 and holes 4 define feed means for engagement by conventional feed means of the applicator means for feeding the connector members in successive manner into pressure-crimping means of the applicator means. Carrier strip 2 provides improved reeling capabilities for reeling the continuous strip of connectors onto a reel means since it will not kink on the reel means and it feeds more smoothly into the crimping area of an applicator means because the plastic material reduces the friction between the feed means and the carrier strip. Soft metal parts can be carried in sleeves 3 because the soft metal parts can now be obtained as a carrier strip.

FIG. 10 is an alternative embodiment of the sleeve-applying station of FIG. 7. Mandrel 8a applies metal sleeves 9a into

sleeves 3, and, after sleeves 9a are inserted into sleeves 3, they pass between oppositely disposed pairs of rollers 16, 17, and 18. The engaging areas of the pairs of rollers 16-18 are progressively closer together so that the sleeves 3 are sized onto metallic sleeves 9a at increasing stages.

FIG. 11 illustrates a connector assembly wherein the continuously extruded strip of FIG. 4 is subjected to a cutting operation to form carrier strip 19 having oblong holes, 20 therealong and sleeves 21 connected to strip 19 via extensions 22. Sleeves 21 are longer than the sleeves of the embodiments of FIGS. 1, 3, 5, and 6 and they are subjected to forming operations by forming dies to form a bell mouth 23 at the trailing ends of the sleeves at one station and the leading ends of the sleeves are enlarged at another station. At a further station, the enlarged ends of the sleeves are subjected to a forming operation so that the leading ends of the sleeves are formed into a rectangular section 24 in which the receptacle part 25 of connector 26 is completely enclosed while ferrule part 27 is disposed within the nonaltered part of sleeve 21 and secured therein via a sizing operation, adhering substance or the like. Of course, the bell mouth 23 and the rectangular section 24 can be formed at a single station if desired.

Bell mouth 23 is crimpable onto the insulation of an electrical conductor and ferrule part 27 is crimped onto the conductive portion of the electrical conductor through the nonaltered part of sleeve 21 when the electrical connector assembly is fed via carrier strip 19 and feed holes 20 into a crimping area of an applicator means. The connector assembly of FIG. 11 is unique in that the entire connector is completely insulated for ready use for application or termination to the ends of conductor means thereby precluding terminating conductor means and then postinsulating the connectors. Of course, sleeves 21 can be reformed in any suitable configuration to completely insulate any configuration of connector to be covered thereby and the configuration illustrated in FIG. 11 is an illustration only of the configuration to completely insulate connector 16.

FIG. 12 illustrates an extruded strip provided with tubular members 28 and 29 interconnected by a web 30, the strip being subjected to a cutting operation to form tubular members 28 and 29 into sleeves 31 and when the web is cut to provide a carrier strip 32 having holes 33 therein and extensions 34 connecting sleeves 31 to strip 32. Metallic sleeves (not shown) are inserted into sleeves 31 and one end of sleeves 31 is closed while the other end is bellmouthed to form closed end connectors. Of course, the ends of the sleeves may be closed first and then the metallic sleeves are inserted therein. The connector assembly illustrated by FIG. 12 is therefore directed to closed end connectors disposed along an integral carrier strip for engagement by feed means of an applicator means for feeding the connector assembly into a crimping area thereof for crimping onto electrical conductors.

FIG. 13 illustrates a strip of plastic 35 which is subjected to a cutting operation to form a carrier strip 36 having feed holes 37 therein and tabs 38 extending outwardly from one side thereof; however, tabs 38 can extend outwardly from each side of carrier strip 36 opposite each other or at staggered positions therealong. Connector 39 similar to connector 26 of FIG. 11 is secured in a preformed dielectric sleeve 40 with receptacle section 41 being disposed in rectangular part 40a of sleeve 40 and ferrule section 42 secured in an intermediate section 40b of sleeve 40, the part of sleeve 40 extending beyond intermediate section 40b having a bell mouth 43. The spring legs of receptacle section 41 overlying the base thereof frictionally engages tab 38 as illustrated by FIG. 14 to maintain the preinsulated connector in position along carrier strip 36 so that when carrier strip 36 is fed into a crimping area of an applicator means via feed means, an electrical conductor 44 is crimped onto a preinsulated connector assembly, the connector assembly is now removed from tab 38 by pulling on terminated conductor 44. The legs may be nonresilient and the base resilient but the spring characteristics of the receptacle section maintain the connectors in place on the tabs.

Sleeves 40 can be severed from a tubular piece of suitable dielectric material and subjected to forming operations similar to those disclosed in conjunction with FIG. 11 to completely insulate the connectors.

FIGS. 15 and 16 illustrate a plastic strip 45 having feed holes 46 therealong and tabs 47 extending outwardly from one side thereof; tabs 47 can, however, extend outwardly from each side of strip 45 opposite each other or at staggered positions therealong. Tabs 47 at the free ends thereof are provided with a leg 48 having a slot 49 therethrough so that tab sections 50 of tab connectors 51 extend through slots 49 and tab sections 50 extend along tabs 47 toward strip 45. Dielectric sleeves 52 are secured on tab connectors 51 in like manner as sleeves 40 are secured on connectors 39 and the portions of sleeves 52 surrounding tab sections 50 and spaced therefrom surround tabs 47 also. Thus, the connector assembly of FIGS. 15 and 16, when fed into a crimping area of an applicator, has tab connectors 51 crimped onto electrical conductors and the crimped connectors 51 are removed from the connector assembly by pulling on the terminated conductors. The tab connectors are maintained in position on tabs 47 because slots 49 are slightly narrower than the width of tab sections 50.

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.

We claim:

1. An electrical connector assembly for feeding into crimping means comprising continuous feed strip means having spaced openings therealong for engagement by feed means of the crimping means, sleeve means each integrally connected to said feed strip means longitudinally along a side thereof at

spaced intervals along the feed strip means, and electrical connector components, having a crimpable portion in said sleeve means and a separable electrical connector portion extending therefrom adapted to be severed from said feed strip means by the crimping means when the electrical connector is crimped via the crimping means onto conductor means.

2. An electrical connector assembly according to claim 1 wherein said sleeve means have axes which are substantially parallel to the longitudinal axis of said feed strip means and said sleeve means axes, and feed strip means are disposed along a common plane.

3. An electrical connector assembly according to claim 1 wherein said sleeve means have axes which are substantially parallel to the longitudinal axis of said feed strip means and wherein said sleeve means and said feed strip means are connected by extensions disposed at substantially right angles with respect to said feed strip means.

4. An electrical connector assembly according to claim 2 wherein one end of said sleeve means has a bell-mouth configuration.

5. An electrical connector assembly for use in crimping means for crimping electrical connectors onto conductor means comprising continuous feed strip means having spaced openings therealong for engagement by feed means of the crimping means, integral tabs extending outwardly from said feed strip means at spaced intervals, legs at free ends of said tabs and having slots therein, electrical connectors having ferrule sections and contact sections and dielectric sleeve means housing said ferrule sections and contact sections, said contact sections extending through said slots in said legs and along said tabs with said housing means surrounding said tabs, said connectors being removed from said tabs by pulling on the conductor means crimped onto the ferrule sections.

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