

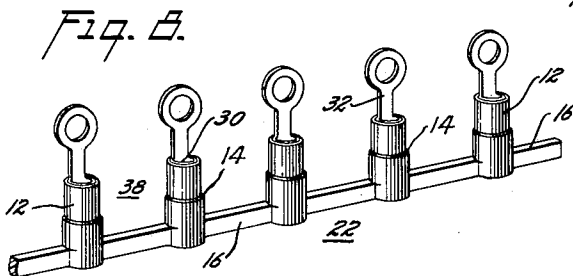
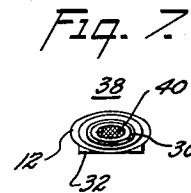
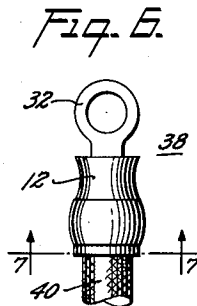
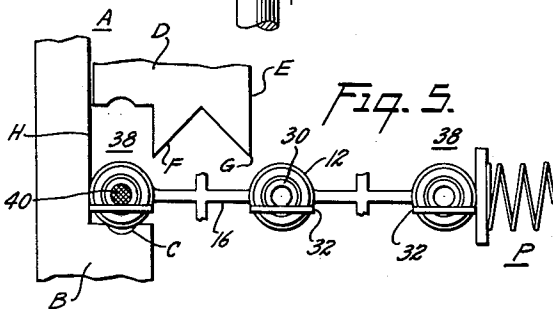
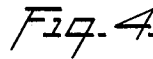
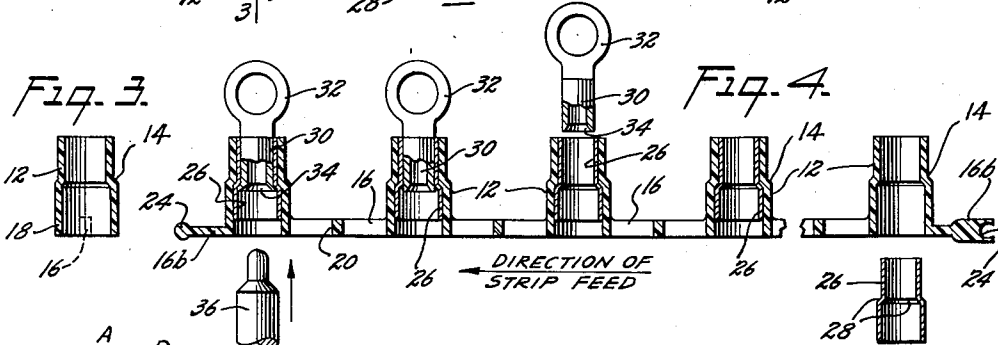
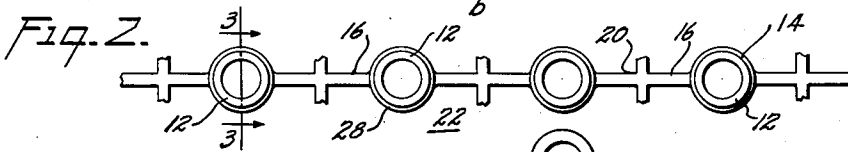
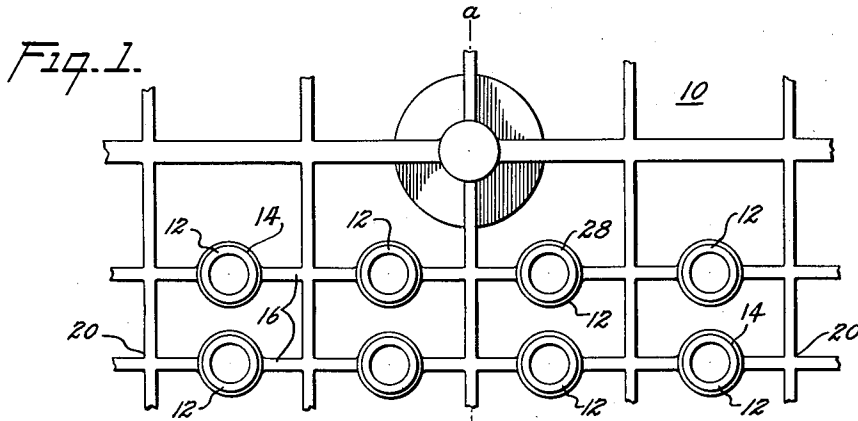
Dec. 13, 1960

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2,964,171

STRIP CONNECTORS

Filed Jan. 15, 1958



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2,964,171

STRIP CONNECTORS

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Filed Jan. 15, 1958, Ser. No. 709,098

3 Claims. (Cl. 206—56)

This application is a continuation-in-part of my co-pending application Serial No. 324,359, filed December 5, 1952.

The invention relates to insulated electric terminal connectors of the character disclosed, for example, in Patent 2,769,965, issued to John Nelson Frey on November 6, 1956, and more particularly to a linear assembly of a plurality of such terminal connectors wherein the insulating sleeves thereof are integrally connected in parallel, spaced relation.

More specifically, the invention resides in a linear assembly of a plurality of equally spaced, individually complete insulated terminal connectors in flexible strip form and of a size adapted for use with 22 to 18 wire size conductors, for example, wherein the terminal connectors are interconnected by a narrow web of plastic insulating material integrally connecting each adjacent pair of the insulating sleeves thereof at diametrically opposite points on one peripheral edge thereof.

Similar prior art terminal connectors, as utilized separately heretofore, involved certain disadvantages in that in the attachment of one of such terminal connectors to a wire conductor required considerable time by reason of the small size thereof and the difficulty in manipulating the same during such operation, more especially when a plurality of such connectors had to be secured one to each conductor end portion in a large bundle thereof, as in an ignition or other electric circuit harness utilized in large aircraft assemblies, for example. Moreover, the feeding of such individual terminal connectors from a hopper charged with a large number thereof involved complicated apparatus in which the feed thereof from the hopper and from station to station, was not practical and/or efficient by reason of the configuration of the terminal connectors.

Non-insulated terminal connectors are also known which are produced in strip form, with the connectors disposed in end-to-end tandem relation, for feeding to a crimping and severing apparatus, as disclosed in Patent 2,494,137, issued January 10, 1950, to R. Martinez. Strips of such interconnected terminal connectors are usually cadmium-plated or tinned, after the production thereof, to preclude corrosion. Thus, such terminal connectors are also objectionable by reason of the fact that, in the severing of each terminal connector from the strip, the plated or tinned coating is mutilated at the points of severance thereon, whereby the connectors are rendered subject to corrosion.

Accordingly, it is an object of the invention to provide a linear assembly of equally spaced, insulated terminal connectors in flexible strip form which may be handled manually, fed to an automatic crimping and severing mechanism or convoluted in coil formation for future sale or use.

Another object of the invention is to provide a linear assembly of individually complete, insulated terminal connectors in flexible strip form, whereby a non-corrosive metallic coating plated on the conductive elements there-

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of is not mutilated in the severing of each individual terminal connector from the strip.

A further object of the invention is to provide a plurality of open-ended insulating sleeves in a form in which the insulating sleeves can be handled manually as a group and successively separated during such handling thereof.

Another object of the invention is to provide a plurality of open-ended insulating sleeves as interconnected, equally spaced elements of a one-piece molded plastic strip adapted to be fed to a suitable machine for successively inserting and securing conductive elements therein to form individually complete insulated terminal connectors, successively inserting and securing a wire conductor in each terminal connector, and successively severing each terminal connector from the strip.

A further object of the invention is to provide a linear assembly of interconnected, insulating sleeves in the form of a molded, flexible plastic strip wherein the opposite free ends of each strip are provided with complementary ball-and-socket-forming connections, whereby a plurality of such strips may be detachably connected in end to end relation.

With the above and other objects in view, the invention resides in the novel construction, combination and arrangement of parts, the novel features of which are set forth with particularity in the appended claims, the invention itself, however, both as to its organization and method of assembly, together with additional objects and advantages thereof, being best understood from the following description of a specific embodiment thereof, when taken in connection with the accompanying drawing, in which:

Fig. 1 is a fragmentary view of a molded plastic grid in plan and comprising a series of equally spaced, interconnected, open-ended insulating sleeves illustrating the manner in which a plurality of linear strips of such insulating sleeves are produced.

Fig. 2 is a fragmentary plan view of a strip of insulating sleeves as severed from a molded grid thereof, shown in Fig. 1, and illustrating a new article of manufacture in accordance with the invention;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2, showing one of the molded insulating sleeves in axial section;

Fig. 4 is a fragmentary sectional view of a strip of interconnected insulating sleeves illustrating the successive insertion into each insulating sleeve in the strip of each of a pair of conductive sleeve elements, and the securing of one of said sleeve elements within the other of said elements;

Fig. 5 is a schematic view illustrating the manner in which a strip of insulated terminal connectors, as assembled in Fig. 4, may be fed step-by-step in a crimping and severing apparatus to crimp each terminal connector on the stripped end portion of an insulated wire conductor, through its insulating sleeve, and sever the connecting plastic web therefrom while severing each insulated terminal connector from the strip;

Fig. 6 is a plan view of an insulated terminal connector as completed, either manually or in automatic feed mechanism in accordance with the invention;

Fig. 7 is a sectional view of the completed terminal connector taken on the line 7—7 of Fig. 6; and

Fig. 8 is a perspective view of a portion of a linear assembly of interconnected insulated terminal connectors showing a preferred form of the invention wherein the connecting webs between each pair of the insulating sleeves are of uniform cross-section throughout with the largest transverse dimension thereof disposed in parallelism with the axes of the connected insulating sleeves.

Referring to the drawing, Fig. 1 is intended to exemplify, in plan, a rectangular grid 10, molded of a synthetic

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polymeric amide, commonly known as "nylon," and comprising a plurality of parallel rows of equally spaced, open-ended sleeves 12, each having a common wall thickness and opposite end portions of different internal and external diameters forming an inclined annular shoulder 14 therebetween mid-way of the length thereof, as in Fig. 3, the axes of the sleeves 12 being disposed in equally spaced, parallel relation with flat integral webs 16 disposed normal thereto and connecting each adjacent pair of the sleeves 12 at diametrically opposite points on the largest peripheral edge 18 of each sleeve.

The molded grid 10, exemplified in Fig. 1, is formed in a size sufficient to provide forty-eight sleeves, for example, twenty four on each side of the medial line *a-b*, and the parallel columns of sleeves subsequently severed therefrom at a plurality of points, generally indicated at 20, to provide flexible strips 22 of the molded sleeves 12, as exemplified in Fig. 2. Preferably, although not necessarily, the grid 10 in Fig. 1 may include a free end web portion 16b, integral with the last sleeve 12 at each end of each column or row thereof, defining complementary ball-and-socket connecting means 24, or the like, for example, whereby a plurality of strips 22 may be detachably connected in end-to-end relation for a purpose hereinafter described.

Further in accordance with the invention and as best shown in Fig. 4, each insulating sleeve 12 in a strip 22 thereof is subsequently provided successively, either manually or by means of an automatic intermittent feed mechanism, with a frictionally fitted liner sleeve 26 of thin conductive metal having a corresponding inclined, annular shoulder 28, intermediate its ends, and a length slightly less than the length of the insulating sleeves 12. Thereafter, the wire barrel portion 30, of an apertured tongue 32, having its free annular end internally chamfered as at 34, is inserted in the smallest end opening of the liner sleeve 26, previously fitted in an insulating sleeve 12, whereupon the intruded chamfered end of the wire barrel 30 is flared outwardly against the inclined shoulder 28 of the liner sleeve 26, as by means of a suitable upsetting punch, as exemplified at 36, whereby the wire barrel 30 is secured within the thin liner sleeve 26 and the liner sleeve within its correlated plastic sleeve 12, against relative movement.

It is to be observed that the web 16 connecting each adjacent pair of insulating sleeves 12 in a strip 22 thereof is preferably formed with its dimension of greatest width disposed in parallelism with the axes of the sleeves 12, whereby to facilitate convoluting such strips into coil form if desired.

Further in accordance with the invention and as shown in Fig. 5, a combined web-severing and wire barrel crimping tool A includes an anvil B provided with a fixed jaw C and a relatively movable jaw D, with the parts so related that, with an insulated terminal connector 38, in a strip 22 thereof, located therebetween and the stripped end of an insulated wire conductor 40, intruded into its wire barrel portion 30, squeeze pressure may be subsequently applied thereon through its insulating sleeve 12, to deform one end of its liner sleeve 26 into crimped engagement with the insulation covering adjacent the intruded stripped end portion of the wire conductor 40, and squeeze pressure applied, at the same time, through the opposite end portion of the insulating sleeve 12, and its liner sleeve 26, to deform the wire barrel portion 30 into crimped engagement with the stripped end portion of the insulated wire conductor 40, intruded therein, as more fully disclosed in the herein-identified Frey patent.

Further in accordance with the invention, the movable jaw D of the tool A, includes an integral extension E, projecting therefrom in a direction lengthwise of the strip 22 of insulated terminal connectors 38, for severing the webs 16, one after the other from the strip 22. The lower edge of the aforesaid extension E is of inverted F-configuration to provide two knife-like cutting edges F

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and G, spaced apart a distance exactly equal to the length of the web 16 between each adjacent pair of insulated terminal connectors 38 in the strip thereof. The left cutting edge F is spaced from a stop wall H of the tool A, a distance equal to the largest outer diameter of the insulating sleeves 12 of the terminal connectors 38. The cutting edges F and G, as aforesaid, have a width, considered transversely of the drawing sheet, greater than the width of the opposite ends of the web 16 to be severed from each adjacent pair of the insulating sleeves 12, and, in general, it is the intent to sever the webs 16, close to the periphery of the sleeves 12, to substantially preclude residual burrs or like projections thereon.

In the schematic arrangement shown in Fig. 5 it is intended, upon each actuation of the tool A, that each successively advanced insulated terminal connector 38 will be crimped and severed from the balance of the strip, after the insertion of the stripped end portion of an insulated wire conductor 40 therein, and that some suitable strip-feeding device, such as a star-wheel or a spring-loaded pusher P, for example, may be utilized to advance each strip 22 of connectors 38 with a step-by-step action to bring the next connector in the strip against the stop wall H and into position to be crimped and then severed therefrom.

Further in accordance with the invention and as illustrated in Fig. 8, a molded strip 22 of insulating sleeves 12, as above described, may also be formed in a mold adapted for the production of a plurality of separate individually complete strips 22 of insulating sleeves, with or without a complementary connecting means at the respective ends thereof, wherein the webs 16, integrally connecting the larger open ends of each adjacent pair of the insulating sleeves 12 at diametrically opposite points on the peripheral edge thereof, have a uniform cross section of small area throughout their entire length and with the largest transverse dimension of the connecting webs 16 disposed in parallelism with the axes of the insulating sleeves 12.

As previously described, the insulating sleeves 12 are each provided with a thin liner sleeve 26 of ductile metal and a wire barrel 30 of ductile metal, including an apertured tongue 32 extending from the smaller end of the liner sleeve, the strips 22 being marketed as shown and adapted to be fed to a crimping and severing mechanism or each insulated terminal connector 38 manually severed from a strip 22 thereof, as needed. Thus, by means of a linear assembly of insulated terminal connectors in flexible strip form, it is possible to manipulate such connectors more readily, especially when it is realized the connectors are usually of such small size as to be difficult to hold between the fingers. Moreover, in strip form, the insulating sleeves can be more readily equipped with the conductive metal elements than is the case when separate sleeves must be handled to insert such elements therein to produce the insulated terminal connectors, as described.

Inasmuch as the insulating sleeves 12 are identical, one with the other, and all exactly and equidistantly spaced apart, each sleeve will occupy the same position as every other sleeve when brought into position to be operated upon in a crimping and/or severing apparatus.

While the invention has been illustrated and described with respect to a preferred embodiment thereof, it is to be expressly understood that various changes and modifications may be made therein without departing from the inventive concept underlying the same. Therefore, the invention is not to be limited except as is necessitated by the prior art and the scope of the appended claims.

I claim:

1. As a new article of manufacture, a linear assembly of insulated electric terminal connectors in flexible strip form, comprising a plurality of open-ended, plastic insulating sleeves having opposite end portions of different internal and external diameter defining an inclined an-

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nular shoulder therebetween, said insulating sleeves having their axes disposed in parallel, spaced-apart relation with webs integral therewith extending in right angular alignment and connecting the larger end portion of each adjacent pair of insulating sleeves at diametrically opposite points on the peripheral edge thereof, a corresponding number of metal connector elements each comprising an apertured tongue portion and a wire barrel portion co-extensive therewith having a free annular end, the wire barrel portion of each of said elements being fitted in the smaller end portion of each of said insulating sleeves with its free end flared outwardly against the inclined shoulder within its correlated insulating sleeve to prevent relative movement therebetween, the opposite free ends of said flexible strip each including an integral web portion provided respectively with a complementary ball-and-socket forming joint for connecting a plurality of said flexible strips in end-to-end relation.

2. As a new article of manufacture, a linear assembly of insulated electric terminal connectors in flexible strip form comprising a plurality of open-ended, plastic insulating sleeves having opposite end portions of different internal and external diameter defining an inclined annular shoulder therebetween, said insulating sleeves having their axes disposed in parallel, spaced-apart relation with narrow webs integral therewith extending in right angular alignment and connecting the larger end portion of each adjacent pair of insulating sleeves at diametrically opposite points on the peripheral edge thereof, a corresponding number of metal connector elements each comprising an apertured tongue portion and a wire barrel portion coextensive therewith having a free annular end, and a thin metal liner sleeve with opposite end portions of different external and internal diameter defining an inclined annular shoulder therebetween, said liner sleeves being fitted within said insulating sleeves and said wire barrel portions extended into the smaller end portions of said liner sleeves with their free ends flared outwardly against the inclined shoulders within said liner sleeves to prevent relative movement between said liner sleeves, wire barrel portions and insulating sleeves, the opposite free ends of said flexible strip each including an integral web portion provided respectively with comple-

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mentary means for connecting a plurality of said flexible strips in end-to-end relation.

3. As a new article of manufacture, a linear assembly of insulated electric terminal connectors in flexible strip form, comprising a plurality of open-ended plastic insulating sleeves having opposite end portions of different internal and external diameter defining an inclined annular shoulder therebetween, said insulating sleeves having their axes disposed in parallel, spaced-apart relation with webs integral therewith extending in right angular alignment and connecting the larger end portion of each adjacent pair of insulating sleeves at diametrically opposite points on the peripheral edge thereof, a corresponding number of metal connector elements each comprising an apertured tongue portion and a wire barrel portion coextensive therewith having a free annular end, the wire barrel portion of each of said elements being fitted in the smaller end portion of each of said insulating sleeves with its free end flared outwardly against the inclined shoulder within its correlated insulating sleeve to prevent relative movement therebetween, the opposite free ends of said flexible strip each including an integral web portion provided with complementary joints for connecting a plurality of said flexible strips in end-to-end relation.

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