



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

**O 037 202
B1**

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **08.08.84** (51) Int. Cl.³: **H 01 R 43/00**

(21) Application number: **81301099.8**

(22) Date of filing: **17.03.81**

(54) **A method of, and apparatus for, producing wired electrical connectors.**

(30) Priority: **31.03.80 US 135740**

(43) Date of publication of application:
07.10.81 Bulletin 81/40

(45) Publication of the grant of the patent:
08.08.84 Bulletin 84/32

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI NL SE

(56) References cited:
**EP - A - 0 000 428
EP - A - 0 001 891
US - A - 3 939 552
US - A - 4 043 017
US - A - 4 235 015**

(73) Proprietor: **AMP INCORPORATED**
P.O. Box 3608 449 Eisenhower Boulevard
Harrisburg Pennsylvania 17105 (US)

(72) Inventor: **Davis, Newton Gardner**
1096 Acri Drive
Harrisburg Pennsylvania 17111 (US)
Inventor: **Loomis, Phillip Eugene**
3856 Rutherford Street
Harrisburg Pennsylvania 17111 (US)
Inventor: **Shughart, Mervin Leonard**
945 Pine Road
Carlisle Pennsylvania 17013 (US)

(74) Representative: **Gray, Robin Oliver et al,**
BARON & WARREN 18 South End Kensington
London W8 5BU (GB)

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European patent convention).

Courier Press, Leamington Spa, England.

EP O 037 202 B1

Description

We have described for example in EP—Al—0 000 428, a method of producing wired electrical connectors each comprising an insulating housing having a plurality of juxtaposed cavities therein each containing an electrical terminal having a wire receiving portion adapted to receive, and to make electrical contact with, a wire, upon the wire being moved laterally of its longitudinal axis, into the wire receiving portion, in which method each wire is aligned with one of the wire receiving portions of the terminals of a connector at a wire insertion station and is there moved into such wire receiving portion laterally of the longitudinal axis of the wire.

In such a method, as carried out, for example, by means of apparatus described in the document cited above, all the terminals of each connector are simultaneously connected to wires. Where, however, the centre-to-centre spacing between the terminals of the connectors is very small, being, for example, of the order of only two or three millimetres, difficulty is encountered in so designing tooling for inserting the wires into the wire receiving portions, that individual wire insertion punches of the tooling, are as closely spaced as the terminals. Not only must such punches be so thin as to be readily susceptible to damage in normal use, but the close spacing between the punches greatly impedes cleaning and servicing of the tooling. Where, as in the apparatus referred to above, means are provided in association with the insertion tooling, for stripping insulation from the wires and for severing them to different lengths, such means must also be dimensioned so as to take account of the close spacing between the terminals of the connectors, thereby giving rise to further design difficulties.

The present invention proceeds from the realization that the design difficulties mentioned above can be overcome by wiring each connector at a plurality of different wire insertion stations, only some of the terminals of each connector being wired at each station.

According to one aspect of the invention, therefore, a method as defined in the first paragraph of this specification is characterised in that each connector is advanced through a plurality of wire insertion stations at each of which each of a plurality of wires is inserted into the wire receiving portion of a respective terminal of the connector, adjacent ones of these said respective terminals being separated from one another at least by one other terminal of the connector.

The apparatus described in EP—Al—0 000 428 comprises a first wire insertion station in a wire insertion zone; means for feeding the wires along a first path to present the wires in a common plane in the wire insertion zone, the wire insertion station having first connector locating means for removably locating a

first connector on one side of the common plane with the row of terminals of the first connector extending transversely of the first path; and first insertion means in the wire insertion zone and on the other side of the common plane, for inserting wires into the wire receiving portions of the terminals of the first connector, the insertion means being movable along a second path, towards and away from the connector.

According to another aspect of the invention such apparatus is characterised by a second wire insertion station having second connector locating means for removably locating a second connector on the one side of the common plane in juxtaposed relationship with the first connector and with the row of terminals of the second connector in longitudinal alignment with the row of terminals of the first connector, second insertion means in the insertion zone and on the said other side of the common plane, the second insertion means being movable along a third path towards and away from a connector in the second connector locating means; and in that the first insertion means is arranged to insert wires into the wire receiving portions of a first group of terminals of a first connector in the first locating means and the second insertion means is arranged to insert wires into the wire receiving portions a second group of terminals of a second connector in the second locating means, adjacent terminals in the first group being separated from each other by a terminal of the first connector which is positioned therein correspondingly to a respective terminal of the second group and adjacent terminals of the second group being separated from one another by a terminal of the second connector which is positioned therein correspondingly to a respective terminal of the first group.

For a better understanding of the invention reference will now be made by way of example to the accompanying drawings in which:—

Figures 1 and 2 are diagrammatic perspective views illustrating, in outline, respective steps in the operation of apparatus for sequentially producing wired electrical connectors;

Figures 3 to 8 are diagrammatic longitudinal sectional views of a wire insertion station of the apparatus, illustrating in greater detail respective steps in the operation of the apparatus;

Figure 9 is a perspective view of the apparatus;

Figure 10 is an enlarged fragmentary plan view of a central portion of the apparatus;

Figure 11 is a similar view to that of Figure 10 but is drawn to a reduced scale and shows further details of the apparatus;

Figures 12 to 14 are views taken on the lines XII—XII and XIII—XIII of Figure 11 and on the lines XIV—XIV of Figure 12, respectively;

Figure 15 is a similar view to that of Figure 14, but showing the parts of Figure 14 in a different position;

Figure 16 is a schematic plan view illustrating electrical connector feed tracks of the apparatus; and

Figures 17 and 18 are enlarged views taken on the line XVII—XVII of Figure 15 and XVIII—XVIII of Figure 11, respectively.

The operation of the apparatus will first be described in outline mainly with reference to Figures 1 and 2.

During each cycle of operation of the apparatus, a fully wired electrical connector 10 (Figure 2), is produced, having insulated wires 14 connected to, and extending from, each of electrical terminals 11 (Figure 10) contained in the housing 12 of the connector 10 which may be according to US—A—4,159,158. The housing 12 has a row of nine juxtaposed cavities 13 each containing a terminal 11 arranged to receive, and to establish, electrical contact with, a wire 14, upon movement of the wire 14 laterally of its axis and into a wire receiving slot (not shown) in a wire receiving portion 11' (Figure 10) of the terminal 11. The cavities 13 are identified as to their positions in the row by numerals marked on one of the side walls of the housing 12, as shown in Figures 1 and 2.

Figures 1 and 2 show three connectors 10 positioned in respective first, second and third wire insertion stations 18, 20 and 22, in a wire insertion zone 16 of the apparatus, means, described below, being provided at each of these stations for locating a connector 10 therein in alignment with insertion punches 44 (as shown in Figures 3 and 4), arranged to force selected wires 14 into the slots of the wire receiving portions 11' of the terminals 11 in the connectors 10. The connectors 10 at the insertion stations 18, 20 and 22 are identified in Figures 1 and 2 by the reference numerals 10-1, 10-2 and 10-3, respectively. As shown in Figure 1, the connector 10-3 at the insertion station 22 has wires connected to its terminals at positions 1, 2, 4, 5, 7 and 8, the connector 10-2 at the wire insertion station 20 has wires connected to its terminals at positions 1, 4 and 7, while the connector 10-1, at the wire insertion station 18 has no wires connected to its terminals. During each operating cycle of the apparatus, wires 14 are advanced in three groups by means described below and are located as shown in Figure 1, in a common plane so that each wire of the first group is in alignment with one of the positions 1, 4 and 7 of the connector 10-1, each wire of the second group is in alignment with one of the positions 2, 5 and 8 of the connector 10-2, and each wire of the third group is in alignment with one of the positions 3, 6 and 9 of the connector 10-3. Each wire of each group of wires is accordingly aligned with a terminal of the corresponding group of terminals. Adjacent terminals of each group are separated from one another by X-1 intervening terminals, where X is the number of the stations 18, 20 and 22. The wires of each group number M/X, where M is the total

number of terminals in each connector 10.

During the operating cycle, the insertion punches 44 are lowered so as to engage each of the wires 14 and to insert them laterally of their longitudinal axes, and simultaneously, into the terminals with which they are in alignment. At the end of this insertion step, the connector 10-3 of Figure 1 has wires connected to all terminals therein and can be removed from the apparatus, as shown in Figure 2. As the completely wired connector is removed from the insertion zone 16 and from the apparatus, the connectors 10-1 and 10-2 at the stations 18 and 20, respectively, are advanced along a feed track 24' to the stations 20 and 22, respectively, and a connector 10 from a connector supply feed track 24 is advanced, as indicated in Figure 2, to the station 18. The insertion step is then repeated so that the connector at the insertion station 22 is fully wired at the end of the operating cycle, after which the connectors are advanced again as described above.

The wires 14 shown in Figure 1, which have been positioned in the common plane above the connectors in preparation for their insertion into the terminals thereof, are spaced apart by a substantial distance, a distance which in fact is equal to three times the distance between the adjacent terminal positions in the connectors. The insertion punches 44, shown in Figure 3, need not therefore be mounted on closely spaced centrelines, so that ample distance for the avoidance of interference between the punches 44, can be provided between adjacent punches. As explained below, this feature also facilitates the mounting of wire insulation stripping and wire lengthening means described below, with reference to Figures 3 to 8.

The operation of the apparatus will now be described in greater detail with reference mainly to Figures 3 to 8.

As shown in Figures 3 to 8, at each insertion station 18, 20 and 22, individual wires 14 are fed from supply reels 26 across a guide roll assembly 28 and extend into a wire feed shuttle assembly, generally referenced 30, which comprises a rear wire guide 32, a wire clamping block 34, and a forward wire guide 36 which is normally spaced ahead of the clamping block 34 and is connected thereto by a resilient lost motion coupling 38 for movement relatively towards the block 34.

A connector feed shuttle 66, described in detail below, is provided for positioning each connector 10 at the insertion stations 18, 20 and 22, a fixed wire locating and guide block 86, described below, being also provided for guiding the wires 14 into the terminals of the connector 10. Each insertion punch 44 is arranged to be depressed from the position of Figures 3 and 4 to that of Figures 5 to 8, to insert one of the wires 14 into an aligned terminal 11 of a connector 10.

During each operating cycle, the wire feed shuttle 30 is advanced from the position of

Figure 3 to that of Figure 4. When the forward guide 36 arrives at the insertion zone 16, it stops in abutment with the block 86. The block 34 and the rear guide 32 continue to move, so that the wires 14 are projected into wire guiding slots 96 in the block 86 so that each wire is positioned above a terminal 11 of a connector 10, at the corresponding wire insertion station, as shown in Figure 4. When the punches 44 have inserted the wires into the terminals of the connector, the clamp 34 is opened as shown in Figure 5, and the feed shuttle assembly 30 is retracted to its initial position (Figure 6), the wires being held taut during such retraction of the assembly 30 by the insertion punches 44 which remain in their lowered positions so as to clamp the wires 14 in the terminals in the connectors 10.

Wire severing and insulating stripping means are provided, which comprise lower and upper tooling blocks 46 and 52, respectively. The lower tooling block 46 has for all the wires 14, a single rectilinear wire severing blade 48, and an insulation severing blade 50 for each wire 14. The blades 50 are staggered so as to be positioned at varying distances from the severing blade 48. The upper tooling block 52 has similarly positioned wire severing and insulating cutting blades thereon for co-operation with those of the block 46 so that when the block 52 is lowered, the trailing end of each wire 14 is severed and the insulation adjacent to such end, but not the core of the wire, is severed circumferentially. By virtue of the staggering of the insulation severing blades, the wire end portions are stripped of insulation to different lengths.

Wire lengthening means are provided which comprise for each wire, a vertical wire lengthening bar 54 provided at its lower end with a roller 56, the lower ends of the bars 54 being normally positioned, at varying elevations above the feed path of the wires 14, as shown in Figures 3 to 6.

Towards the end of each operating cycle, after the shuttle assembly 30 has been returned to its starting position (Figure 6), the bars 54 are lowered, each by the same distance, as shown in Figure 7, to draw additional wire from the spools 26, to an extent determined by the initial vertical positions of the rollers 56. The upper tooling block 52 is then depressed to the position of Figure 8 so that the wires 14 are severed by the wire severing blades and the insulation of each wire is severed circumferentially by a pair of the insulation severing blades. Thereafter, the bars 54 are further lowered (Figure 8) so that the individual wires 14 are drawn from between the tooling blocks 46 and 52, so as to withdraw the severed ends of the cores of the wires from the severed portions of insulation thereof.

The wire lengthening bars 54, the tooling block 52 and the insertion punches 44 are then raised to their initial positions, and the fully wired connector 10-3 in the final wire insertion

station 22 is removed from the apparatus. The connectors in the first and second insertion stations 18 and 20 are then advanced and an unwired connector is fed to the station 20.

It is to be noted that the parts at all the wire insertion stations operate simultaneously in the manner described above.

The apparatus will now be further described with reference mainly to Figures 9 to 18.

Since the wire lengthening means and the insulation stripping and severing means may be substantially in accordance with EP—A—0 000 428 or US—A—4,043,017 they will not be further described in detail here.

As shown in Figure 9, the apparatus is mounted on a table 58. The wires 14 extend from the spools 26 (not shown in Figure 9) to the guide roll assembly 28 and to the shuttle assembly 30, which is common to all the stations 18, 20 and 22 (as best seen in Figure 10). The wire severing and insulation stripping means are contained within a cover 60, the wire insertion stations being contained within a cover 62. The wire lengthening bars 54 are positioned between the covers 60 and 62.

The means for feeding the connectors 10 along the tracks 24 and 24' of Figures 1 and 2 and for locating the leading ends of the wires 14 in alignment with the terminals in the connectors 10 in preparation for their insertion into the terminals 11, are mounted, as best seen in Figure 12, on a base plate 64 which in turn is supported on the table 58. The plate 64 has sides 65 and 67 and ends 69 and 71 (Figures 11 and 14 to 16). As indicated diagrammatically in Figure 16, the connector supply feed track 24 extends parallel to the ends 69 and 71 and towards the side 67, the feed track 24', along which the wire insertion stations 18, 20 and 22 are located, extending parallel to the ends 69 and 71 and towards the side 65.

The individual connectors 10 are transported along the feed tracks 24 and 24' by means of identical, individual connector transfer shuttles 66 (Figures 10 to 13 and 17), one shuttle being provided for each connector, there being accordingly a total of six shuttles 66. Each shuttle 66 has an upper surface 68 (Figure 12) having a recess 70 dimensioned to receive an individual connector 10. As shown in Figure 17, connector locating pins 72 mounted in each recess 70 are securable in selected positions longitudinally of the shuttles 66 by means of set screws 73, to permit the accommodation of connectors of various lengths in the recesses 70.

The shuttles 66 are slidably supported on the upper surface of a shuttle support plate 74, as best seen in Figures 12, 13 and 17, parallel to, and supported above, the base plate 64 by L-shaped support and guide plates 76 and 76' (Figures 14 and 15), described below, and by spacer blocks 78 located adjacent to the sides 67, 65 of the base plate 64, as best seen in Figure 15.

The feed tracks 24 and 24' are defined by guide plates 80, 82 and 84, Figures 12 and 13), which extend parallel to the ends 69 and 71 of the base plate 64 and which are spaced so that the opposed vertical surfaces of the guide plates 80 and 82 define the feed tracks 24 while the opposed vertical surfaces of the guide plates 82 and 84 define the feed track 24'. These guide plates are fixed to the base plate 64 by fasteners, as shown. The guide plate 80 has a leftwardly (as seen in Figure 12) extending flange 81 on its upper end which projects over the shuttles 66 in order to confine them along their paths of travel. The plate 82 has a similar flange 83, for the same purpose.

The individual wires 14 are positioned in alignment with the terminals in the connector 10 by means of the wire locating and guide block 86 which is secured by fasteners 88 to the upper surface of the centre guide plate 82 and which extends leftwardly (as seen in Figure 12) in cantilever fashion at the wire insertion stations 18, 20 and 22, over the shuttles 66 in the track 24 and over the front guide plate 84. The block 86 has a depending flange 90 at its righthand (as seen in Figure 12) end, the lower end of which flange 90 bears against the shuttles 66 on the feed track 24 to confine and guide them. The underside 99 of the device 86 has a recess 92, to provide clearance for the projecting upper portions of the connectors 11 fed along the track 24'.

The block 86 has an enlarged lefthand (as seen in Figures 12 and 13), end portion 94 into which extend the wire guiding slots 96, each slot 96 having an inner end 98 in alignment with the righthand (as seen in Figure 13) end of the connector 10 immediately adjacent to and beneath the slot 96. The slots 96 open into the lower surface 99 of the device 86 so that the end portions of the wires can be moved from the slots 96 into the wire receiving portions 11' of the terminals 11 of the connectors 10.

Each slot 96 has a wire entrance portion having an inclined upper wall 100 to guide a wire end into the slots 96 so that the wire end is positioned as shown in Figure 4.

The unwired connectors 10 are loaded into the shuttles 66 at a location 101 (Figure 16) on the track 24, adjacent to the side 65 of the base plate 64. The shuttles 66 are then initially advanced along the feed track 24 towards the side 67. Each shuttle is transferred laterally, at a location 103 adjacent to the side 67, onto the feed track 24' by means described below. During successive cycles of the apparatus, each shuttle 66 is sequentially transferred through the stations 18, 20 and 22. Each shuttle 66 is transferred from the station 22 to the location 101, at which location the fully wired connector is removed from the shuttle 66.

The mechanisms for advancing the shuttles 66 along the tracks 24 and 24' are shown in Figures 14 and 15. The shuttles 66 are advanced along the feed track 24 by means of a

slide 102, and along the track 24', past the insertion stations 18, 20 and 22, by means of a slide 102'. The slide 102 is mounted for reciprocating movement in a recess defined by the plates 76 and 80. As shown best in Figure 17, a dog 104 is mounted in the slide 102 in plate 105 secured in a recess in one end of the slide 102. The dog 104, which is biased upwardly (as seen in Figure 17) by a spring 108, has a portion which projects through a slot 107 in the plate 74 and is dimensioned to enter notches 112 in the lower surfaces of the shuttles 66, near their right hand (as seen in Figure 17) ends. It will be apparent from Figure 17 that the slide 102 can be moved leftwardly (as seen in Figure 17) from the position shown, to cause the dog 104 to be retracted from the notch 112 in which it is engaged and to move over the lower surface of the shuttle 66 until the dog 104 engages in the notch 112 in the next adjacent shuttle 66. Upon subsequent movement of the slide 102 in the opposite direction, the dog 104 advances the shuttle rightwardly (as seen in Figure 17) along track 24. Further notches 110 are provided near to the lefthand (as seen in Figure 17) ends of the shuttles 66, so that a similar dog 104' (Figure 14) can similarly advance the shuttles 66 along the track 24' described below.

The slide 102 is driven in reciprocating movement by means of a piston-and-cylinder unit 116 (Figure 14) mounted on the plate 64 and the piston rod 114 of which is threaded into a cross-head 118 which projects leftwardly (as seen in Figure 14) through an opening 122 in the plate 80. The cross-head 118 is in turn secured, by fasteners 120, to the slide 102.

The slide 102' is driven in reciprocating movement by the unit 116 acting through a pinion 126 mounted between the ends of the plates 76, 76' as shown in Figure 14. The pinion 126 meshes with teeth on the lefthand (as seen in Figure 14) edge of the slide 102 and with the teeth on the righthand (as seen in Figure 14) edge 124' of the slide 102'. Thus when the piston rod 114 is retracted from the position of Figure 14 to that of Figure 15, the slide 102' is moved towards the side 65, to advance the shuttles 66 along the track 24' and the slide 102 is moved towards the side 67 to advance the shuttles 66 along the track 24. The dog 104' which engages the shuttle 66 which is nearest to the side 67 as shown in cross section in Figure 14.

The shuttle 66 at the end of the track 24 nearest the side 67 of the plate 64 is transferred laterally towards the end 71 of the base plate 64, and is delivered to the track 24', by movement of a transfer plate 128. When the plate 128 is moved from the retracted position in which it is shown in Figure 15, to the advanced position in which it is shown in Figure 14, two upstanding posts 130 on the plate 128 transfer the shuttle 66 which is at the end of the track 24, nearest the side 67, to the track 24'. A

plate 132 (Figure 13) is provided on the free end of each post 130 to confine the shuttle 66, to support the connector 10 in the shuttle 66 during its transfer, and to position the shuttle on the track 24' so that the notch 112 of this shuttle receives the dog 104.

The transfer plate 128 is moved between its positions of Figures 14 and 15 by means of a pinion 138, the teeth of which mesh with teeth 136 on an edge of the plate 128 and with teeth 140 of a rack mounted in a recess in a cross-head 142 which is slidable between guides 137 and 139, as shown in Figure 14. The cross-head 142 is threaded on one end of a piston rod 144 of a piston-and-cylinder unit 146. The rod 144 is retracted into the cylinder of the unit 146 as the parts move to their positions of Figure 15 so that the pinion 138 is rotated in a clockwise (as seen in Figure 15) sense causing the slide 128 to move to the position of Figure 15. The slide 128 is returned to its Figure 14 position by advance movement of the piston rod 144.

A similar transfer plate 128' provided adjacent to the side 65 of the base plate 64 and has upstanding posts 130'.

When the slide 128' is moved from the position of Figure 14 towards that of Figure 15, it delivers a shuttle 66 at the end of the track 24' nearest the side 65, to the location 101 where the wired connector 10 contained in such shuttle is removed therefrom and the unwired connector 10 is placed in the shuttle.

The transfer plate 128' is driven in reciprocating motion by means of the unit 146, a portion 144' of the piston rod of which extends from its cylinder towards the side 65 of the base plate 64 and is screwed into a cross-head 142' containing a rack bar, teeth 140' of which mesh with a pinion 138'. The pinion 138', in turn, meshes with teeth 136' on an edge of the plate 128'.

As shown in Figure 18, each insertion punch 44 is formed integrally with a mounting block 148 secured to a tool holder 150 arranged to be driven by a ram (not shown) which may be actuated, for example by a bench press (not shown), within the cover 62 shown in Figure 9.

The wire lengthening bars 54 are vertically adjustable relative to one another, as will be apparent from the relative positions of the upper ends of these bars in Figure 9, so that varying lengths of wire can be provided for the individual terminals in the connectors to be wired. The rollers 56 facilitate the withdrawal of wire from the spools 26 and reduce the possibility of damage to the wires as they are withdrawn.

As shown in Figures 10 and 11, the individual insulation severing blades 50 are provided with mounting blocks 152 which are adjustably clamped by means of fasteners 154 in spaced grooves 156 in the tooling block 46. The distances between the blades 50 the wire severing blade 48, shown in Figure 10, correspond to the different lengths of insulation to

be stripped from the ends of the wires 14.

A roll 51 is provided at the right hand (as seen in Figure 10) end of the block 46. As will be apparent from Figures 7 and 8, as the wires 14 are depressed by the bars 54, the roll 51 reduces the frictional forces to which the insulation of the wires 14 is subjected.

The wire feed shuttle assembly 30 may be reciprocated towards and away from the insertion zone by means, for example, of a piston-and-cylinder unit (not shown). The shuttle assembly 30 is guided along its path of reciprocating movement by guide means (not shown) which provide for upward movement (indicated by a broken line 158 in Figures 4 and 6) of the assembly 30 as it moves from the position of Figure 3 to that of Figure 4 and from the position of Figure 5 to that of Figure 6, to ensure that the assembly 30 clears the blades 48 and 50 during its traverse.

As shown in Figure 8, the wire guide 36 is depressed by the block 52 as it moves to the position of Figure 8, so to position the wires 14 on the blades 48 and 50. The shuttle assembly guide means may be provided with camming means for so depressing the guide 36.

As shown in Figure 10, the terminals 11 of each connector 10 are closely spaced from one another, with, for example, a centre-to-centre spacing of about 2.54 mm. As shown in Figure 18, however, the insertion punches 44 are spaced from one another by a much greater distance, each punch 44 having a bulky mounting block 148. The punches could not in practice be mounted on the same centre-to-centre spacing as the terminal without suffering damage in operation. Since the bars 54 must, as shown in Figure 10, be thick enough to accommodate the rollers 56 it would be impractical for the rollers 56 to have such small thickness as 2.54 mm. Also, the width of the blades 50 and their mounting blocks 152 must greatly exceed 2.54 mm, if these blades are to be sufficiently durable.

The wire insertion stations could for example be only two, or more than three in number. In any case adjacent ones of the terminals that are wired at each station are separated from one another by at least one other terminal.

Claims

1. A method of producing wired electrical connectors (10) each comprising an insulating housing (12) having a plurality of juxtaposed cavities therein each containing an electrical terminal (11) having a wire receiving portion (11') adapted to receive, and to make electrical contact with, a wire (14), upon the wire (14) being moved laterally of its longitudinal axis, into the wire receiving portion (11'), in which method each wire (14) is aligned with one of the wire receiving portions (11') of the terminals (11) of a connector (10) at a wire insertion station (18, 20 or 22) and is there moved

into such wire receiving portion (11') laterally of the longitudinal axis of the wire (14); characterised in that each connector (10) is advanced through a plurality of wire insertion stations (18, 20 and 22) at each of which each of a plurality of wires (14) is inserted into the wire receiving portion (11') of a respective terminal of the connector (10), adjacent ones of these said respective terminals (11) being separated from one another at least by one other terminal (11) of the connector (10).

2. A method according to Claim 1, characterised in that the wire insertion stations (18, 20 and 22) are at least three in number and are arranged in a row in a common wire insertion zone (16), and in which method, the connectors (10) are advanced step by step through the stations (18, 20 and 22) from a first station (18) at one end of the row to a second station (22) at the other end of the row, the method comprising the following steps:—

(a) providing for each connector applying station (18, 20 and 22), a group of wires of a number M/X , where M = the number of terminals in each connector (10) and X = the number of the connector applying stations (18, 20 and 22);

(b) aligning each wire of each group of wires (14) with the wire receiving portion (11') of a respective terminal (11) of an individual one of the connectors (10), adjacent ones of these said respective terminals (11) being spaced from one another by $X-1$ intervening terminals;

(c) moving each wire (14) of each group into the wire receiving portion (11') with which it is aligned;

(d) removing a fully wired connector (10) from the second station (22), advancing the connectors (10) along the row of connector applying stations (18, 20 and 22) to position a connector (10) in each station excepting the first station (18) and placing an unwired connector in the first station (18); and

(e) continuously repeating steps (a) to (d).

3. Apparatus for producing wired electrical connectors (10), such connectors (10) each comprising an insulating housing (12) containing a row of electrical terminals (11) each having a wire receiving portion (11') into which a wire (14) can be inserted laterally of its longitudinal axis to make electrical connection with the terminal (11), the apparatus comprising a first wire insertion station (18) in a wire insertion zone (16); means (30) for feeding the wires (14) along a first path to present the wires in a common plane in the wire insertion zone (16), the wire insertion station (18) having first connector locating means (66) for removably locating a first connector (10) on one side of the common plane with the row of terminals (11) of the first connector extending transversely of the first path; and first insertion means (44) in the wire insertion zone (16) and on the other side of the common plane, for inserting wires into the wire receiving portions (11') of the ter-

minals (11) of the first connector (10), the insertion means (44) being movable along a second path, towards and away from the connector; characterised by a second wire insertion station (22) having second connector locating means (66) for removably locating a second connector (10) on the one side of the common plane in juxtaposed relationship with the first connector (10) and with the row of terminals (11) of the second connector (10) in longitudinal alignment with the row of terminals (10) of the first connector (10), second insertion means (44) in the insertion zone (16) and on the said other side of the common plane, the second insertion means (44) being movable along a third path towards and away from a connector (10) in the second connector locating means (66); and in that the first insertion means (44) is arranged to insert wires (14) into the wire receiving portions (11') of a first group of terminals (11) of a first connector (10) in the first locating means (66) and the second insertion means (44) is arranged to insert wires (14) into the wire receiving portions (11') a second group of terminals (11) of a second connector (10) in the second locating means (66), adjacent terminals in the first group being separated from each other by A terminal (11) of the first connector which is positioned therein correspondingly to a respective terminal of the second group and adjacent terminals (11) of the second group being separated from one another by a terminal (11) of the second connector which is positioned therein correspondingly to a respective terminal of the first group.

4. Apparatus according to Claim 3, characterised by a third wire insertion station (20) having third connector locating means (66) for removably locating a third connector (10) on the one side of the common plane in juxtaposed relationship with the first and second connectors (10) and with the row of terminals (11) of the third connector (10) in longitudinal alignment with the rows of terminals of the first and second connectors (10), and third insertion means in the insertion zone (16) and on the said other side of the common plane, the third insertion means (44) being movable along a fourth path towards and away from a connector (10) in the third connector locating means (66), and being arranged to insert wires into the wire receiving portions (11') of a third group of terminals (11) in the connector (10) in the third locating means (66), each connector comprising three groups of terminals, the terminals of each group being spaced by two intervening terminals and being of a number $M/3$, where M is the number of terminals (11) in each row.

5. Apparatus according to Claim 3 or 4, characterised by a mechanism (114, 116) for transferring each connector locating means (66) from one wire insertion station (18 or 20) to the next (20 or 22).

6. Apparatus according to Claim 5, characterised in that each connector locating means is

in the form of a shuttle (66), the shuttles being arranged to be driven in juxtaposed relationship along first (24) and second (24') juxtaposed spaced tracks, the second track (24') extending through the wire insertion stations (18, 20 and 22), and means (128 and 128') being provided for transferring the shuttles (66) from the first track (24) to the second track (24').

7. Apparatus according to Claim 5 or 6, characterised by means for sequentially actuating the wire feeding means (30), the wire insertion means (44) and the transfer mechanism (114, 116), to cause the connectors (10) to be shifted stepwise through the wire insertion stations (18, 20 and 22) and the groups of terminals in the connectors (10) in the connector locating means (66) to be simultaneously wired.

8. Apparatus according to any one of Claims 3 to 7, characterised in that the wire feeding means comprises a single shuttle assembly (30) arranged simultaneously to feed a plurality of groups of wires (14), so that the wires (14) of each group are in each in alignment with one of the wire receiving portions (11') of the terminals (11) of one of the connectors (10) in the connector locating means (66) at the wire insertion stations (18, 20 and 22).

9. Apparatus according to Claim 8, characterised in that wire lengthening bars (54) are provided upstream, in the wire feeding direction, of the wire insertion means (44), each such bar (54) being movable to cause a roller (56) on the free end of the bar (54) to engage one of the wires (14) immediately following its insertion into the corresponding wire receiving portion (11'), to draw a length of the wire from a wire supply source (26).

10. Apparatus according to Claim 9, characterised in that wire severing means (48) and wire insulation stripping means (50) are provided upstream of the wire lengthening bars (54), which are arranged to be further moved in the same direction after the lengths of wire have been drawn from the wire supply sources (26), to drag the wires (14) from the insulation stripping means (50) to strip the trailing ends of the wires (14), the wires (14) engaging a wire friction reduction roll (51) interposed between wire lengthening bars (54) and the insulation stripping means (50).

Revendications

1. Procédé de fabrication de connecteurs électriques câblés (10) comprenant chacun un boîtier isolant (12) présentant plusieurs cavités juxtaposées contenant chacune une borne électrique (11) ayant une partie (11') de réception d'un fil conçue pour recevoir et pour établir un contact électrique avec un fil (14), à la suite d'un déplacement du fil (14) latéralement à son axe longitudinal, vers l'intérieur de la partie (11') de réception de fil, procédé dans lequel chaque fil (14) est aligné sur l'une des parties (11') de réception de fils des bornes (11) d'un connecteur

(10) dans un poste (18, 20 ou 22) d'insertion de fils et est introduit dans cette partie (11') de réception de fil par un déplacement latéral à l'axe longitudinal du fil (14); caractérisé en ce que chaque connecteur (10) est avancé de façon à passer par plusieurs postes (18, 20 et 22) d'insertion de fils dans chacun desquels chacun de plusieurs fils (14) est inséré dans la partie (11') de réception de fil d'une borne respective du connecteur (10), certaines, adjacentes, desdites bornes respectives (11) étant séparées les unes des autres par au moins une autre borne (11) du connecteur (10).

2. Procédé selon la revendication 1, caractérisé en ce que les postes (18, 20 et 22) d'insertion de fils sont au moins au nombre de trois et sont agencés en une rangée dans une zone commune (16) d'insertion de fils, et procédé dans lequel les connecteurs (10) sont avancés pas à pas de façon à passer par les postes (18, 20 et 22), à partir d'un premier poste (18) situé à une première extrémité de la rangée vers un deuxième poste (22) situé à l'autre extrémité de la rangée, le procédé comprenant les étapes suivantes qui consistent:

(a) à fournir à chaque poste (18, 20 et 22) de pose de connecteurs un groupe de fils en nombre M/X , où M = le nombre de bornes de chaque connecteur (10) et X = le nombre de postes (18, 20 et 22) de pose de connecteurs;

(b) à aligner chaque fil de chaque groupe de fils (14) sur la partie (11') de réception de fil d'une borne respective (11) de l'un, individuel, des connecteurs (10), certaines, adjacentes, desdites bornes respectives (11) étant espacées les unes des autres de $X-1$ bornes intermédiaires;

(c) à introduire chaque fil (14) de chaque groupe dans la partie (11') de réception de fil sur laquelle il est aligné;

(d) à retirer un connecteur complètement câblé (10) du deuxième poste (22), à faire avancer les connecteurs (10) le long de la rangée de postes (18, 20 et 22) de pose de connecteurs pour positionner un connecteur (10) dans chaque poste, sauf le premier poste (18), et à placer un connecteur non câblé dans le premier poste (18); et

(e) à répéter en continu les étapes (a) à (d).

3. Appareil de fabrication de connecteurs électriques câblés (10), ces connecteurs (10) comprenant chacun un boîtier isolant (12) contenant une rangée de bornes électriques (11) ayant chacune une partie (11') de réception d'un fil dans laquelle un fil (14) peut être inséré, latéralement à son axe longitudinal, pour établir une connexion électrique avec la borne (11), l'appareil comprenant un premier poste (18) d'insertion de fils situé dans une zone (16) d'insertion de fils; des moyens (30) destinés à faire avancer les fils (14) le long d'un premier trajet pour présenter les fils dans un plan commun dans la zone (16) d'insertion de fils, le poste (18) d'insertion de fils comportant des moyens (66) de positionnement d'un premier

connecteur destinés à positionner de manière amovible un premier connecteur (10) sur un premier côté du plan commun de façon que la rangée de bornes (11) du premier connecteur s'étendent transversalement au premier trajet; et des premiers moyens (44) d'insertion situés dans la zone (16) d'insertion de fils et sur l'autre côté du plan commun, afin d'insérer des fils dans les parties (11') de réception de fils des bornes (11) du premier connecteur (10), les moyens (44) d'insertion étant mobiles le long d'un second trajet de façon à se rapprocher et s'éloigner du connecteur; caractérisé par un deuxième poste (22) d'insertion de fils comportant des moyens (66) de positionnement d'un deuxième connecteur destinés à positionner de manière amovible un deuxième connecteur (10) sur le premier côté du plan commun, en juxtaposition au premier connecteur (10) et de manière que la rangée de bornes (11) du deuxième connecteur (10) soit en alignement longitudinal sur la rangée de bornes (11) du premier connecteur (10), des deuxièmes moyens d'insertion (44) situés dans la zone (16) d'insertion et sur ledit autre côté du plan commun, les deuxièmes moyens d'insertion (44) étant mobiles le long d'un troisième trajet de façon à se rapprocher et s'éloigner d'un connecteur (10) placé dans les moyens (66) de positionnement du deuxième connecteur; et en ce que les premiers moyens d'insertion (44) sont disposés de manière à insérer des fils (14) dans les parties (11') de réception de fils d'un premier groupe de bornes (11) d'un premier connecteur (10) placé dans les premiers moyens (66) de positionnement et les seconds moyens d'insertion (44) sont agencés de manière à insérer les fils (14) dans les parties (11') de réception de fils d'un second groupe de bornes (11) d'un second connecteur (10) placé dans les seconds moyens (66) de positionnement, des bornes adjacentes du premier groupe étant séparées les unes des autres par une borne (11) du premier connecteur qui y est placée, en correspondance avec une borne respective du second groupe, et des bornes adjacentes (11) du second groupe étant séparées les unes des autres par une borne (11) du second connecteur qui y est placée, de façon correspondante à une borne respective du premier groupe.

4. Appareil selon la revendication 3, caractérisé par un troisième poste (20) d'insertion de fils comportant des moyens (66) de positionnement d'un troisième connecteur destinés à positionner de manière amovible un troisième connecteur (10) sur le premier côté du plan commun, en juxtaposition aux premier et deuxième connecteurs (10) et de manière que la rangée de bornes (11) du troisième connecteur (10) soit en alignement longitudinal sur les rangées de bornes des premier et deuxième connecteurs (10), et des troisièmes moyens d'insertion situés dans la zone (16) d'insertion et sur ledit autre côté du plan commun, les

troisièmes moyens d'insertion (44) étant mobiles le long d'un quatrième trajet de manière à se rapprocher et s'éloigner d'un connecteur (10) se trouvant dans les moyens (66) de positionnement du troisième connecteur et étant agencés pour insérer des fils dans les parties (11') de réception de fils d'un troisième groupe de bornes (11) du connecteur (10) placées dans les troisièmes moyens (66) de positionnement, chaque connecteur comprenant trois groupes de bornes, les bornes de chaque groupe étant espacées par deux bornes intermédiaires et étant en nombre $M/3$ où M est le nombre de bornes (11) de chaque rangée.

5. Appareil selon la revendication 3 ou 4, caractérisé par un mécanisme (114, 116) destiné à transférer chacun des moyens (66) de positionnement de connecteurs d'un poste (18 ou 20) d'insertion de fils vers le suivant (20 ou 22).

6. Appareil selon la revendication 5, caractérisé en ce que chacun des moyens de positionnement de connecteurs se présente sous la forme d'une navette (66), les navettes étant agencées de façon à être entraînées en juxtaposition le long de premier (24) et second (24') chemins espacés et juxtaposés, le second chemin (24') passant à travers les postes (18, 20 et 22) d'insertion de fils, et des moyens (128 et 128') étant prévus pour transférer les navettes (66) du premier chemin (24) vers le second chemin (24').

7. Appareil selon la revendication 5 ou 6, caractérisé par des moyens destinés à actionner séquentiellement les moyens (30) d'avance de fils, les moyens (44) d'insertion de fils et le mécanisme de transfert (114, 116), afin que les connecteurs (10) soient déplacés pas à pas à travers les postes (18, 20 et 22) d'insertion de fils et que les groupes de bornes des connecteurs (10) placés dans les moyens (66) de positionnement de connecteurs soient câblés simultanément.

8. Appareil selon l'une quelconque des revendications 3 à 7, caractérisé en ce que les moyens d'avance des fils comprennent un ensemble à navette unique (30) agencé pour faire avancer simultanément plusieurs groupes de fils (14) afin que les fils (14) de chaque groupe soient chacun en alignement sur l'une des parties (11') de réception de fils des bornes (11) de l'un des connecteurs (10) placés dans les moyens (66) de positionnement de connecteurs dans les postes (18, 20 et 22) d'insertion de fils.

9. Appareil selon la revendication 8, caractérisé en ce que des barres (54) d'allongement des fils sont placées en amont, dans le sens d'avance des fils, des moyens (44) d'insertion des fils, chacune de ces barres (54) étant mobile afin qu'un galet (56), porté par l'extrémité libre de la barre (54), s'applique contre l'un des fils (14) immédiatement après son insertion dans la partie correspondante (11) de réception de fil pour tirer une longueur du fil d'une source (26)

d'approvisionnement en fil.

10. Appareil selon la revendication 9, caractérisé en ce qu'il est prévu, en amont des barres (54) d'allongement des fils, des moyens (48) de sectionnement des fils et des moyens (50) de dénudage des fils qui sont agencés pour être déplacés davantage dans le même sens, après que les longueurs de fils ont été tirées des sources (26) d'approvisionnement en fils, afin de tirer les fils (14) par rapport aux moyens (50) de dénudage pour dénuder les extrémités arrière des fils (14), les fils (14) entrant en contact avec un rouleau (51) de réduction de frottement des fils interposé entre des barres (54) d'allongement des fils et les moyens (50) de dénudage.

Patentansprüche

1. Verfahren zur Herstellung verdrahteter elektrischer Verbinder (10), von denen jeder ein isolierendes Gehäuse (12) mit einer Vielzahl von nebeneinanderliegenden Hohlräumen darin aufweist, in denen jeweils ein elektrischer Anschluß (11) aufgenommen ist, der einen Drahtaufnahmeabschnitt (11') aufweist, welcher zur Aufnahme eines Drahtes (14) zur Herstellung eines elektrischen Kontaktes mit diesem ausgebildet ist, wenn der Draht (14) seitlich zu seiner Längsachse in den Drahtaufnahmeabschnitt (11') hineinbewegt wird, wobei jeder Draht (14) mit einer der Drahtaufnahmeabschnitte (11') der Anschlüsse (11) eines Verbinders (10) an einer Drahteinsetzstation (18, 20 oder 22) ausgerichtet und hier seitlich zur Längsachse des Drahtes (14) in einen derartigen Drahtaufnahmeabschnitt (11') hineinbewegt wird, dadurch gekennzeichnet, daß jeder Verbinder (10) durch eine Vielzahl von Drahteinsetzstationen (18, 20 und 22) vorgeschoben wird, daß an jeder dieser Stationen jeder einer Vielzahl von Drähten (14) in den Drahtaufnahmeabschnitt (11') eines jeweiligen Anschlusses des Verbinders (10) eingesetzt wird, und daß benachbarte dieser jeweiligen Anschlüsse (11) voneinander um wenigstens einen anderen Anschluß (11) des Verbinders (10) getrennt sind.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Zahl der Drahteinsetzstationen (18, 20 und 22) wenigstens drei beträgt und die Drahteinsetzstationen in einer Reihe in einer gemeinsamen Drahteinsetzzone (16) angeordnet sind, daß bei dem Verfahren die Verbinder (10) schrittweise durch die Stationen (18, 20 und 22) ausgehend von einer ersten Station (18) an ein Ende der Reihe zu einer zweiten Station (22) am anderen Ende der Reihe vorgeschoben werden, daß das Verfahren ferner die folgenden Schritte umfaßt:

(a) das für jede Verbinder-Anbringungsstation (18, 20 und 22) eine Gruppe von Drähten in der Zahl M/X vorgesehen wird, wobei M die Zahl der Anschlüsse in jedem Verbinder (10) ist und X die Zahl der Verbinder-

Anbringungsstationen (18, 20 und 22);

(b) das jeder Draht jeder Gruppe von Drähten (14) mit dem Drahtaufnahmeabschnitt (11') eines jeweiligen Anschlusses (11) eines der Verbinder (10) aufgerichtet wird, wobei benachbarte dieser jeweiligen Anschlüsse (11) zueinander im Abstand von X-1 zwischenliegende Anschlüsse angeordnet sind;

(c) daß jeder Draht (14) jeder Gruppe in den Drahtaufnahmeabschnitt (11'), mit dem er ausgerichtet ist, hineinbewegt wird;

(d) daß ein vollverdrahteter Verbinder (10) aus der zweiten Station (22) herausgenommen wird, daß die Verbinder (10) entlang der Reihe von Verbinder-Anbringungsstationen (18, 20 und 22) vorgeschoben werden, um einen Verbinder (10) in jeder Station mit Ausnahme der ersten Station (18) zu positionieren, und schließlich ein unverdrahteter Verbinder in die erste Station (18) eingesetzt wird; und

(e) daß die Schritte (a) bis (d) fortwährend wiederholt werden.

3. Vorrichtung zur Erzeugung von verdrahteten elektrischen Verbindern (10), wobei diese Verbinder (10) jeweils ein isolierendes Gehäuse (12) aufweisen, welches eine Reihe von elektrischen Anschlüssen (11) enthält, die jeweils einen Drahtaufnahmeabschnitt (11') aufweisen, in den ein Draht (14) seitlich zu seiner Längsachse eingesetzt werden kann, um mit dem Anschluß (11) eine elektrische Verbindung herzustellen, wobei ferner das Gerät eine erste Drahteinsetzstation (18) in einer Drahteinsetzzone (16) aufweist, Einrichtungen (30) zur Zufuhr der Drähte (14) entlang eines ersten Pfades zur Anordnung der Drähte in einer gemeinsamen Ebene in der Drahteinsetzzone (16), wobei die Drahteinsetzstation (18) erste Verbinderpositioniereinrichtungen (66) aufweist, um einen ersten Verbinder (10) an einer Seite der gemeinsamen Ebene wegnehmbar zu positionieren, so daß die Reihe von Anschlüssen (11) des ersten Verbinders sich quer zum ersten Pfad erstreckt, sowie erste Einsetzeinrichtungen (44) in der Drahteinsetzzone (16) und an der anderen Seite der gemeinsamen Ebene, um Drähte in die Drahtaufnahmeabschnitte (11') der Anschlüsse (11) des ersten Verbinders (10) einzusetzen, und wobei die Einsetzeinrichtung (44) entlang eines zweiten Pfades zu dem Verbinder hin und von diesem weg bewegbar ist, dadurch gekennzeichnet, daß eine zweite Drahteinsetzstation (22) zweite Verbinderpositioniereinrichtungen (66) aufweist, um einen zweiten Verbinder (10) an der einen Seite der gemeinsamen Ebene in nebeneinanderliegender Beziehung mit dem ersten Verbinder (10) entfernbar zu positionieren, wobei die Reihe von Anschlüssen (11) des zweiten Verbinders (10) in Längsrichtung mit der Reihe der Anschlüsse (11) des ersten Verbinders (10) ausgerichtet ist, daß zweite Einsetzeinrichtungen (44) in der Einsetzzone (16) und auf der anderen Seite der gemeinsamen Ebene vorgesehen sind, daß die zweiten Ein-

setzeinrichtungen (44) entlang eines dritten Pfades zu einem Verbinder (10) in der zweiten Verbinderpositioniereinrichtung (66) hin und von diesem weg bewegbar sind, und daß die erste Einsetzeinrichtung (44) zum Einsetzen von Drähten (14) in die Drahtaufnahmeabschnitte (11') einer ersten Gruppe von Anschlüssen (11) eines ersten Verbinders (10) in der ersten Positioniereinrichtung (66) ausgebildet ist und die zweite Einsetzeinrichtung (44) zum Einsetzen von Drähten (14) in die Drahtaufnahmeabschnitte (11') einer zweiten Gruppe von Anschlüssen (11) eines zweiten Verbinders (10) in der zweiten Positioniereinrichtung (66) ausgebildet ist, wobei benachbarte Anschlüsse in der ersten Gruppe voneinander um wenigstens einen Anschluß (11) des ersten Verbinders, der hier positioniert ist, entsprechend einem jeweiligen Anschluß der zweiten Gruppe getrennt sind, und benachbarte Anschlüsse (11) der zweiten Gruppe voneinander um wenigstens einen Anschluß (11) des zweiten Verbinders, der hier positioniert ist, entsprechend einem jeweiligen Anschluß der ersten Gruppe getrennt sind.

4. Gerät nach Anspruch 3, dadurch gekennzeichnet, daß eine dritte Drahteinsetzstation (20) mit einer dritten Verbinderpositioniereinrichtung (66) versehen ist, um einen dritten Verbinder (10) an einer Seite der gemeinsamen Ebene in nebeneinanderliegender Beziehung zu dem ersten und zweiten Verbinder (10) entfernbar zu positionieren, wobei die Reihe von Anschlüssen (11) des dritten Verbinders (10) in Längsrichtung mit den Reihen der Anschlüsse des ersten und zweiten Verbinders (10) ausgerichtet ist, daß in der Einsetzzone (16) und an der anderen Seite der gemeinsamen Ebene eine dritte Einsetzeinrichtung vorgesehen ist, daß die dritte Einsetzeinrichtung (44) entlang eines vierten Pfades zu einem Verbinder (10) in der dritten Verbinderpositioniereinrichtung (66) hin und von diesem weg bewegbar ist, und derart angeordnet ist, daß Drähte in die Drahtaufnahmeabschnitte (11') einer dritten Gruppe von Anschlüssen (11) in dem Verbinder (10) in der dritten Positioniereinrichtung (66) eingesetzt werden, wobei jeder Verbinder drei Gruppen von Anschlüssen aufweist und die Anschlüsse jeder Gruppe um zwei zwischenliegende Anschlüsse beabstandet sind und ihre Anzahl $M/3$ beträgt, wobei M die Zahl der Anschlüsse (11) in jeder Reihe ist.

5. Gerät nach Anspruch 3 oder 4, dadurch gekennzeichnet, daß ein Mechanismus (114, 116) vorgesehen ist, um jede Verbinderpositioniereinrichtung (66) von einer Drahteinsetzstation (18 oder 20) zur nächsten (20 oder 22) zu überführen.

6. Gerät nach Anspruch 5, dadurch gekennzeichnet, daß jede Verbinderpositioniereinrichtung als Schiffchen (66) ausgebildet ist, daß die

Schiffchen derart angeordnet und ausgebildet sind, daß sie in nebeneinanderliegender Beziehung entlang eines ersten (24) und eines zweiten (24') nebeneinander im Abstand angeordneten Pfades angetrieben sind, daß der zweite Pfad (24') sich durch die Drahteinsetzstationen (18, 20 und 22) hindurcherstreckt, und daß Einrichtungen (128 und 128') vorgesehen sind, um die Schiffchen (66) von der ersten Bahn (24) auf die zweite Bahn (24') zu überführen.

7. Gerät nach Anspruch 5 oder 6, dadurch gekennzeichnet, daß Einrichtungen zur sequentiellen Betätigung der Drahtzufuhreinrichtungen (30), der Drahteinsetzeinrichtungen (44) und des Überführungsmechanismus (114, 116) vorgesehen sind, um zu bewirken, daß die Verbinder (10) schrittweise durch die Drahteinsetzstationen (18, 20 und 22) geschoben werden und die Gruppen von Anschlüssen in den Verbindern (10) in der Verbinderpositioniereinrichtung (66) gleichzeitig verdrahtet werden.

8. Gerät nach einem der Ansprüche 3 bis 7, dadurch gekennzeichnet, daß die Drahtzufuhreinrichtungen eine einzige Schiffchenanordnung (30) umfassen, welche derart ausgebildet ist, daß eine Vielzahl von Gruppen von Drähten (14) gleichzeitig zugeführt wird, so daß die Drähte (14) jeder Gruppe jeweils in Ausrichtung mit einem der Drahtaufnahmeabschnitte (11') der Anschlüsse (11) eines der Verbinder (10) in der Verbinderpositioniereinrichtung (66) an den Drahteinsetzstationen (18, 20 und 22) angeordnet sind.

9. Gerät nach Anspruch 8, dadurch gekennzeichnet, daß Draht-Ablängstangen (54) in Drahtzufuhrrichtung stromaufwärts der Drahteinsetzeinrichtung (44) vorgesehen sind, daß jede dieser Stangen (54) bewegbar ist, um eine Rolle (56) auf dem freien Ende der Stange (54) in Eingriff mit einem der Drähte (14) zu bringen, und zwar unmittelbar nach seinem Einsetzen in den entsprechenden Drahtaufnahmeabschnitt (11'), um ein Stück des Drahtes von einer Drahtvorratsquelle (26) abzuziehen.

10. Gerät nach Anspruch 9, dadurch gekennzeichnet, daß Drahtabtrenneinrichtungen (48) und Drahtisoliations-Abzieheinrichtungen (50) stromaufwärts der Drahtablängstangen (54) vorgesehen sind, die derart angeordnet sind, daß sie weiter in die gleiche Richtung bewegt werden, nachdem die Drahtstücke von den Drahtvorratsquellen (26) abgezogen wurden, so daß die Drähte (14) von den Isolationsabzieheinrichtungen (50) weggezogen werden und die nachteiligen Enden der Drähte (14) abisoliert werden, und daß die Drähte (14) im Eingriff mit einer Drahtreibungs Verminderungsrolle (51) stehen, die zwischen den Drahtablängstangen (54) und der Isolationsabzieheinrichtung (50) eingefügt ist.

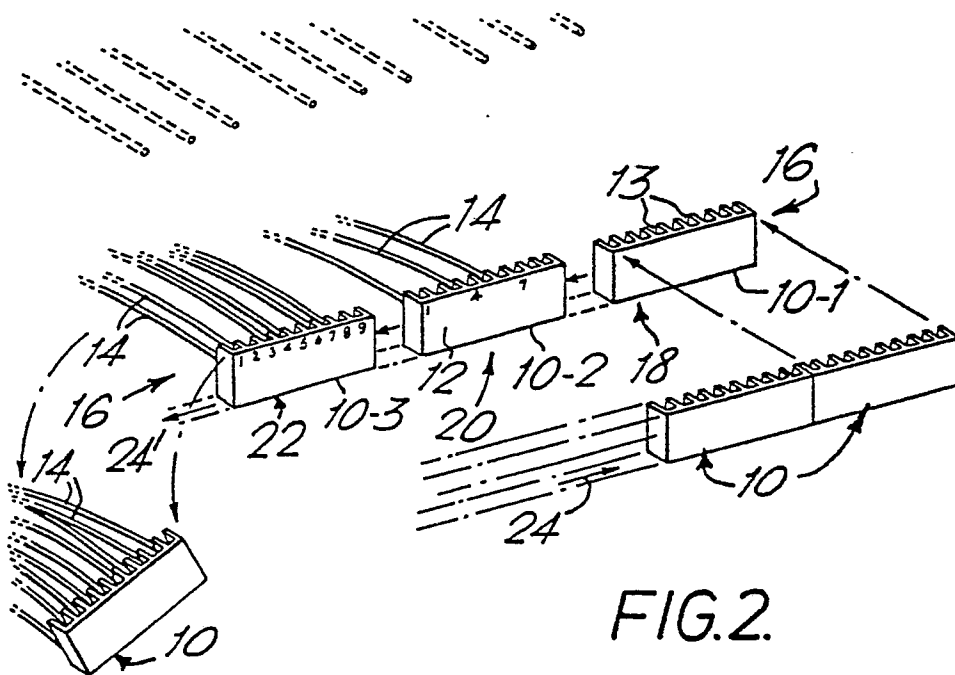
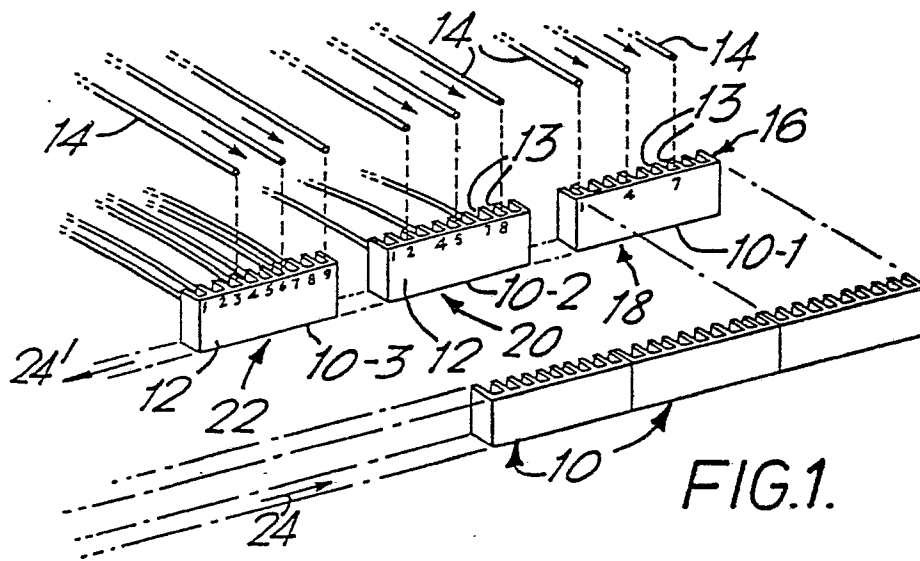


FIG.3.

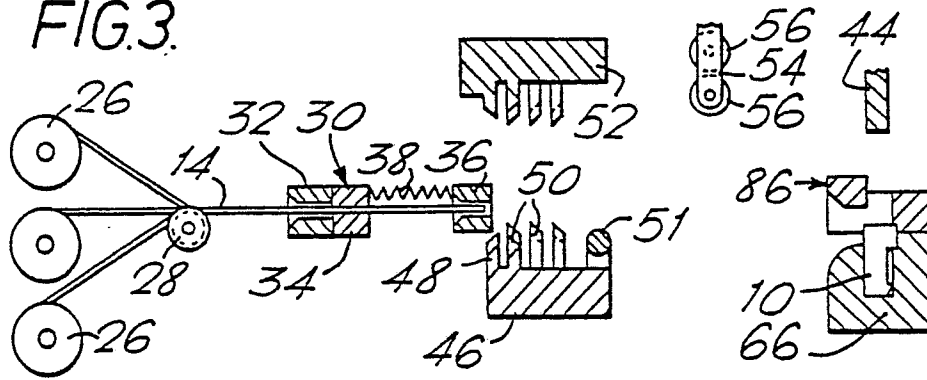


FIG.4.

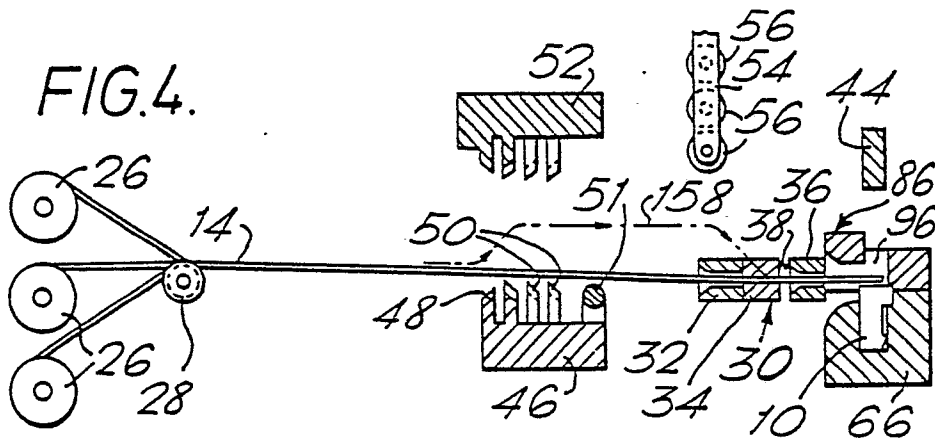


FIG.5.

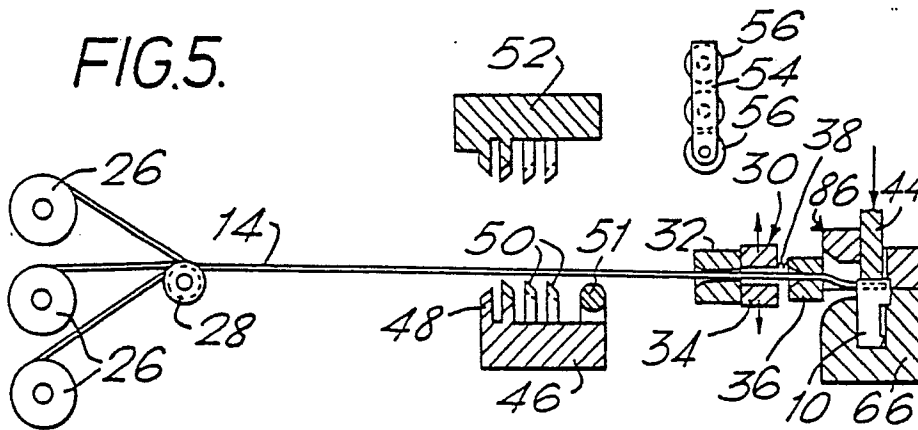


FIG.6.

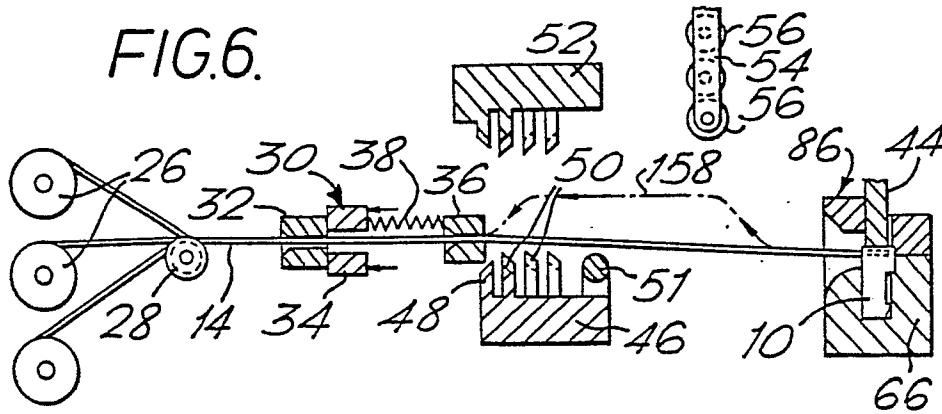


FIG.7.

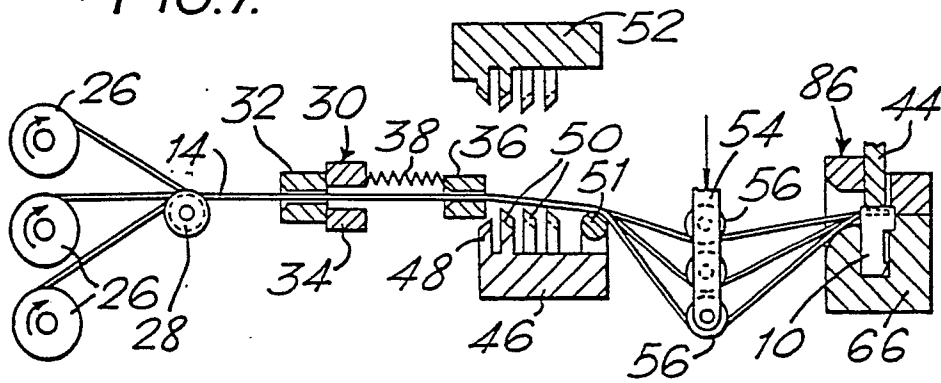


FIG.8.

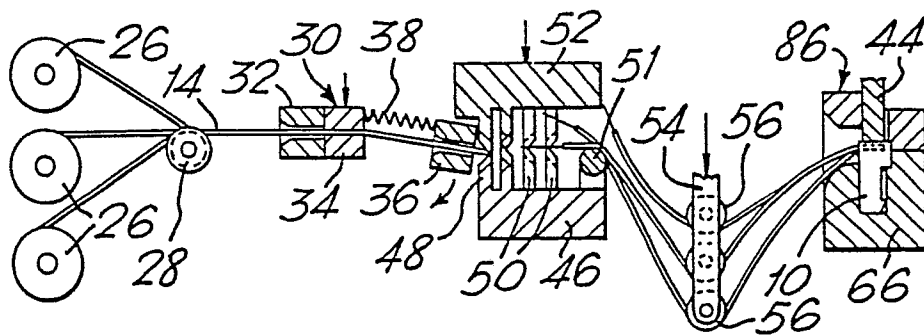


FIG.9.

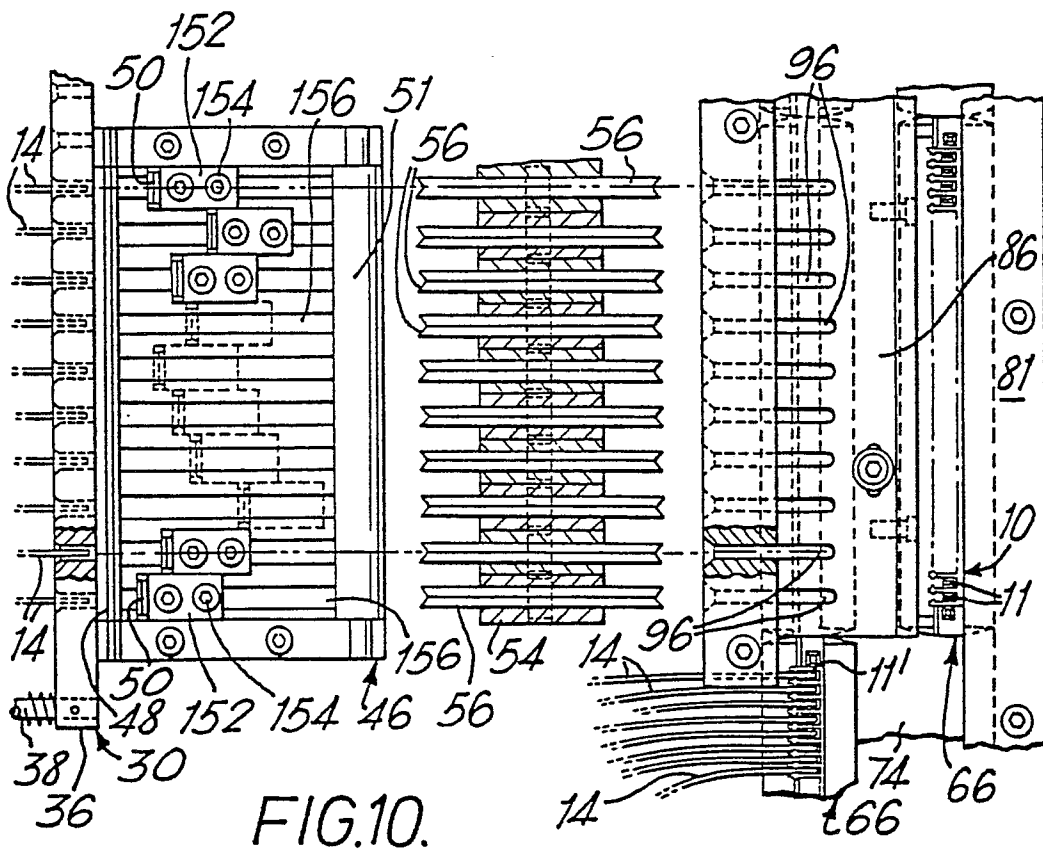
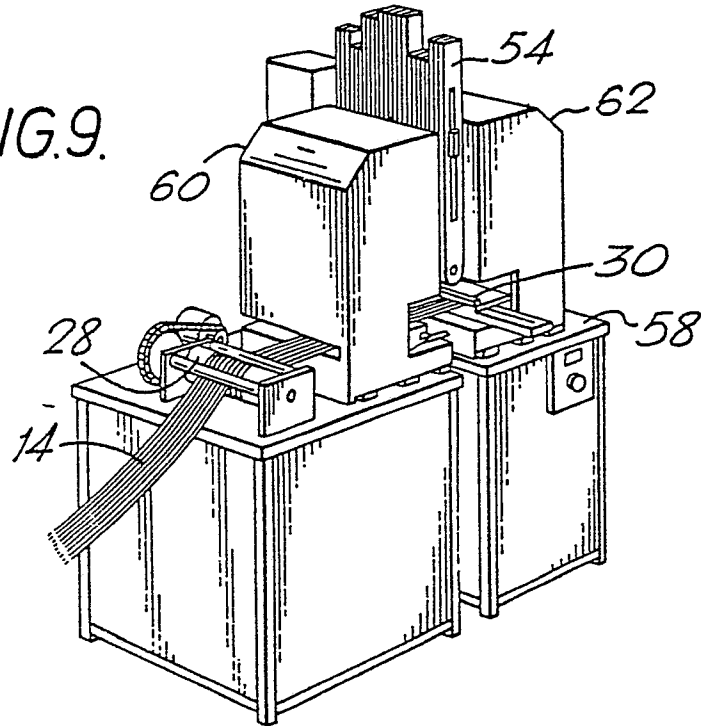


FIG.10.

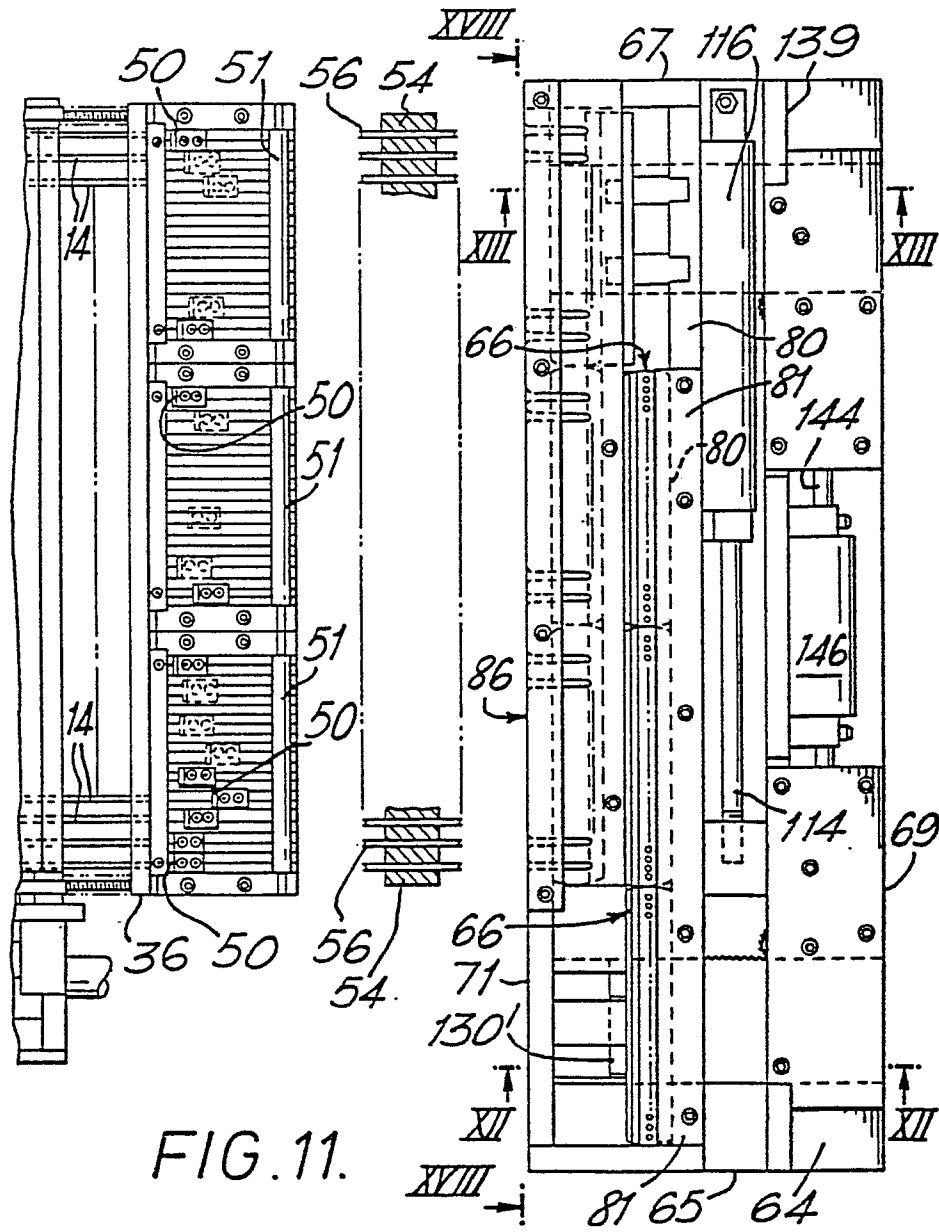


FIG.12.

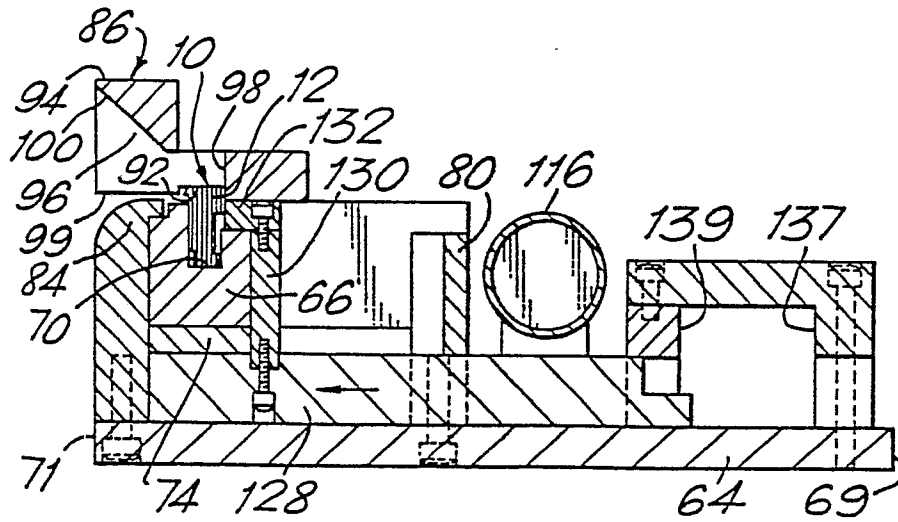
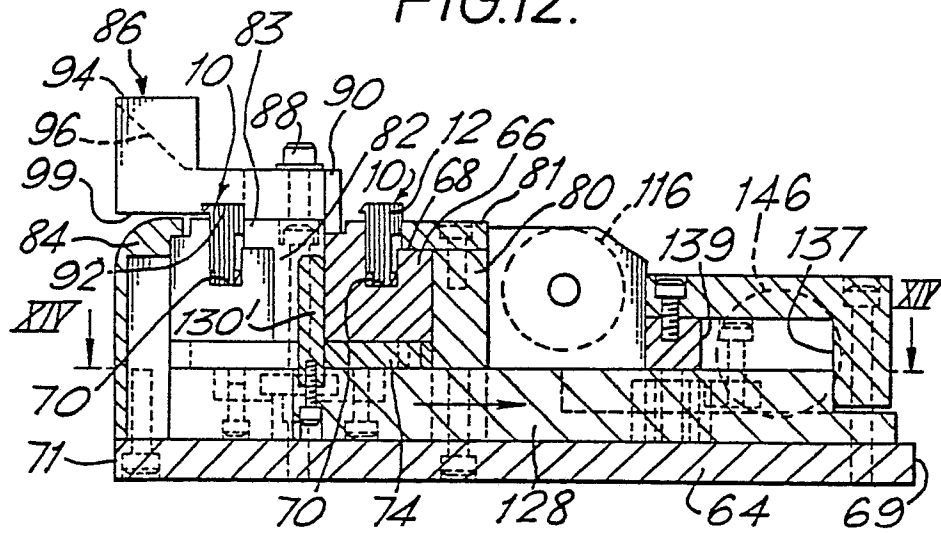


FIG.13.

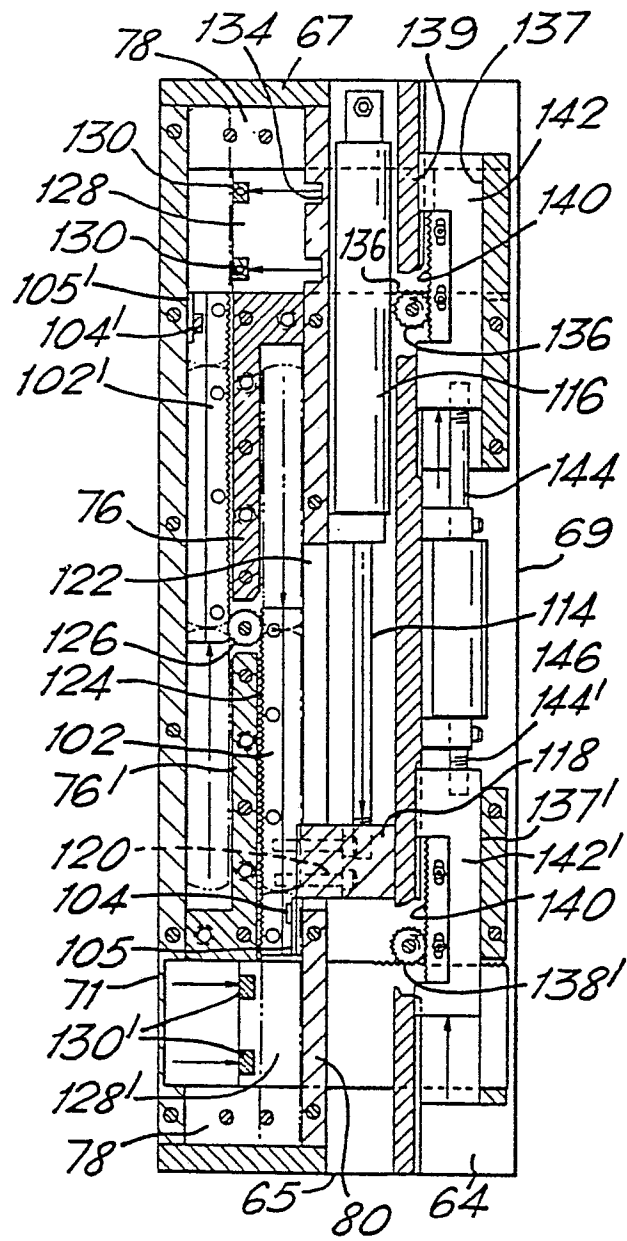


FIG. 14.

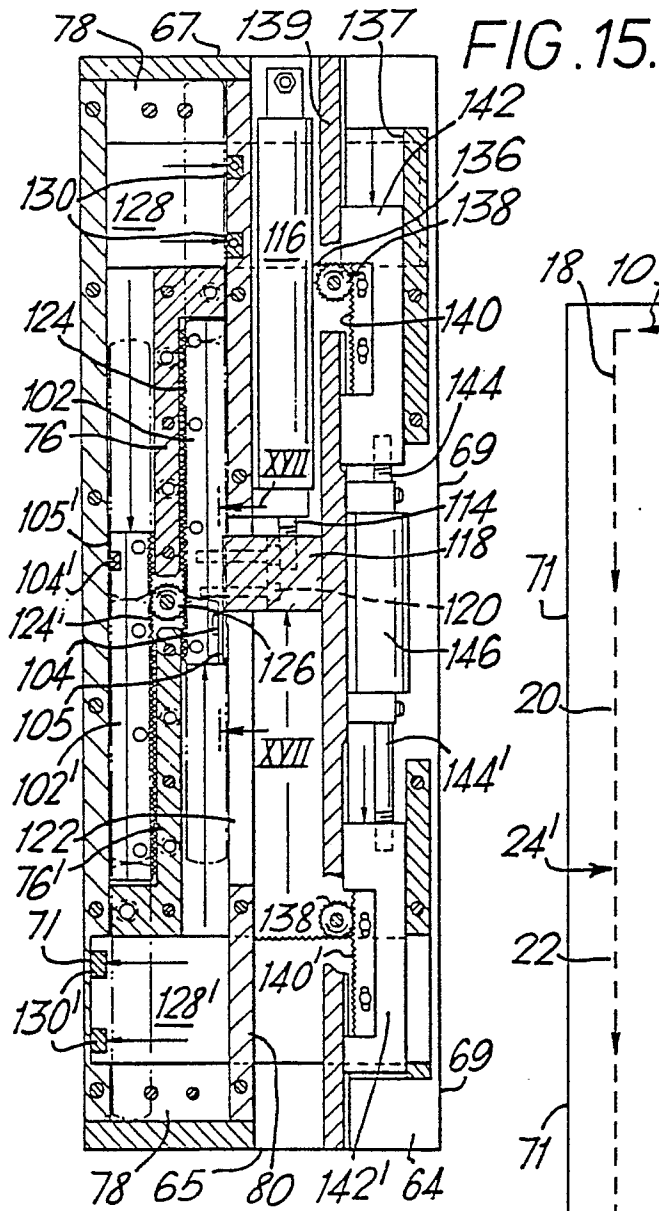


FIG. 16.

